

PC WORLD

September 1986 \$2.95

Canada & Foreign \$3.95

*The Comprehensive Guide to
IBM Personal Computers and Compatibles*

Special Issue

1986 Official Advanced Guide



- Network Management Tips
- Remote Control Packages Compared
- Application Programming Tools
 - How to Optimize Your BASIC Programs
 - Graphics Power on a Chip
 - Programmers' Secrets of Success



ATTENTION SIDEKICK USERS!

SuperKey®

If you use SideKick, you need SuperKey. They're designed to work together—and work for you. SuperKey's an amazing keyboard enhancer for your IBM® PC and compatibles. With easy-to-write macros, you and SuperKey can turn 1000 keystrokes into 1. SuperKey also includes powerful encryption technology (so powerful that the U.S. Government restricts the export of SuperKey) that can scramble your files and keep confidential files absolutely confidential. Unless you tell someone your secret password, no one else can get into your files for any good or not-so-good reason. SuperKey's macros put an end to keystroke repetition, and encryption puts an end to any security risk. Suggested retail: \$69.95.



Borland's Programming Languages and Toolboxes:

Turbo Pascal® 3.0 High-speed Pascal compiler and integrated programming environment.

Turbo Tutor® 2.0 Basic through advanced Turbo Pascal programming concepts and techniques.

Turbo Graphix Toolbox™ High resolution graphics for Turbo Pascal.

Turbo Database Toolbox™ Complete library of database routines for Turbo Pascal.

Turbo Editor Toolbox™ Word processor construction set for Turbo Pascal.

Turbo GameWorks™ Chess, Bridge, and Go-Moku in Turbo Pascal.

Artificial Intelligence:

Turbo Prolog™ High-speed compiler for Prolog, the 5th-generation Artificial Intelligence language.



SideKick®

Powerful desktop management program and the #1 best seller for the IBM PC. SideKick includes notepad, calendar, calculator, appointment scheduler, telephone directory, autodialer, and ASCII table. It's "RAM-

resident," which means SideKick is always there ready to react when you need to do something, call someone, or find out something in a hurry. And it does all this while you run other programs. It acts just like the old Western movie "sidekicks" it was named after—it's always there to help, but it never gets you into bar fights in the saloon.

InfoWorld named SideKick "Product of the Year" in '85 and PC World's William Urschel recently wrote that "Borland's SideKick continues to be the most

popular." Suggested retail:

copy protected \$54.95; not copy protected \$84.95.



Notepad and Calculator Window over Lotus 1-2-3®

Technical Specifications:

TURBO PASCAL 3.0 Minimum memory: 128K, includes 8087 and BCD features for 16-bit MS-DOS and CP/M-86 systems. CP/M-80 version minimum memory: 48K, 8087 and BCD features not available.

TURBO DATABASE TOOLBOX Minimum memory: 128K. CP/M-80 minimum memory: 48K. Requires Turbo Pascal 2.0 or later.

TURBO GRAPHIX TOOLBOX™ Minimum memory: 192K. Requires PC/MS-DOS 2.0 or later, Turbo Pascal 3.0, and IBM CGA, Hercules Monochrome Card or equivalent.

TURBO TUTOR 2.0 Minimum memory: 192K. CP/M-80 version minimum memory 48K. Requires PC/MS-DOS 2.0 or later and Turbo Pascal 3.0.

TURBO EDITOR TOOLBOX™ Minimum memory: 192K. Requires PC/MS-DOS 2.0 or later and Turbo Pascal 3.0.

TURBO GAMEWORKS™ Minimum memory: 192K. Requires PC/MS-DOS 2.0 or later and Turbo Pascal 3.0.

TURBO PROLOG™ Minimum memory: 384K.

REFLEX: THE ANALYST™ Minimum memory: 384K. Requires IBM CGA, Hercules Monochrome Card or equivalent. Works with Intel's AboveBoard-PC and -AT, AST's RAMpage! and RAMpage! AT, Quadram's Liberty-PC and -AT, Tecmar's 640 Plus, IBM's EGA and 3270/PC, AT&T's 6300 and many others.

REFLEX WORKSHOP™ Minimum memory: 384K. Requires Reflex: The Analyst. Two disk drives or hard disk recommended.

TURBO LIGHTNING™ Minimum memory: 256K. Two disk drives required. Hard disk recommended.

LIGHTNING WORD WIZARD™ Minimum memory: 256K. Requires Turbo Lightning, Turbo Pascal 3.0 required to edit source code.

SIDEKICK™ Minimum memory: 128K.

TRAVELING SIDEKICK™ Minimum memory: 256K.

SUPERKEY™ Minimum memory: 128K.

*For IBM PC, AT, XT, PCjr and true compatibles only, running PC/MS-DOS 2.0 or later.

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Traveling SideKick™

"Traveling SideKick could become as useful to you on the road as SideKick is at your desk," says Jim Bartimo of Personal Computing, and we're happy to agree.

Traveling SideKick is your SideKick's sidekick, and an electronic version of the familiar

diaries, time-managers, and daytime organizers that are so popular.

Traveling SideKick is BinderWare™ that includes an organizer, a binder, a software program, and a Report Generator that taps into your SideKick files and prints them out in convenient, portable form. Your appointments can be produced in daily/weekly/monthly/yearly calendars. You can also reproduce your phone list, client list, and mailing list and take them with you. Traveling SideKick is the smart new way to take your computer with you, without taking your computer with you. It's an attractive, professional-looking binder and a modern business tool that you can take around the world or just home for the night or weekend. There's nothing else like it, Traveling SideKick is quite unique—just like you. It's electronic, so unlike traditional record-keepers, it doesn't "expire" at the end of any calendar year. Suggested retail: \$69.95.

Turbo Lightning™

While you use SideKick, Reflex, MultiMate, WordPerfect, Microsoft, Word, 1-2-3, and most popular programs, Turbo Lightning proofreads as you write! You can rely on Turbo Lightning to save you from embarrassing typos and horrorbull spelling

while you do your letters, worksheets, or databases. Lightning's a revolutionary new software program and the

forerunner of a complete Electronic Reference Library. It includes the 80,000-word Random House Concise Dictionary and the 50,000-word Random House Thesaurus. (If you use electronic mail services

like MCI, CompuServe, BIX or The Source, Lightning will check your spelling on-line and save you from those unfortunate typos which tell a huge electronic audience that you can't spell for nutz!) The thesaurus, meanwhile, gives you instant synonyms—your vocabulary gets better all the time. "Lightning's good enough to make programmers and users cheer, executives of other software companies weep," says Jim Seymour of PC Week.

Suggested retail: \$99.95.

Lightning Word Wizard™

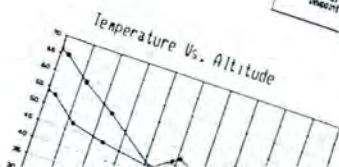
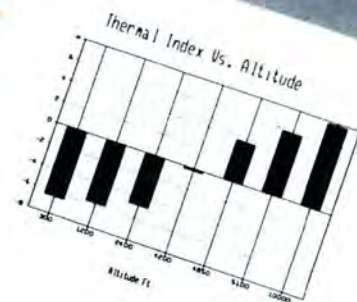
An important addition to Turbo Lightning, Lightning Word Wizard includes fascinating and challenging word games like "Akerue" (try reading that backwards), "That's Rite," "CodeCracker," "CrossSolver," "MixUp," and "FixUp," to name some of them. With CrossSolver, mind-benders like the New York Times crossword puzzle are demystified, solved, and your sanity saved. Lightning Word Wizard introduces you to the "nuts and bolts" of Turbo Lightning technology, and gives you more than 20 different calls to the Lightning engine. If you're into programming, by studying the Turbo Pascal source code and the Lightning engine calls, you'll learn how to put word power into your own programs. You can use Lightning Word Wizard for the games, and/or as the technical reference manual and development toolbox for Turbo Lightning. Suggested retail: \$69.95 (Bundled with Turbo Lightning, \$149.95).



Recognition for Borland International has come from business, trade, and media, and includes both product awards and awards for technical excellence and marketing. Borland was named "Company of the Year" by PC Magazine, SideKick, the #1 best seller for the IBM PC, was named "Product of the Year" by InfoWorld; Turbo Pascal was selected one of PC Week's Top 10 Products for 1984; SuperKey won one of PC Magazine's "Best of 1985" awards; Reflex, The Analyst was recognized in the "Software Products of the Year" awards by InfoWorld, and Reflex and SideKick were both nominated for British Micro Awards in 1986.

REFLEX™ THE ANALYST™

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Altitude	Temp	Pressure	Humidity	Wind	Clouds
0	70.0	30.0	100	0	0
1000	65.0	29.0	90	10	10
2000	60.0	28.0	80	20	20
3000	55.0	27.0	70	30	30
4000	50.0	26.0	60	40	40
5000	45.0	25.0	50	50	50
6000	40.0	24.0	40	60	60
7000	35.0	23.0	30	70	70
8000	30.0	22.0	20	80	80
9000	25.0	21.0	10	90	90
10000	20.0	20.0	0	100	100



We frequently surprise people with inventive, imaginative software, and people frequently surprise us with the way *they* use it.

For example, you'll read on this page about how a California soaring club uses our Reflex: The Analyst™ to give their pilots weather and thermal predictions and

charts and graphs every weekend.

That's an application we didn't imagine when we released Reflex as a highly visual analytical database manager and report writer.

But it's the kind of eye-opening application that might stimulate fresh ideas in your mind about how you can put your Reflex: The Analyst to work for you.

And thank you for your interest in and support for Borland International.

PKahn

Philippe Kahn,
President, Borland International

INSIDE STORIES!

- ☐ Maybe no one but your mother knows you can't spell, but go on-line with CompuServe, MCI, The Source and others, and *the whole world knows!* So use Turbo Lightning to save you from public electronic embarrassment. Lightning checks your spelling on-line, as you type, and before the *word* gets out. See inside pages for more.
- ☐ Just released, new addition to Turbo Lightning. Called the Lightning Word Wizard, it's both a technical reference manual for the "engine" that drives Turbo Lightning, and a crossword-solving, mind-bending, mystery-making, code-cracking set of word challenges—and you don't need to be a programmer to play.

LATE NEWS! TANDY NOW EVEN MORE HANDY!

- ☐ Borland International and Tandy Corporation have reached a new agreement which gives you about 5,500 more places worldwide to buy Borland products. Through Tandy's "Express Delivery" program, you can now order Borland products from any Tandy catalog in any Tandy store and get two-day delivery in the U.S.

TOSHIBA PICKS SIDEKICK AND SUPERKEY!

- ☐ Borland International and Toshiba America, Inc. have announced a joint marketing arrangement in which Toshiba will bundle Borland's SideKick and SuperKey programs on their new Toshiba 3100 portable, and SideKick on their new T1100 PLUS portable computers. The new Toshiba models and Borland's software programs are IBM PC-compatible.

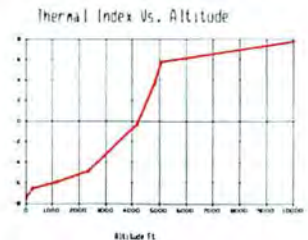
Reflex: The Analyst and the Wild Blue Yonder!

Andrew J. Piziali wrote us, "I have been using Reflex for several months now for both home budgeting and, would you believe, SOARING FORECASTS!

This soaring forecast is uploaded to the local hang gliding bulletin board each Saturday and Sunday morning. Prior to using Reflex, the raw data was plotted on a weather chart with a plastic overlay. This (new) system is much easier to use and I can manipulate the graph scales and hypothesize soaring conditions under changing variables."

He sent us Reflex graphs showing "Thermal Index vs. Altitude" and "Temperature vs. Altitude" (both shown here), along with Reflex-generated reports showing

inversions, wind direction, knot speeds at varying altitudes, and top of convection stats. All the

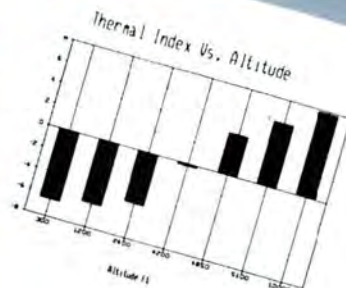


criteria pilots need to know and need to see before they fly, because most of them know the flying maxim, "There are old pilots and bold pilots, but there are no old bold pilots."

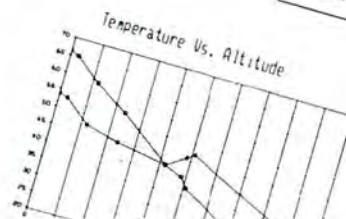
Another novel use for Reflex, the greatest analytical tool since the couch!



"The reason angels can fly is because they take themselves lightly."
NAGITREV



Altitude	Temp	Wind	Pressure	Humidity	Clouds
0	70.0	10.0	30.0	60.0	0.0
1000	65.0	10.0	29.5	60.0	0.0
2000	60.0	10.0	29.0	60.0	0.0
3000	55.0	10.0	28.5	60.0	0.0
4000	50.0	10.0	28.0	60.0	0.0
5000	45.0	10.0	27.5	60.0	0.0
6000	40.0	10.0	27.0	60.0	0.0
7000	35.0	10.0	26.5	60.0	0.0
8000	30.0	10.0	26.0	60.0	0.0
9000	25.0	10.0	25.5	60.0	0.0
10000	20.0	10.0	25.0	60.0	0.0



Reflex: The Analyst upgrades and adds the new Reflex Workshop!

Why running your business without Borland's Reflex and the new Reflex Workshop is an act of blind faith

Running a successful business isn't something you can do with your eyes shut, but no matter what business you're in, Reflex™ and the new Reflex Workshop™ give you all the tools and views to see what all the numbers look like.

Using Lotus 1-2-3* or dBASE* without Reflex is like driving at night without lights

Products such as 1-2-3 or dBASE can do the numbers for you, but you may still not get the picture—simply because they can't show you analytical graphs and pictures of your data, nor can they analyze and summarize all the information you manipulate like Reflex can.



The best just got better. Introducing Reflex 1.1 NEW!

The new Reflex 1.1 with expanded memory support allows you to manage huge databases of up to 8 megabytes of RAM, 32,000 records, and 250 fields per record with the now-legendary "Reflex Lightning Speed." Furthermore, Reflex 1.1 with its EGA support displays 40 lines of information in its spreadsheet-style List View, compared to less than 25 lines displayed by traditional spreadsheets.

Minimum memory: 384K

Reflex gives you five graphic ways of looking at your data, five different ways of analyzing your information.

The FORM VIEW lets you build and examine your database.

The LIST VIEW lets you put data in tabular list form just like a spreadsheet.

The REPORT VIEW allows you to generate everything from mailing labels to sophisticated reports. You can use database files created with Reflex or transferred from 1-2-3, dBASE, PFS: FILE, and other applications.

The GRAPH VIEW gives you instant interactive graphic representations.

The CROSTAB VIEW gives you amazing "cross-referenced" pictures of the links and relationships hidden in your data.

SPECIAL OFFER!

If you already bought Reflex 1.0, get Reflex 1.1 and the Reflex Workshop for only \$69.95

Because you bought Reflex from us, you're "our kind of people." And since we're not the "take-the-money-and-run" kind of company, you can upgrade to Reflex 1.1 and the Reflex Workshop for only \$69.95. If you prefer to simply upgrade to Reflex 1.1, you can do that for only \$10 by returning your 1.0 diskettes.

SPECIAL OFFER!

You get Reflex 1.1 and the Reflex Workshop for only \$199.95*

Sold separately, the new Reflex Workshop is \$69.95 and Reflex is \$149.95, totaling \$219.90—but you can get them both for a limited time only, at an amazing \$199.95. So act now, rush to your nearest dealer, call us, or clip the coupon and put Reflex 1.1 and the Reflex Workshop to work for you right away!

NEW! Introducing the Reflex Workshop

A major addition to Reflex, the new Reflex Workshop gives you a wide range of analytical tools written for specific applications. You can use these tools "as is" or modify them to suit your business needs. What you have to work with right away are 22 different tools.

For Finance/Accounting:

- Business Expense Tracking
- Petty Cash Tracking
- Line of Credit Tracking & Analysis
- Accounts Receivable Tracking & Aging Analysis
- Purchase Order Entry & Analysis
- Purchase Order Tracking System
- Leasing Inventory Management

- Asset Inventory Tracking
- Cash Management Trial Balance
- Commercial Real Estate Tracking & Analysis

For Administration:

- Mail List
- Appointment Scheduling
- Applicant Tracking & Inquiry System
- Facilities Planning
- Project Scheduling

For Sales & Marketing:

- Sales Lead Tracking & Analysis
- Store Check Inventory Analysis
- Sales Analysis
- Trend Analysis

For Production and Operations:

- Manufacturing Quality Assurance Tracking
- Assembly Repair Turnaround Tracking
- Product Cost Analysis and Control

YES! I want the best!

For credit card orders or the dealer nearest you
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Copies	Product	Price	Totals
—	Reflex: The Analyst	\$149.95*	\$
—	Reflex Workshop	69.95*	\$
—	Reflex, Reflex Workshop	199.95*	\$
—	Turbo Prolog	99.95	\$
—	Turbo Pascal 3.0 w/8087 & BCD	99.95	\$
—	Turbo Pascal for CP/M-80	69.95	\$
—	Turbo Database Toolbox	69.95	\$
—	Turbo Graphix Toolbox	69.95	\$
—	Turbo Tutor 2.0	39.95	\$
—	Turbo Editor Toolbox	69.95	\$
—	Turbo GameWorks	69.95	\$
—	Turbo Lightning	99.95	\$
—	Lightning Word Wizard	69.95	\$
—	Turbo Lightning, Lightning Word Wizard	149.95	\$
—	SideKick	84.95	\$
—	Traveling SideKick	69.95*	\$
—	SideKick, Traveling SideKick	125.00*	\$
—	SuperKey	69.95	\$

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Prices include shipping to all US cities.

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I use: ☐ PC-DOS ☐ MS-DOS

☐ CP/M-80 ☐ CP/M-86

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*Limited Time Offer until September 1, 1986.

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Prices subject to change without notice.

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PC WORLD

The Comprehensive Guide to IBM Personal Computers and Compatibles
September 1986



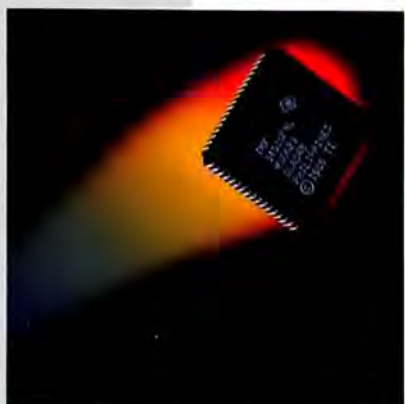
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Explore the mystique of personal computer programming with the creators of CP/M, *dBASE*, *VisiCalc*, and *Framework*—a treat even if you've never written a line of code.



202 Smarter Than the Sum of Its Parts

By adopting a philosophy of loose integration, the *Smart System* can afford to pack power into each module. And a heavyweight programming language makes this integrated package an application developer's playground.



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Shouldering the burden of video display processing, new coprocessors from Intel and Texas Instruments promise near-photographic imaging on the PC.

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1943-1985
Founding Editor

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Circle 98 on reader service card

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MEMO

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From: The boss
Re: New business presentation
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S.S.T.



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J. Gundersberg
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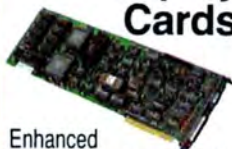
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Quarterly Sales Report -- First Quarter, 1988				
SECTION	MANAGER	CARS	TRUCKS	TOTAL
Region 1	Linda Stornes	872	532	1,404
Region 2	Sam Swinton	520	480	996
Region 3	Ralph Engstrom	671	458	1,129
Region 4	Kevin Stockdale	982	437	1,321
Region 5	Rick Duffy	822	433	1,255
Region 6	Sam Simon	540	528	1,068
Region 7	John Miller	420	713	1,133
Region 8	Harvey Roberts	780	328	1,028
Region 9	Rob Peterson	918	516	1,428
Region 10	Al Stone	887	587	1,384
Region 11	Nick Anderson	825	484	1,229
Region 12	Bruce Anderson	763	445	1,208
Region 13	Wesley Becker	680	472	1,178
Region 14	Bong Bradley	825	583	1,328
Region 15	Ann Spreitzer	935	535	1,470
Region 16	Patty Cooper	928	499	1,409

Lotus 1-2-3.[®] All releases of 1-2-3 run in SixPakPremium's DESQview[™] windows.

[illegible]

Dow Jones® Monitor on-line stock quotations while working on other projects.

C:\PAPERSON PAGE 2 LINE 3 COL 30

Dear Mr. Smith..

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The collage features several overlapping windows from different applications:

- Top Left:** A window titled "S:\-Lotus 2.1\ (500K)" showing a file named "A2: [U14]" with a "Print" button and the text "Send print output directly to printer".
- Top Right:** A window titled "SixPack (96K)" displaying a calendar for April 14, 1986, with a table showing days of the week (Sun, Mon, Tue, Wed, Thu, Fri, Sat).
- Middle Left:** A window titled "Quarterly Sales Report - First Qtr" showing a table with columns for REGION, C, and P. It lists data for Region 1 and Region 2.
- Middle Right:** A window titled "INFOVIEW.APP" showing a table with columns for Day, Mon, Tue, Wed, Thu, Fri, and Sat, with values 14 and 1986.
- Bottom Left:** A window titled "1-Bow Jones (100K)" showing a list of names and addresses, including "BOW JONES, BRIAN" and "BOW JONES, BRIAN".
- Bottom Center:** A large window titled "Thank you for inquiring about our multitasking solution, SixPackPremier." with a sub-header "With SixPackPremier and MSDOS-VI 9 large programs on your PC - at once you can run virtually all popular prog".
- Bottom Right:** A window titled "ADDRESS:" showing a list of names and addresses, including "Mountain View", "SARCE", "PARCE", "SARCE", and "SARCE".

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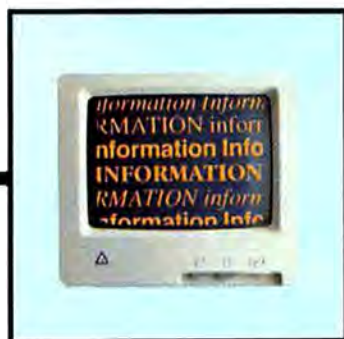
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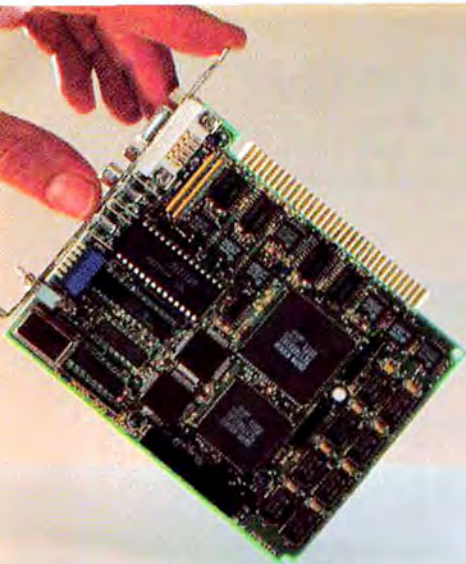
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HP LaserJet

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Circle 242 on reader service card

South Seas Shipping Company

November 20, 1986

Ms. Cathy Lyons
Import Officer
Botanical Research Ltd.
55 Weewak Road
Moresby, Papua, New Guinea

Re: Palm Fruit Research

Dear Ms. Lyons:

This letter confirms the agreement we reached at our meeting last week in San Francisco. Botanical Research, Ltd. will recommend the optimal conditions for shipping palm fruit and palm oil. Most important issues for consideration are: temperature during shipping and length of time between departure and arrival.

It is completed by June 1, 1987.

South Seas Shipping Company
Corporate Organizational Chart

PRESIDENT
Trevor Cardinal

INVESTOR'S UPDATE

SHIPPING GOES WILD IN SOUTH PACIFIC

BY ELEANOR FAIRBANK
DIRECTOR OF SALES

South Seas is causing a stir in the shipping world. It's not just every other company. South Seas has managed to maintain its growth despite the strong dollar. For the first quarter ending on March 31, South Seas turned in a record \$20 million profit on sales of \$117.1 million. President Trevor Cardinal cited several reasons for this record-breaking quarter. First of all, by expanding operations into special-ized, price insensitive commodities like palm oil and rum, South Seas has been relatively unaffected by the strong dollar and unfavorable exchange rates.

Second, South Seas is now reaping the benefits of long-term relationships it has developed with port authorities throughout the South Pacific. These relationships have let South Seas keep its rates competitive, yet profitable, during recent freight rate wars.

Finally, Mr. Cardinal said South Seas had money left over from funds it set aside last year for costs associated with the building and launching of new container ships.

Outlook for Sales

Spectacular sales for the first quarter will set the pace for what industry analysts expect will be a record year for South Seas. "South Seas will be the industry leader by 1990," says Michael Wong, a vice-president at Donovan, Kroll & Co. "Their growth strategy gives them and their balance sheet the muscle to grow even during the current slump in the shipping industry."

Competitive Factors

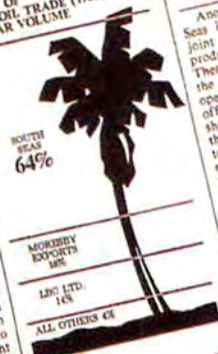
One of the primary factors in South Seas' success has been the company's ability to identify new market opportunities and then to establish the dominant position in that market. The palm oil trade is a prime example of this successful strategy. Since entering the market in 1977, South Seas has become a key player in the specialty shipping market.

However, LHC Ltd. is expected to become a more aggressive player. The Singapore concern had concentrated its efforts on the Indian Ocean. Last year, LHC purchased the sailing Barton Lines. This move the sailing doubled LHC's tanker capacity. Several of these mid-sized tankers have been refitted for the palm oil trade and are expected to enter service by mid-1986. So far, the LHC has been unsuccessful in winning any of South Seas' customers. In the future, the increased competition can be expected to depress both prices and margins, but for the short-term, South Seas contracts with most of the palm oil industries largest producers should insulate it.

Joint Ventures Considered

Another growth strategy South Seas is exploring is to establish joint ventures with several of the producers of these commodities. These ventures would be similar to the TransPac/South Seas cooperative, in that South Seas would offer its shipping capabilities in exchange for a share of the venture. At this time, the company is holding exploratory talks with many agri-culture firms. Another agri-culture firm would be a good fit with a shipping concern.

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LANGUAGES THAT ARE CAUSING THE BIGGEST PROGRAMMING BACKLOG IN HISTORY ARE ALSO EATING NICE BIG HOLES IN OUR POCKETS.

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We've been given some incredibly powerful hardware in recent times, but the languages aren't a whole lot better than they were 20 years ago.

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It gives you the power and speed to create screens, windows and reports of such richness and clarity you would never attempt them with any other language.

Because you would have to write the code.

With CLARION you simply design the screens using our SCREENER utility and then CLARION writes the source code AND compiles it for you in seconds.

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Remember, only CLARION can recompile and display a screen or report layout for modification.

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All the power and facilities you need to write great programs, faster than you ever dreamed of.

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Imagine making source program changes with the CLARION EDITOR. A single keystroke terminates the EDITOR, loads the COMPILER, compiles the program, loads the PROCESSOR and executes the program. It's that easy!

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A file may have as many keys as it needs. Each key may be composed of any fields in any order. And key files are updated whenever the value of the key changes.

Like SCREENER and REPORTER, CLARION's FILER utility also has a piece of the CLARION COMPILER. To create a new file, you name the Source Module. Then you name the Statement Label of a file structure within it.

FILER will also automatically rebuild existing files to match a changed file structure. It creates a new record for every existing record, copying the existing fields and initializing new ones.

Sounds pretty complicated, huh?

Not with CLARION's documentation and on-line help screens. If you are currently competent in BASIC, Pascal or "C" you can be writing CLARION applications in a day. In two days you won't believe the eloquence of your CLARION programs.

Okay, now for the best part of all. You can say it in CLARION

for \$295.00—plus shipping and handling. All you need is an IBM® PC, XT, AT or true compatible, with 320 KB of memory, a hard disk drive, and a parallel port.

And we'll allow a full 30 day evaluation period. If you're not satisfied with

CLARION, simply return it in its original condition for a full refund.

If you're not quite ready to take advantage of this no-risk opportunity, ask for our detailed 16 page color brochure. It vividly illustrates the elegance of CLARION. Consider it a preview of programming in the fast lane.

Either way, the 800 call's a freebie.



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CLARION™

DEPT. A2AD:3

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Circle 504 on reader service card



David Bunnell

The Software Storm Ahead

A new bill has been introduced in Congress that threatens to put software rental firms out of business. But who else stands to lose out? Not just the customer, but software vendors too.

Batten down the software hatches—we're heading for a gale. A move is afoot to introduce a bill in the next session of Congress that would prohibit the rental of personal computer software.

Representative Pat Schroeder, D-Colo., with input from the Software Publishers Association, is sponsoring H.R. 4949, otherwise known as the Computer Software Rental Act of 1986. The issue is complex, problematic, and almost Catch-22 in its ramifications. Although well intentioned, the bill is fraught with danger for the software consumer and the personal computer industry alike.

Why? Because when customers have few meaningful opportunities to test software before buying it, they begin to shrink away from investing in expensive but unproven programs.

Surely we must be able to steer a creative course around the software storm the bill would create. Otherwise a lot of ships are going to go down, with all hands on board.

Schroeder sees software publishers as the sole victims: "Com-

mercial business interests should not be allowed to reap profits from loopholes in the copyright laws or to conduct trade in copyrighted works at the expense of copyright owners."

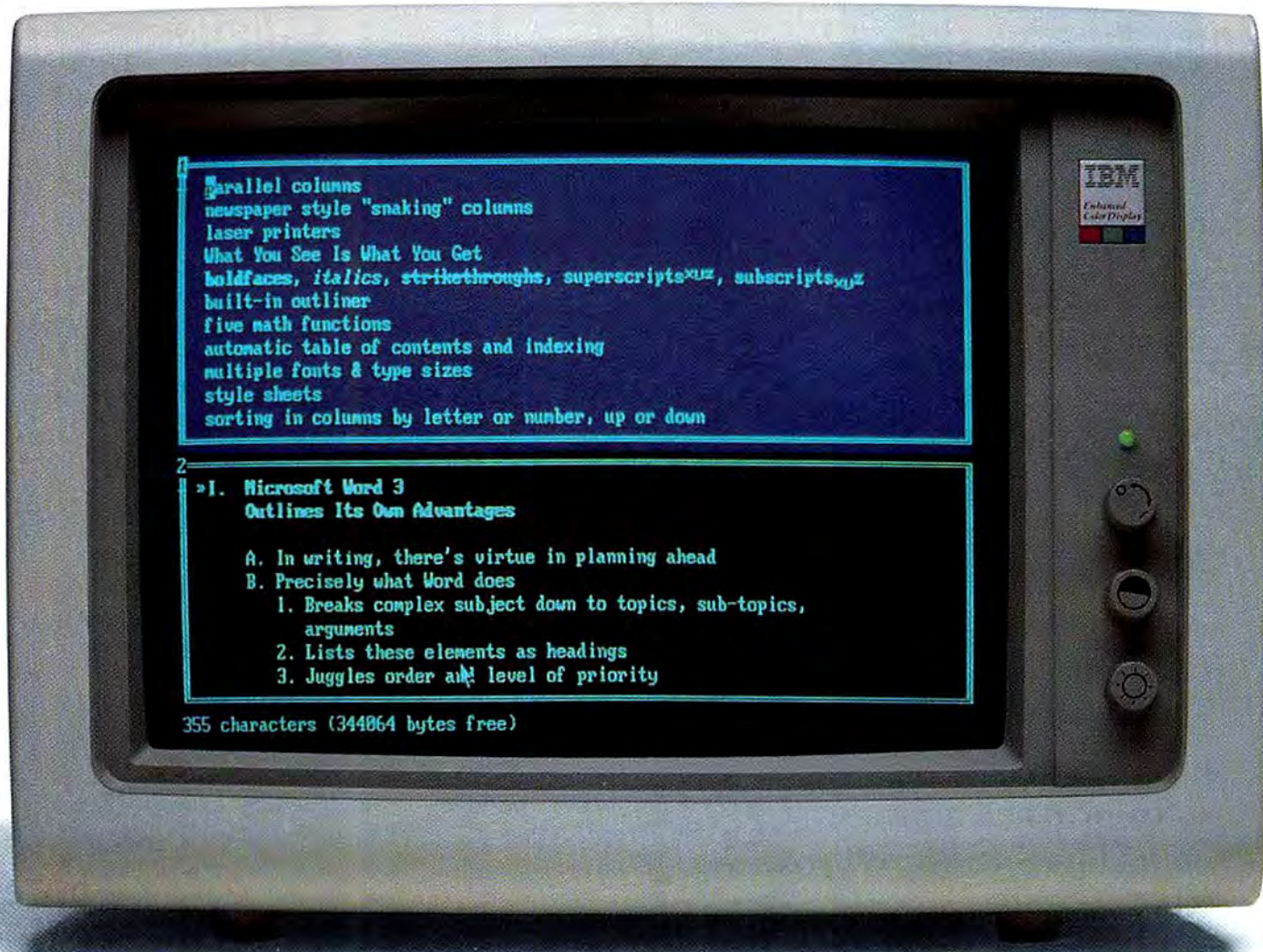
The "loophole" she refers to is the "first sale doctrine" of the U.S. copyright law, which allows buyers of copyrighted works to dispose of them in any way they choose.

The bill's target is software rental outlets, but the real victim is you—the software user.

In one of my columns, "The Battered PC User" (PCW, April 1986), I described what I considered the real causes of the decline in personal computer use. I observed that most software is confusing, difficult, and time-consuming to learn and that good software support is scarce. Consequently, customers become frustrated and give up computing instead of advancing further. Rather than encouraging power users, we end up with powerless users—a sad state of affairs.

(continues)

Microsoft Word 3. It outlines its own advantages.



The virtue of planning ahead is never more apparent than when you set out to make a point on paper. Which is precisely why we included a built-in outline program in Microsoft® Word Release 3.

Armed with the outliner, it's a simple matter to organize your thoughts before you write. Take a complex subject, break it down into a long roster of topics, subtopics, or arguments.

List all of these elements as headings. Then juggle their order and their level of priority. In Microsoft Word 3 the outline and the document it frames are linked. So you can jump back and forth between

the outline and your work. Collapse long manuscripts down to manageable main elements. And restructure the entire piece by simply moving the headings.

Then watch your ideas fall into place.

Watch this live demonstration.

Any kind of writing can benefit from the gentle discipline imposed by the outliner. A good for instance is the ad you're reading right now. Say you had to write it. If Word were your writing instrument, you'd simply list its many attributes, stream-of-

I. Microsoft Word 3 Outlines Its Own Advantages

- A. In writing, there's virtue in planning ahead
- B. Precisely what Word does
 - 1. Breaks complex subject down to topics, sub-topics, arguments
 - 2. Lists these elements as headings
 - 3. Juggles order and level of priority
- C. Outline and document are linked
 - 1. Jump between outline and work
 - 2. Collapse manuscripts down to main elements
 - 3. Restructure the entire piece by moving headings
- D. Even ad writing could benefit
 - 1. (List this ad's elements at random)
 - 2. Live demonstration
 - a. (Ad outline goes here)
- E. Word delivers what it promises
 - 1. What You See (on the screen) Is What You Get (printed on the page)--WYSIWYG
 - a. **Boldfaces**, underlines, *italics*, ~~strikethroughs~~
 - b. Superscripts^{xyz}, subscripts_{xyz}
- F. Word squeezes the most out of printers
 - 1. Drives over 100 different printers
 - a. Dot matrix
 - b. Impact
 - c. Laser
 - 2. Take advantage of latest laser printers
 - a. An extensive collection of fonts
 - b. Multiple fonts on a page
 - c. Proportional spacing
 - d. Microjustification
- G. Word saves time and effort
 - 1. Style sheets
 - a. Save complex formats of letters and forms
 - b. Set up those formats with a keystroke
 - 2. Glossaries
 - a. Save and instantly retrieve boilerplate
 - b. Contract clauses, headings and closings
 - 3. "Windowing"
 - a. View several documents or different parts of the same document simultaneously
 - b. Copy and move text easily between documents
 - c. Save time and bother of shutting down and opening files

consciousness style. The way it's displayed on the screen above.

Then, after designating each feature or thought as a heading, you electronically rearrange these random facts into something resembling real, organized writing. Like the very professional looking printout on the right side of the page.

**We think you
get the idea by now.**

By now you not only understand pretty clearly how the outliner works, you've got a good overview

of the new and amplified capabilities of Microsoft Word 3 for the IBM® PC and compatibles.

But you'll find it more satisfying if you get your hands on the program itself. Drop by a Microsoft dealer for a demonstration. And see how Word makes it easy to think before you write.

**Introducing
Microsoft® Word 3**
The High Performance Software

Program Review:



Makes dBASE Easier to Program, Reduces Logic Errors, Bugs

TranSec dANALYST™ automatically converts any dBASE III program to dBASE III PLUS with true record and file locking for multi-user operation. Features include syntax/blocking analysis, tabbed file output, variable cross reference. Framework-type interface command windows, pop-up menus, graphic analysis REPORTS menu. Saves programmer's time to analyze and debug dBASE II, III, or PLUS. Supports multi-user Clipper and network version of WordTech. Not copy protected. Rated a "best buy."

TranSec dANALYST™ \$74.95 plus \$5 s/h
TO ORDER: 1-800-423-0772 VISA/MC
IN FL: 1-305-474-7548

Program Review:



Simplify Naming, Finding Your Files with 32-Character File Names

TranSec PCEasy™ is a new easy-to-use "office environment" file management system that allows anyone to easily organize large amounts of data on a hard disk. Expands DOS file name limit to 32 characters to name files naturally, the way you think. Use easily remembered plain words or numbers. The interface structure mimics the paper world, only it's faster, better and easier to use... by programmers, managers, secretaries, clerks. PCEasy immediately finds file cabinets, file drawers, file folders, spread sheets, reports in their own logical location. Automatic menu access to application programs. Works with all popular applications and utilities. Not copy protected. Rated "★★★★ for ease of use."

TranSec PCEasy™ \$74.95 plus \$5 s/h
TO ORDER: 1-800-423-0772 VISA/MC
IN FL: 1-305-474-7548

Now there is an interesting but controversial way to alleviate some of that software frustration—software rental. By renting a program, potential buyers can test its capabilities to see if it really fulfills their needs, and they can try out new applications as well.

Paul Terrell has helped pioneer the software rental concept with his San Francisco Bay Area chain of five Software Emporium stores. But Paul is not new to pioneering: He started the world's second computer store, which later became the world's first computer-store chain, known as the Byte Shops.

When you walk into a Software Emporium, you can easily mistake it for a video store. Terrell has the titles displayed full-face on all four walls. He has a superb selection of software, including packages for the Macintosh, the IBM PC, the Apple II, and the Commodore 64—a much greater variety of software than you would find in most computer stores. Daily rental fees range from \$1 to \$20, with a minimum two-day rental. If you later decide to buy, you get an attractive bonus: You can apply the full rental cost to the purchase price of the software.

Of course, some people see rentals as an opportunity to steal software. But as our *PC World* software piracy survey showed ("Copying Software: Who's Right?," *PCW*, September 1985), illegal or unauthorized copies often lead to legitimate sales. People try out unauthorized copies of software, and once they're satisfied that the software is good, they most likely purchase it. They

want the documentation, the customer support, and the program updates.

(Neither Schroeder nor the Software Publishers Association—which is chiefly responsible for drafting the contents of the Computer Software Rental Act—has investigated the correlation between software rental and piracy.)

If software companies would allow software to be rented, perhaps rental software could be copy protected, while purchased software would remain unprotected. You could try out any program you found interesting, and if it passed inspection, you would be motivated to buy it.

This would solve the serious training dilemma associated with software. For this reason, I think Paul Terrell and his Software Emporium are really onto something.

Unfortunately, some software rental companies operate on the premise that all software renters are thieves. These stores frequently sell code-breaking programs like *Copy II PC* or *Copy II Mac*, thus encouraging their customers to pirate programs.

This unconscionable behavior is undoubtedly the impetus behind Schroeder's anti-software-rental bill.

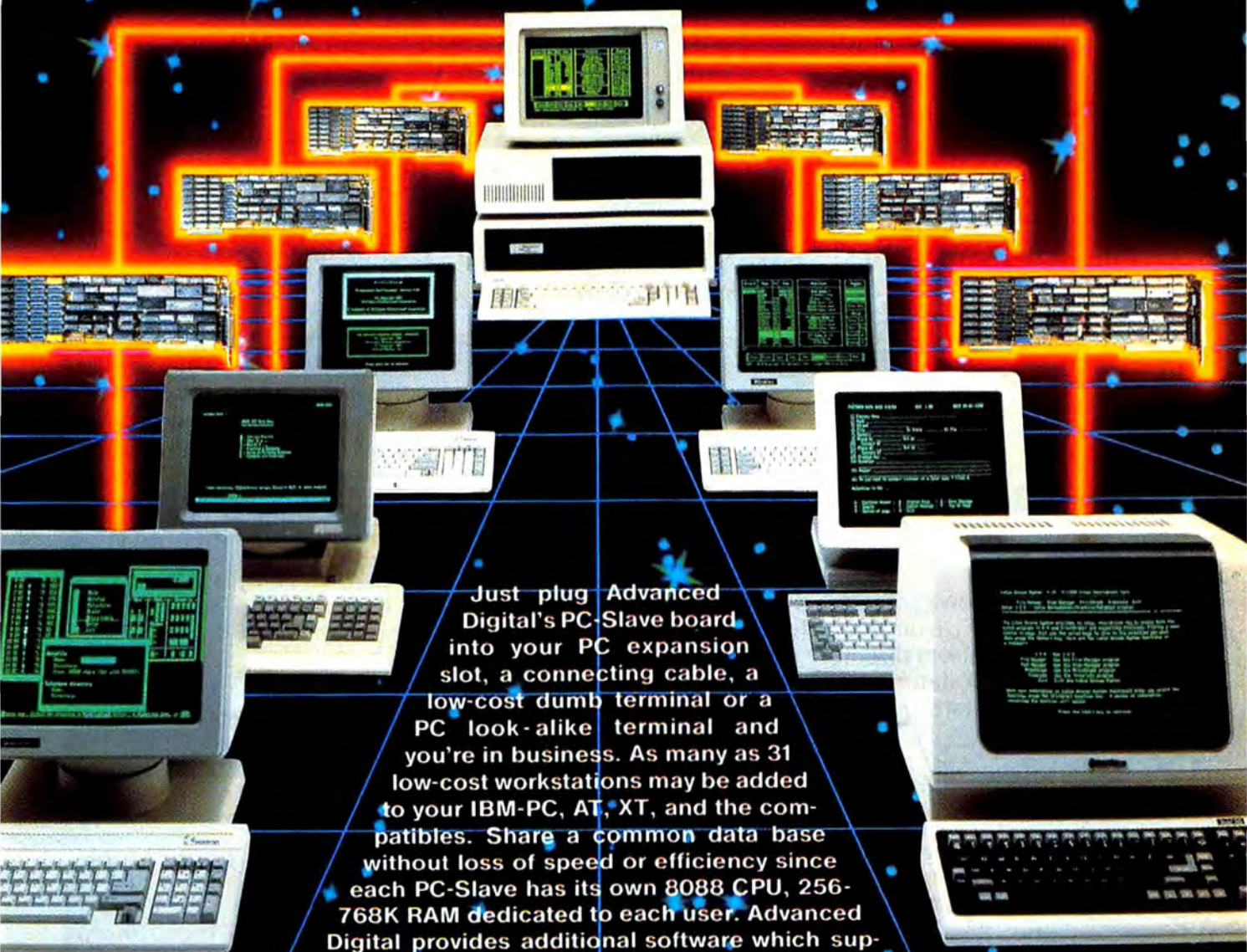
The problem with Schroeder's bill is its potential to destroy the software rental business altogether. Paul Terrell's approach to software education would then disappear.

We should encourage Terrell's alternative because it's a positive

(continues)

MORE USERS FOR YOUR PC

Advanced Digital's PC-Slave is the solution to your multi-user or local area network problems.



Just plug Advanced Digital's PC-Slave board into your PC expansion slot, a connecting cable, a low-cost dumb terminal or a PC look-alike terminal and you're in business. As many as 31 low-cost workstations may be added to your IBM-PC, AT, XT, and the compatibles. Share a common data base without loss of speed or efficiency since each PC-Slave has its own 8088 CPU, 256-768K RAM dedicated to each user. Advanced Digital provides additional software which supports File & Record locking and print spooling. Advanced Digital's slave concept provides the best multi-user PC system available today! For the location of the dealer nearest you contact:

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Circle 944 on reader service card

"If you can

If you can find a company with better tape achievements, buy from them:



EVEREX Streaming Tape Family

- Over 30,000 streaming tape sub-systems, ½ height, 5¼" form factor industry standard QIC 24 recording format, QIC-36 hardware interface and largest installed customer base worldwide.
- Over 100,000 industry standard streaming tape controllers in the field.
- The first company to release QIC-02 IBM-compatible software drivers to the OEM community.
- The first company to release an internal 5¼" half-height IBM compatible tape subsystem.
- The first company to release file-by-file retrieval from a mirror-image backup.

If you can find better streaming tape software, buy it:

User Interface

- Menu driven.
- Multiple windows (nestable and movable).
- Context sensitive on-line help.
- File selection from directory listing or command line.
- Constant tape status display.
- Menu driven hardware configuration guide.

Tape Functions

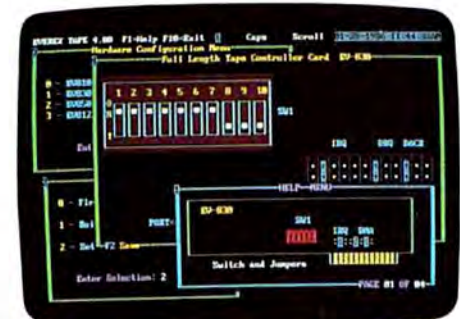
- Multiple tapes allowing unlimited backup capacity.
- Multiple datasets for multiple backups on the same tape.
- Tape sequence management recorded on the tape.
- Programmable messages.
- File-by-file and image backup on the same tape.
- Installation program.

Functionality

- Physical image backup/restore of local disks.
- Logical image backup/restore of local or remote disks.
- File backup from any local or remote disk of any file size.
- File restore from image backup or file backup.
- Allows wildcards for selection of files.
- Automatic scheduler for unattended backups.
- Backup across networks (using logical image or file-by-file).
- Real time clock display.
- Backup any disk whether formatted for DOS or not
- Escape to DOS while in backup/restore operation.



Automatic Scheduler



Nestable, Movable Windows

find...



Backup with Multiple Datasets



Multiple Tape Restores

If you can find a streaming tape with better performance and system characteristics, buy it:

Performance

- File-by-file operations near streaming speed.
- Dynamic adjustment to disk and system speeds.

System Characteristics

- Hardware identification provides software integrity.
- External systems can be shared with many users.
- Same software for all types of tape drive, controller, and computer system configurations
- External systems uses a shielded round cable with a D-connector for tangle-free, easy connect and disconnect.
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Circle 699 on reader service card

At last! - Fast, On-screen FLOWCHARTS And Organization Charts

Finally! An on-screen flowchart processor that knows about flowcharts and organization charts - not just another "screen draw" program that makes you do most of the work.

Interactive EasyFlow is a powerful full-screen graphics program dedicated to flowcharts and organization charts. With this program you can quickly compose charts on the screen. More important, you can easily modify charts so they are always up to date.

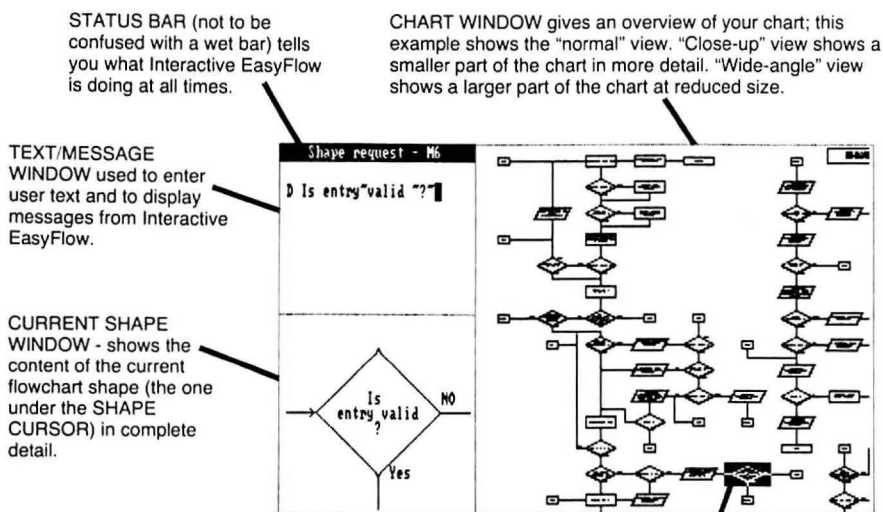
Features: • Text is automatically centered, character by character, within shapes as you type it • Text formatting controls allow you to over-ride the automatic formatting where desired • Lines are created by specifying the starting and ending points - the program automatically generates the route • Powerful editing facilities allow shapes and even entire rows and columns of shapes to be inserted or deleted; lines are automatically re-routed as necessary • Large chart size (up to 16 shapes wide by 16 shapes high) allows very large flowcharts and organization charts to be handled with ease • Charts can be larger than the screen - the window into the chart scrolls both horizontally and vertically as necessary • Flexible printer interface allows it to work with all

printers, not just dot matrix printers. Wide charts can be printed in strips Also works with Hewlett-Packard 7475A (and compatible) plotters • Twenty standard flowcharting shapes included • Common shapes supplied in three sizes • Extensive manual (125 pages) includes many examples • Context sensitive "help" facility provides immediate assistance at any time • Any number of titles can be placed on a chart • Commentary text blocks can be placed anywhere in the chart • Fast: written in 8088 assembler • Plus many more features than we can mention here.

Requires at least 256K memory, DOS-2 or higher and an IBM or Hercules compatible graphics card.

Order direct for only **\$149.95** + \$2.00 S&H (USA/Canada), \$10.00 (foreign). Payment by MO, check, VISA, COD or Company P.O. Rush orders accepted (\$15.00 S&H; USA/Canada only). Rush orders received by noon will be delivered the next business day (to most locations).

The sample screen display shown below is typical of what you see while editing a chart. Other screen displays are provided for entering titles, changing options, getting "help" and so on.



HavenTree Software Limited
P.O. Box 1093-M
Thousand Island Park, NY 13692
(613) 544-6035 ext 47

Circle 489 on reader service card

solution to the number one cause of declining personal computer use: the almost perverse complexity of software.

In announcing her proposal, Schroeder noted the passage of similar legislation banning the rental of audio recordings.

No real parallel exists, however, between the two products. You need not test a record album to determine its value. You hear the music on the radio; then, if you like the song, you buy the album.

Software is different. No store is completely reliable. You can read reviews in magazines, but they provide only a certain amount of information. You can read advertising claims, but you can never be certain how a particular package might suit you. Until you run it, you can't really tell if it will work in your computing environment.

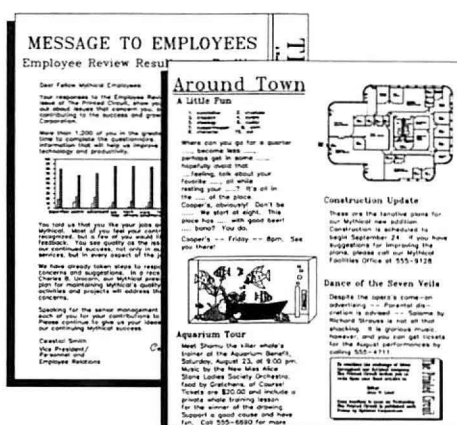
Because of these fundamental differences, the software business needs different laws than the record business. To draft a bill for the computer industry based on record industry legislation is a critical mistake.

Schroeder expresses concern about software rentals impeding the growth of the software industry because people steal rented software.

Anyone who's involved with personal computers can easily see that software companies impede their own growth when they market programs that don't work and have poor documentation—not to mention undocumented features and substandard support.

(continues)

Want to Save a Cool \$10,000? We did--on this ad!



You can, too!

With Windows DRAW you can drastically reduce your operating costs, improve the quality of your communications, and save time--right now--for less than \$200!

Using your own PC, you can produce top quality, camera-ready art and text in-house. All you need is Windows DRAW and an HP LaserJet or Apple LaserWriter!

Save Money!

We began using our newest program, Windows DRAW, to publish in-house, and the savings began to pile up! By eliminating typesetting, layout, and graphic arts charges, we save thousands of dollars every month.

Now all of our ads, brochures, marketing materials, user's guides, technical documentation, correspondence, and business forms are produced in our own office by our own

talent. Professional, camera-ready art for a fraction of the cost!

Save Time!

Cut production time drastically by making production a part of the creation process. Eliminate the middle man and the possibility of introducing costly errors. Don't ever miss a deadline again because of last minute revisions and corrections!

With Windows DRAW on your PC, you deliver your camera-ready art directly to the printer.

Improve Quality!

Regain control of the quality of your work. You pay thousands to a contractor, and pay again to make changes. Produce your own typeset text and artist-quality graphics. Print at 300 dpi on an HP LaserJet Plus or Apple LaserWriter. *You* stay in control all the way.

Of course this is a Windows DRAW ad! You'll be solving your own publishing problems within a few hours with the easy-to-learn-and-use Windows DRAW!

Order Now! 1-800-272-DRAW

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Company Name _____

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State _____ Zip _____

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Richardson, TX 75081
In Texas: 214-234-1769

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Circle 718 on reader service card

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Now there's one high resolution color monitor that does things your way. The MultiSync™ monitor from NEC.

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Compatibility with the IBM® Enhanced Graphics Adapter Board



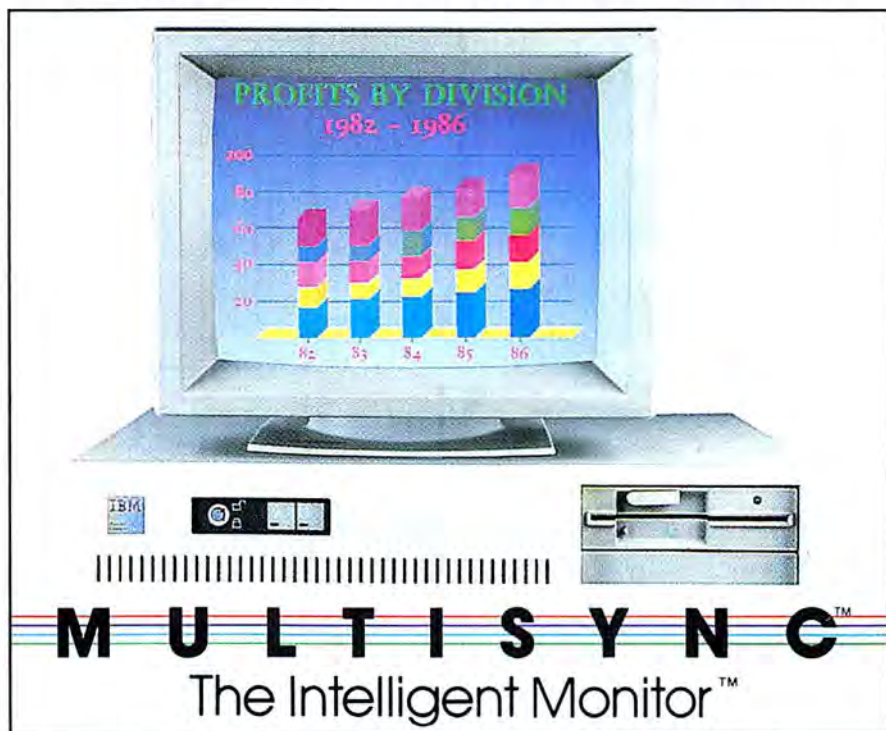
- MultiSync, the NEC feature that automatically adjusts to color adapter board scanning frequencies from 15.75 KHz to 35 KHz—suggesting the possibility that the MultiSync monitor might be compatible with *all* color graphics boards that are fully compatible with the IBM PC, PC/XT, and PC/AT, now and in the future.

- Full implementation of high resolution graphics software for business and other applications, now and in the future.

- And color capability limited only by the board being used.

See Things Our Way

Until now, you had to choose different color monitors for



compatibility with all three PC color graphics boards made by IBM. With so many board and monitor configurations, folks didn't know which way to look.

The new MultiSync color monitor gives you unique compatibility. As well as TTL and analog color. With 7 switchable text colors. And resolution up to maximum 800 horizontal dots and maximum 560 vertical lines, on a large, 13" diagonal viewing area.

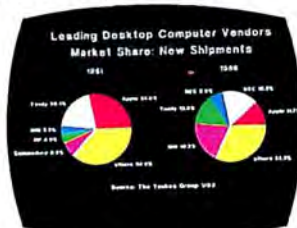


Compatibility with the IBM® Professional Graphics Adapter Board



It's the one color monitor that does everything your way.

Compatibility with the IBM® Color Graphics Adapter Board



But why talk more about it? Visit your nearest dealer and see a graphic demonstration of the new NEC MultiSync monitor's capabilities. Then draw your own conclusions.

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PC World
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October 15, 1985
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- Unlimited number of accounts
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- Allows budgeting

ACCOUNTS RECEIVABLE

- Open invoice and/or balance forward
- Allows unapplied payments and multi-company accounts receivable
- Handles credit limits, collection status and payment discounts
- Supports partial payments and finance charges
- Allows unapplied credit memos
- Up to 5 user-defined aging periods
- Customized text on user-designed statements
- Mailing labels and reports with 7 different sorts

INVENTORY

- Supports LIFO, FIFO, weighted average or standard cost
- Supports markup, margin or list
- Allows up to 4 places to right of decimal for units, cost & price
- Supports any unit of measure
- Supports quantity price breaks

SALES INVOICING

- Supports service or product oriented businesses
- User defined tax tables, including multiple sales taxes
- User defined sales discount tables
- Prints packing slips
- Prints immediate invoices if needed
- Alerts user to customer exceeding credit limit
- Sales History Reports
- Customized text on user-designed invoices
- Automatic updating of inventory daily
- Prints sales journals
- Allows return credit memos
- Interfaces with General Ledger, Accounts Receivable & Inventory

ACCOUNTS PAYABLE

- Can post to 200 general ledger expense accounts per invoice
- Automatically updates inventory and general ledger daily
- Automatically prepares payments
- Supports partial payments and handwritten checks
- Supports prepaid expenses and future liabilities
- Processes credit and debit memos
- Computes discounts and records discounts taken

PAYROLL

- Generates automatic payroll
- Automatically posts to General Ledger and Accounts Payable
- Provides up to 15 user-defined rates
- Allows post facto payroll
- Allows distribution of payroll expenses to user-defined departments
- Benefits and deductions are calculated on fixed amounts, hourly amounts, percentage of gross or variable
- Allows additions to gross which may be taxable, nontaxable, or partially taxed
- Handles sick leave and vacations
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David Bunnell

I doubt if software rental curtails software sales by more than 1 percent, certainly a marginal amount. On the other hand, software rental enables us to find out whether a program works before we put our money down.

Why should we have to pay \$700 for a data base program, only to discover that it doesn't meet our needs, that it's bug-ridden, or that we can't figure out how to use it? Why can't we test-drive it first?

Schroeder's bill assumes that the consumer is wrong and that the software company is right. Ironically, the bill's passage may prove most damaging to those it's intended to protect—the software companies.

Eventually, many software customers will begin to shrink from investing their money in expensive but iffy programs.

And that would be a great loss for everyone—customers and software publishers alike.

Surely, software vendors and legitimate software rental businesses can find a creative solution before Schroeder's Software Curtain falls.

I urge readers to write to Schroeder expressing their concern about her proposed Computer Software Rental Act of 1986:

Patricia Schroeder
Congresswoman, First District,
Colorado
2410 Rayburn House Office
Building
Washington, DC 20515 ●



How I work three times faster without raising a sweat.

accounting, finance, and other business professionals. And the only company offering a full line of turbos. They've even got a super high-performance PCturbo 286e with *five* times the speed of the PC. Nice to know, in case the work really piles up.

ORDER YOUR TINYTURBO TODAY.
IT WILL PAY
FOR ITSELF IN FOUR WEEKS.

I always considered myself a 'power' PC user. But waiting for the system to load and recalculate spreadsheets, post accounts, and sort databases, was holding me back.

Then I installed Orchid's TinyTurbo 286 high-performance accelerator. It's tiny in size: just a half slot card. And tiny in price. But there's nothing tiny about the performance: now my programs run three to four times faster than before. So I get AT performance without the AT price. And without the downtime of transferring my files to a new system.

I count on my PC every day. So I was glad to learn that TinyTurbo 286 is made by Orchid—the leading manufacturer of turbo products for

	IBM XT	WITH TINYTURBO
Post 700 accounts	12 sec/acct (2.3 hours)	3.5 sec/acct (0.7 hours)
Sort 10,000 records	25.4 minutes	14.9 minutes
Spreadsheet recalc.	44 seconds	14 seconds
Integer calculation	10 minutes	3 minutes

I used to panic when my boss asked me to work up some additional reports an hour before a big meeting. Now I just smile and say, "no sweat."



WHEN YOU SAY TURBO,
YOU MEAN ORCHID.

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Every so often, though, there's an exception.

Presenting Easy™ 1.5, the word processing system that gets you started—and a lot more.

Easy not only gives you several unique features. It gives them to you for about \$50 less than its major competitors, PFS®: Write and IBM®'s Writing Assistant.

So you can have the best in price *and* performance.

An outstanding package at a bargain price.

Even when you buy Easy Extra—made up of Easy and EasyMail™, a mailing list program—you still pay only \$149.

Which is roughly what PFS: Write and Writing Assistant cost *without* mailing capabilities.

When you run down the list of Easy's features, it's clear why Easy is the best buy for the money.

Get up and running in 30 minutes.

Easy's pop-up menus point the way to every command. If you falter at all, its exclusive on-screen prompts and help index are there to support you.

With help like this—and a built-in spelling corrector—you'll be creating letter-perfect documents in under 30 minutes. Even if you've never touched a computer before.

Enjoy Lotus® 1-2-3® compatibility.

If you're a spreadsheet user, you won't have to waste any more time converting files. Easy reads 1-2-3 and Symphony® spreadsheets *directly* into documents—something only MicroPro word processors can do.

Produce the best-looking documents.

By supporting over 240 printers—including laser jet models—Easy lets you benefit from the highest quality output available anywhere.

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Easy is compatible with MicroPro's more powerful systems, so you'll have connectivity in your office. Nothing could be more natural than Easy users sharing files with WordStar® and Wordstar® 2000 users. With PFS: Write, you simply have nowhere to go.

Mail more, pay less.

With the Easy Extra package, you can create, update, and sort mailing lists. Print labels and envelopes. Launch targeted mailings by company, zip code, or other criteria.

To do all this with the competition, it could cost at least \$240.

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The first word in word processing.™

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Easy 1.0 owners may update to Easy 1.5 or upgrade to Easy Extra by calling MicroPro Customer Update at (800) 227-5609. Easy 1.0 owners who have registered their software prior to September 30, 1986 may update to Easy 1.5 for FREE and upgrade to Easy Extra for \$35. After September 30, update and upgrade prices will increase to \$10 for Easy 1.5 and \$79 for Easy Extra.

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JUST RELEASED

Unleash the power of your LaserJet™

Mix any combination of fonts

Merge text and graphics from any program

Print extended and foreign language characters

Use all the printing features of your LaserJet with Polaris Ram-Resident PrintMerge

Ram-Resident PrintMerge gives you quick and easy access to all the LaserJet's printing features -- no matter which word processing, database or LaserJet-compatible graphics program you're using. With a few simple commands, you can turn a ho-hum report into an exciting, visually appealing presentation. You'll be able to format text from virtually any program and combine it with the graphic output from any graphics program that can print on the LaserJet.

For instance, the chart on the left was created with Graphic Communication's Freelance and Graphwriter. Ram-Resident PrintMerge even prints properly aligned tables made up of any combination of proportional fonts like the table on the right.



1985 Sales Summary		
Region	Sales (thousands)	Percent Gain
West	11,047	15.7%
Midwest	3,991	15.3%
South	10,719	18.2%
East	9,430	21.4%
Europe	1,268	8.8%
Far East*	927	-2.3%

* This is a new region this year.

You also get full access to all the formatting you've been missing with DisplayWrite 3, Multimate, etc. which include: selection of any fonts, right justification of any combination of fonts, and a handy line and box drawing function. Plus, keyboard translation screens give you instant access to the LaserJet's foreign language and special purpose characters. Here's a small sample of words you can type without missing a beat:

Nimes	£125	io!é!
±2'	Provençal	1.7 Å
baño	München	Ørsted

Be sure to ask about Polaris Crunch, a program used with Ram-Resident PrintMerge. Polaris Crunch automatically reduces files to sizes the LaserJet can handle. It also rotates and trims graphic images which allows you to print only the amount you want.

Read more about Ram-Resident PrintMerge below.

Justify any proportionally spaced text

Align tables printed with proportional fonts

Draw lines and boxes

Your software only lets you use a small fraction of the LaserJet's printing capabilities. Unfortunately, that also limits how precisely you communicate your message. That's why you need Polaris Ram-Resident PrintMerge.

It's the only program that puts you in direct control of all the LaserJet's printing capabilities—so you control what your document looks like, not the limitations of your software.

You'll be able to add graphics right in the middle of your text. Use all the LaserJet fonts and extended characters wherever you like. And print it all beautifully with Ram-Resident PrintMerge's justification and line-drawing abilities. What's more, Ram-Resident PrintMerge works with the software you're already using, so it's very easy to learn.

Since Ram-Resident PrintMerge lets you merge graphics from virtually any program that prints on the LaserJet, you can reinforce complex ideas with illustrations right in the text. You can merge the graphic output or save a screen image, and merge either in any of four print resolutions. If your graphics are too large for your LaserJet to handle, try Polaris Crunch, a separate program that compresses, rotates and trims images.

With the help of Ram-Resident PrintMerge's useful formatting features, your document

Runs Directly From:

DisplayWrite 3
Multimate
Freelance
Lotus 123
Paradox
NewWord
R:base 5000
Map-Master
WordPerfect
Chart-Master

WordStar
Microsoft Word
Graphwriter
Javelin
WordStar 2000
Framework
Easy
Microsoft Chart
PC Crayon
Sign-Master

and more

will be as impressive as its contents. You'll be able to use LaserJet fonts in any combination for more attractive, readable text. And justify right-hand margins and align table columns printed with proportional fonts—even if they're downloaded from diskettes. For extra emphasis, use Ram-Resident PrintMerge's line and box drawing capabilities and the LaserJet PLUS patterns to highlight important ideas.

And when you need to use extended or foreign language characters, Ram-Resident PrintMerge's five keyboard translation screens will put them at your fingertips instantly.

But even with all these features, Ram-Resident PrintMerge is truly easy to use.

Timesaving printer setup screens store nine sets of page parameters. Simply enter parameters for Lotus, dBase, or any other application program once, and use them again and again. "Ram-Resident" means it loads automatically when you boot your system, so it's always ready. Just use your software as you normally would. When you need Ram-Resident PrintMerge's special features, set up the printer with one of the nine setup screens or key in the simple print commands right in your document.

Put the rest of your LaserJet's printing power to work for you. Call these toll-free numbers to order your Ram-Resident PrintMerge. Versions are available for IBM-PC/100% compatibles. There's a 30-day money-back guarantee, so order now without risk.

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plus \$6 shipping and handling.

For ordering information call:

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Outside California call
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New Amdek monitor outperforms AT&T by a long distance.

The new Amdek 725 RGB color monitor offers complete compatibility with the AT&T PC. But it includes a larger screen, a longer warranty period, and a lower retail price than the AT&T color display. So, the 725 is clearly the better choice. By far.

Amdek's new high-resolution color monitor is easy on the eyes, no matter how you look at it. It's attractively styled. And a chemically etched screen smothers glare.

What's more, the 725 monitor displays high quality non-interlaced graphics with a resolution of up to 720(H) dots x 400(V) lines. The text is monochrome quality, and the graphics are clear and precise. In

addition, easy-to-use front-mounted controls let you adjust contrast and brightness to your individual comfort levels.

That's for the eyes. To save your neck, an optional tilt-swivel base is available.

And, behind all the 725's features is Amdek, and the Amdek warranty: three years on the CRT and two years for all other parts and labor. You can't get a better warranty. Anywhere.

Choosing between long distance telephone companies might be tough. But selecting the best monitor for your AT&T computer is easy: The Amdek 725 is your best call.

AMDEK

Clearly the finest in monitors.

AT&T is a registered trademark of
AT&T Information Systems, Inc.2201 Lively Boulevard, Elk Grove Village, IL 60007, Phone: 312/364-1180, TLX: 280-803

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Picture Perfect[®] Slides

So don't settle for computer graphics; make your charts Picture Perfect. For additional information, call or write:

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214 661-8960

Suggested retail: \$295

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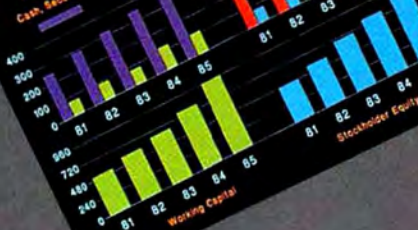
IBM is a registered trademark of International Business Machines Corporation.

Picture Perfect is a powerful, comprehensive graphics product that will transform your data into presentation-quality bar, line, pie and combined bar/line charts.

Picture Perfect is menu-driven with interactive functions that allow you to move text and legends anywhere on the chart. There are no commands to learn or lengthy question-answer sessions.

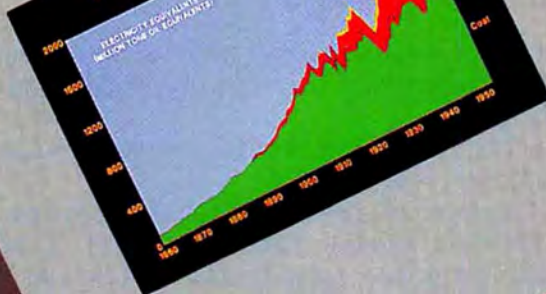
Picture Perfect is available for the IBM PC/XT/AT, IBM 3270 and IBM compatibles. The IBM Enhanced Graphics Adapter and a wide variety of plotters, printers and film recorders are supported.

PNB Five Year Financial History



Only Picture Perfect offers combined bar and line charts with 4 independent Y-axes on a single page.

World Commercial Energy Production 1960-1985

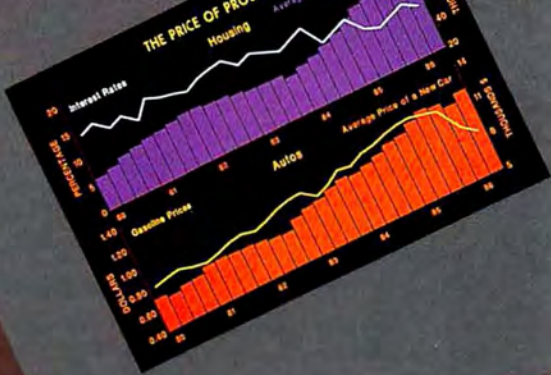


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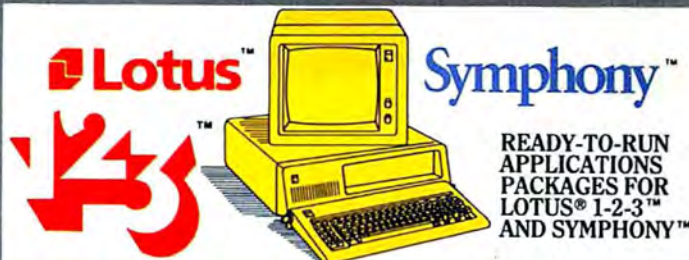
REVIEWS:
Distribution of the VersaSeries has now exceeded 100,000 making the VersaSeries the largest mass distributed accounting software package in the world. Among recent reviews, the VersaSeries received an excellent rating in the new Addison-Wesley rating encyclopedia. The VersaSeries actually outperformed competitive packages selling at three to five times the price.

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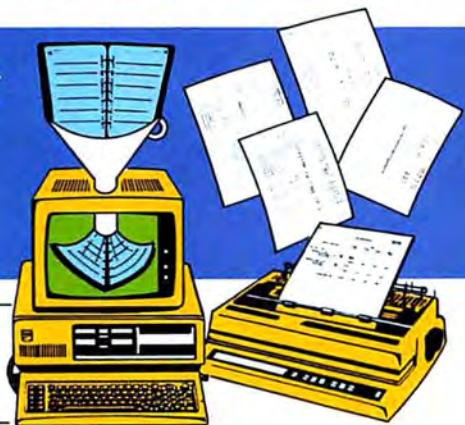
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This system performs all bookkeeping activities associated with owning

small or large apartment buildings, commercial office buildings, warehouses, retail stores, single-family homes, co-ops or condominiums, recreational vehicles, personal property storage facilities or any other similar rental properties.

EASY TO UNDERSTAND

THE INSTANT BUSINESS PROPERTY MANAGEMENT SYSTEM is designed to save time and money. The comprehensive user's manual gives step-by-step instructions with detailed reproductions of screen displays and sample reports. The on-line help instructions and easy to follow menus will quickly eliminate the need to refer to the manual.

SAVE TIME AND MONEY

This system is designed to save time and money. The goal of INSTANT PROPERTY MANAGEMENT is to automate your accounting and management of properties in a fast and economical way. The system is flexible so that you can pick and choose only those options that apply to your needs.

Save time and money by issuing COMPUTERIZED STATEMENTS and COLLECTION NOTICES. Your timely, accurate and professional statements and collection notices will speed up collections and spot potential losses early enough to take corrective action.

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At the touch of a button, see the current status of any property, rental unit or tenant. A memo file allows the recording of notes such as damages, noise complaints, etc.

COMPLETE TRANSACTION BOOKKEEPING

Record complete transaction history for all residential and/or commercial property-related charges, deposits, payments, refunds, write-offs, etc. Automatically posts standard monthly rents for easy entry and computes common area assessments and percentage leases.

PROPERTY MANAGEMENT



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Print checks and keep detailed information related to any checks that must be written. Flexible accounts allow for customization of your system. The CHECK REGISTER ACCOUNTING SYSTEM also keeps track of all cash disbursements.

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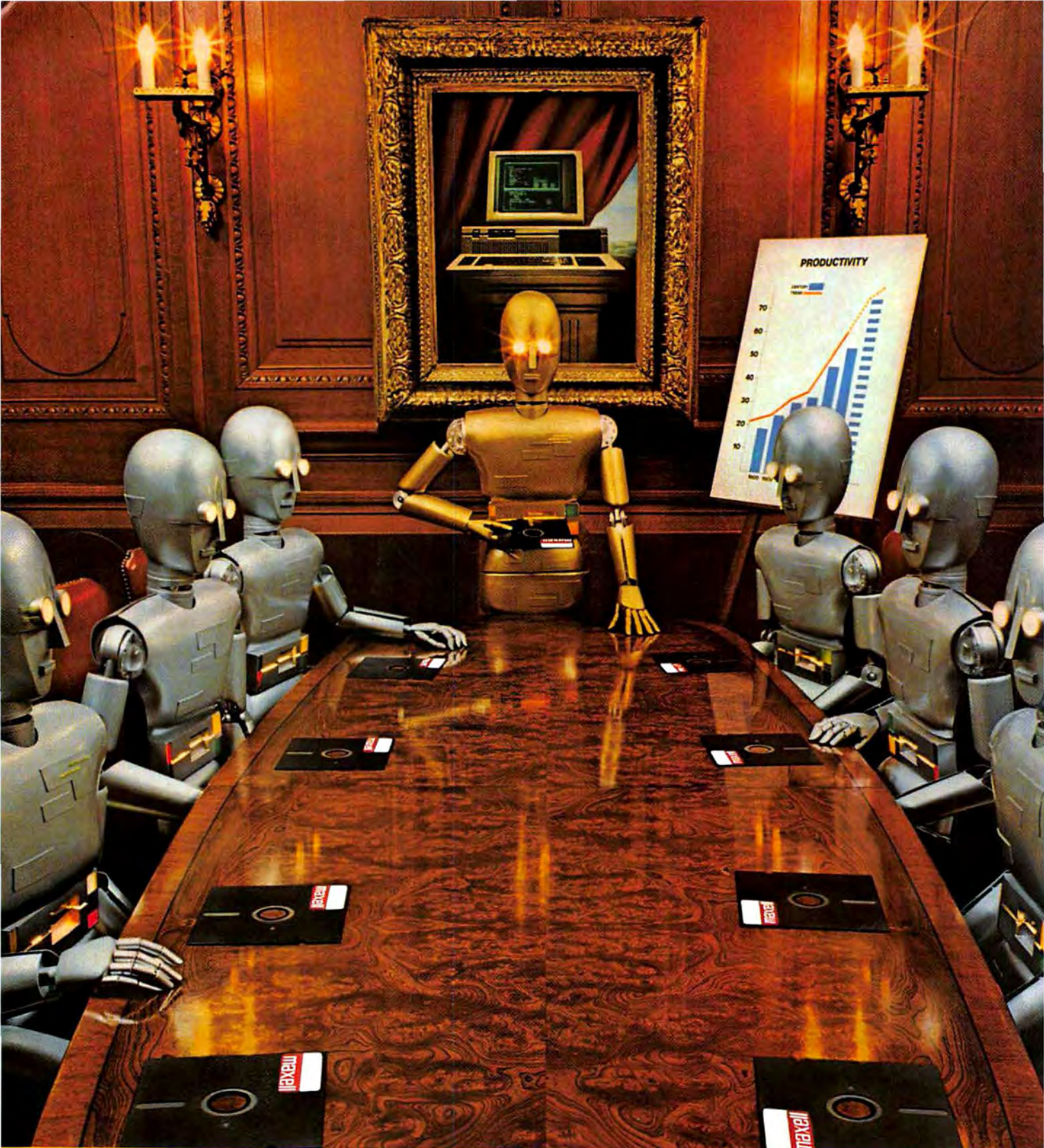
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THE GOLD STANDARD



Letters



Reactions and responses from the PC World community

Whose NECs?

TJ Byers' article about NEC's V-series microprocessors, "NEC's Move?" [PC World View, PCW, May 1986], omitted a very important fact: Intel is suing NEC for copyright infringement for copying code from the 8088/8086 family. New federal laws now protect the enormous investment and creativity that goes into designing sophisticated circuitry and micro-code. Those designs can no more be plagiarized than could *Gone With the Wind*.

I'm neither a lawyer nor an electrical engineer, so I can't comment on the strength of Intel's suit. But I don't think Intel or any other major U.S. manufacturer would undertake a lawsuit of this magnitude lightly. I believe in getting the best quality and performance for my dollar—that's why my car is a Toyota. But I won't support the decimation of the American semiconductor industry by purchasing chips from foreign companies that violate our laws. I'd rather have a computer that runs perfectly well, albeit a tad slower, thank you.

Kenneth Rygler
Wilmington, Delaware

Accountant Face-Off

"Accounts Affordable" [PCW, May 1986] by Charles Rundgren contains several errors and oversights that may cause your readers to reach invalid conclusions about RealWorld's 4-in-1 Basic Accounting. As an accountant and a licensed reseller of RealWorld products who has installed 4-in-1 for many small businesses, I'd like to address several points made in the article.

The review states that all three packages use the accrual basis of accounting. One of 4-in-1's strong points is its ability to use either the accrual or the cash method for both accounts receivable and accounts payable, a very unusual feature for any accounting package.

Mr. Rundgren devotes an entire paragraph to what he describes as a "discrepancy" in the general ledger module that makes "the balance sheet perpetually out of balance." This strong statement would be enough to convince an uninformed user to reject the package outright, and it's based on the reviewer's misunderstanding of how the report writer actually works. As explained in the manual, the current period's net income is added to retained earnings with a "BSNI" line in the balance sheet layout.

4-in-1 may not produce fancy special reports as its competitors do, but it's a solid, reliable product with complete account distribution flexibility that can fill the needs of many small businesses. It certainly deserves higher marks than provided in your review.

David Baker
San Francisco, California

A few years ago I bought a used car. The next month, a national consumer magazine recommended against purchasing that particular year and model. I think I understand how Mr. Baker feels. I will, however, address each of his points.

It's true that you can keep A/R and A/P by either the accrual or the cash method. However, the manual describes these as "cash basis receivables" and "cash basis

(continues)

Two Powerful Networks...

LAN or Multi-User System? Until now, you've been forced to choose between these two, normally incompatible, types of networks for your company. And that's too bad, because multi-user systems are usually less costly to install since they use inexpensive terminals, instead of PCs, as workstations. For a wide variety of applications, a multi-user system makes more sense than a LAN.

On the other hand, the ability of a local area network to share programs, files, and peripherals among PCs has made it an invaluable productivity tool in the workplace.

Thanks to the synergy (and 100% compatibility) of MultiLink Advanced™ and LANLink™ you can choose the networking solution you need today and let it evolve into the system you'll need in the future.

MultiLink Advanced™... The Software-Driven, Multi-User System That Runs Programs Under PC-DOS. MultiLink Advanced™ represents the next generation of multi-user systems. The software package transforms a single XT or AT into the CPU of a multi-tasking, multi-user network. Programs, files, and peripherals can be shared by multiple users locally, or by using a modem.

Designed to take advantage of the AT, the system enables as many as eight terminals, connected to a single computer, to emulate IBM PCs having up to 420K RAM. Our PC-Shadow™ Workstation (shown left) even has an AT look-alike, as well as work-alike, keyboard, display, and serial printer port.

A wide range of off-the-shelf software which includes WordStar 2000, dBASE III, Multimate, and Lotus 1-2-3 is fully supported.

Nine Workstations for the Price of an AT. Additional PCs and Kilobuck "Network Interface Boards" aren't required. All that's needed is an everyday RS-232 port for each user.

Instead of spending \$3,000 per workstation for a PC with a network board, you can use inexpensive terminals... nine of which cost less than an IBM AT. Even if you need only one additional workstation, you'll realize significant savings.

MultiLink Advanced™ is the ideal departmental networking solution for small businesses and departments of large corporations, alike. And because it's fully compatible with LANLink™ each multi-user cluster can be linked together, as well as connected to the LAN, in order to access network disks, files, programs, and peripherals.

MultiLink[®] ADVANCED

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If You Know DOS, You Already Know How To Use LANLink™ LANLink™ is a totally transparent network environment. COPY transfers files among users, and a 2-drive PC Satellite boots 1-2-3 from the Server's hard disk with the entry c:\lotus.

99% of all PC-DOS software runs on the system. Lotus Symphony and 1-2-3, dBASE III, and WordStar are just a sampling of off-the-shelf software that can run under LANLink™.

A Constellation of Configurations. Although a number of configurations are possible, LANLink™ is most often set up as a "star," where up to eight satellites are connected to a single server. Larger networks can have multiple servers. Because the Server's not dedicated, a total of 73 or more network users can be supported.

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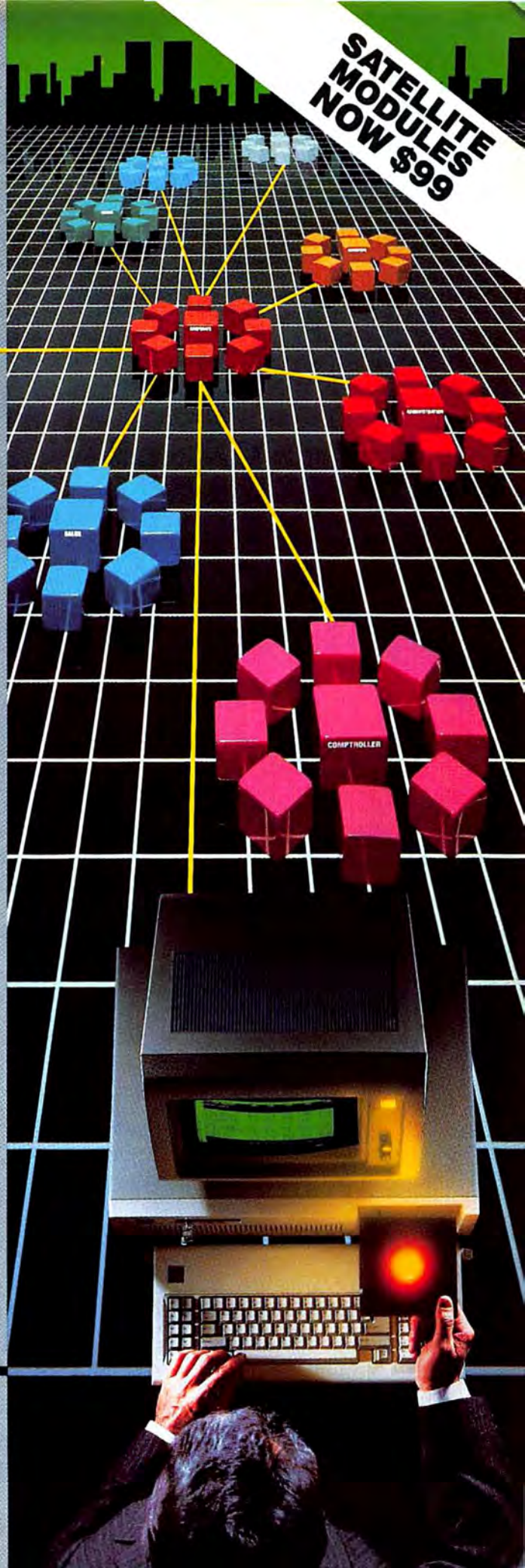
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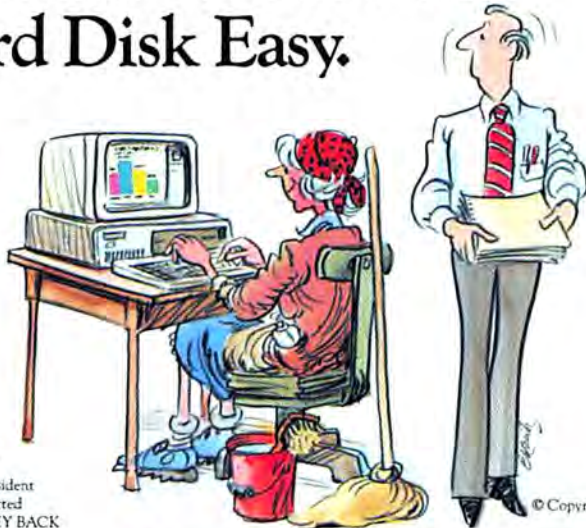


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PreCursor™ is an amazingly compact and sophisticated menuing system for your hard disk. It runs just ahead of your other applications and makes some very user-friendly arrangements. And at a very businesslike price.

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Tailoring PreCursor to your system is an easy operation. On-line help is available at the touch of a function key. A triple level of password protection is built right in. You don't need to know paths or subdirectories or other complicated syntax. You can even change the color of PreCursor.

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payables," which seem to be contradictions in terms. The explanation only confuses the issue further. I omitted any reference to this; it seemed another example of 4-in-1's poor documentation.

Mr. Baker argues that the lack of integration between the balance sheet and income statement is based on a "misunderstanding" of the report writer. It's inconceivable to me that an accounting package's basic financial statements are not integrated. It's as if *RealWorld* thinks a balanced balance sheet is an option. Not with my clients.

Mr. Baker should understand that a software review isn't a laundry list of features, it's an analysis of a program's good and bad aspects. 4-in-1 paled in comparison to the other two programs, and a comparison is what the whole review was about. —Charles Rundgren

Are We Having Fun Yet?

David Bunnell contends that in the future, fun—in the form of computer games—and not functionality will be the deciding factor that puts PCs in every home ["Personal Computer Games Come of Age," *PCW*, May 1986]. But there are many games currently available besides *Business Simulator* and *Balance of Power* that combine intellectual stimulation with pure entertainment.

The Infocom interactive text adventures are a prime example. SSI's *Rails West*, an entertaining and detailed simulation of railroad

(continues)

Imitation is the sincerest form of flattery.

But for *fast* backups, FASTBACK* is still the only choice

It seems that everyone with a floppy-based hard disk backup program is comparing themselves to FASTBACK* these days. Well, we're flattered.

The Industry Standard

After all, with the majority of Fortune 500 companies standardized on FASTBACK*, it's only natural for our competitors to compare themselves to us. Problem is, there's no comparison.

The fastest backups, period.

FASTBACK* can back up a full 10-megabyte hard disk in less than 8 minutes flat on standard 360K floppy diskettes! No other program can even come close to matching our speed. So when a competitor says they can make "average" daily backups in two minutes, they're talking about a small (1 meg) incremental backup that FASTBACK* can make in less than a minute! And on the IBM-AT & compatibles, we're even faster: 20 megabytes in 8 minutes on high-density 1.2 meg diskettes.

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You won't find FASTBACK* cluttered with "file management" utilities and complex options to slow you down. FASTBACK* is a sleek, powerful program designed for one purpose: to safely back up and restore the vital data on your hard disk as fast as possible. Easy-to-understand prompts, interactive screen display and full wildcard naming conventions give you total flexibility to make full, partial or incremental backups quickly and easily.

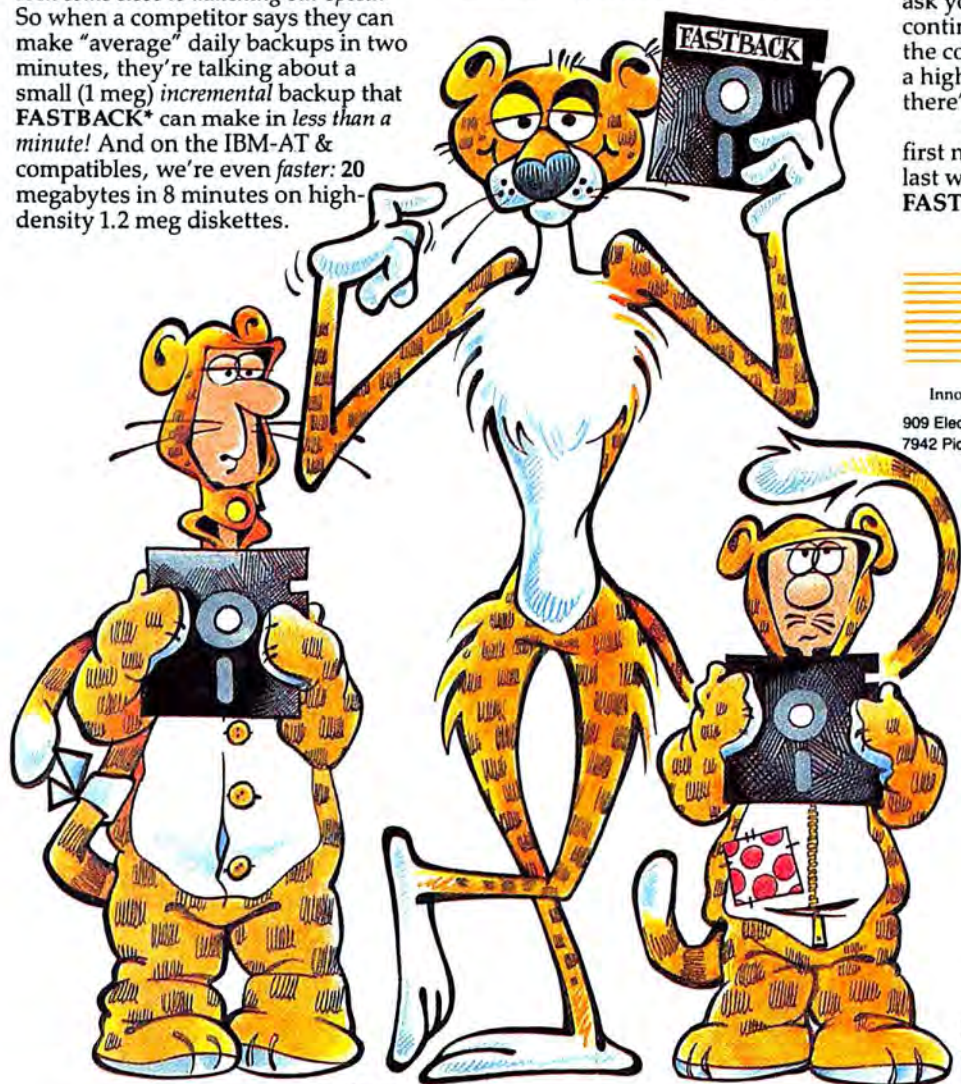
Error-correction vs. "disk mapping"

Some of our erstwhile flatterers try to make a virtue of the

fact that they use standard DOS disk format for backups and "map out" bad sectors. But that won't do anything for disks damaged after the backups were made. FASTBACK*'s special brilliance is a proprietary format that not only allows each disk to receive more data much faster than DOS, it also encodes Advanced Error Correction information that allows your vital data to be recovered even if you staple, scratch or mutilate your finished backup (tolerates up to 80 damaged sectors per disk)! You get what you pay for.

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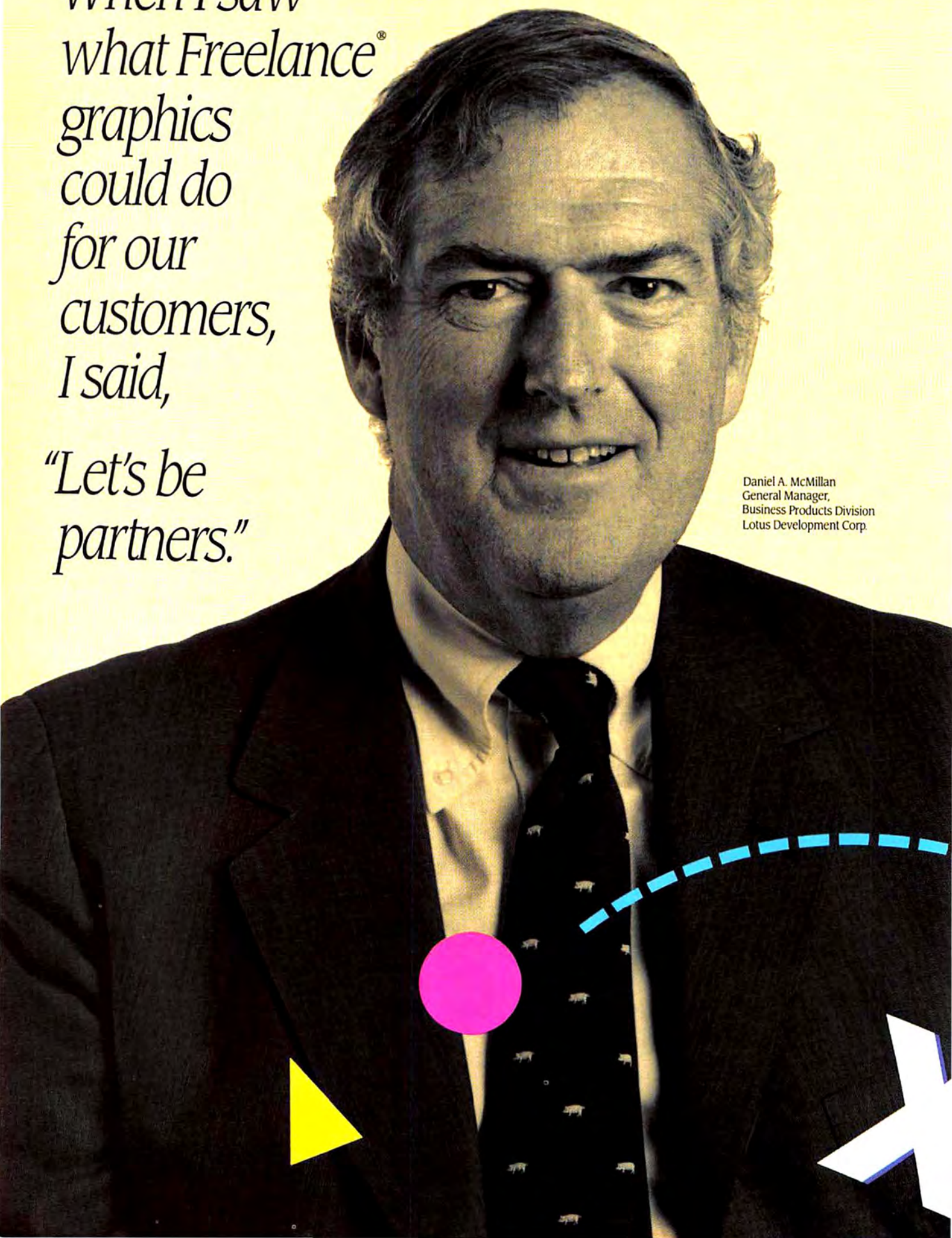
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*When I saw
what Freelance[®]
graphics
could do
for our
customers,
I said,
"Let's be
partners."*

Daniel A. McMillan
General Manager,
Business Products Division
Lotus Development Corp.



Users have been telling us that the next thing they want from Lotus® is more and better graphics. Everyone at Lotus agreed.

So when word of our merger talks with GCI, the makers of Freelance, hit the street, no one seemed surprised. It was a natural for the leader in business software to join up with the highest-rated, most complete graphics software package on the market.

Freelance. It's that good. And that different.

Only Freelance brings together the whole list of graphics capabilities for presentations and everyday communications. In just one package.

There's chart editing, word charts, and the drawing tools to create your own images. There's a huge library of pictures, symbols and maps, so you don't have to be an artist to produce like one. And you can bring 1-2-3® or Symphony® charts right into Freelance for enhancements you didn't think were possible.

Of course, everyone's read what the press has been saying: *PC Magazine* included it among their "Best of 1985." *PC World* named it "Pacesetter Product of 1986" because of its outstanding depth and ease-of-use. The *Datapro Report* spent 12 pages explaining why Freelance deserves their highest graphics product rating ever.

But some things you just have to discover for yourself. So I tried Freelance.

As soon as I began, I could see that Freelance was different. For one thing, its Lotus-style menu lets anyone who's ever worked with 1-2-3 or Symphony start creating almost immediately.

In less than ten minutes I was able to take a routine Symphony chart and turn it into this. How much easier can it get? I was so impressed, I showed it to our marketing group. They

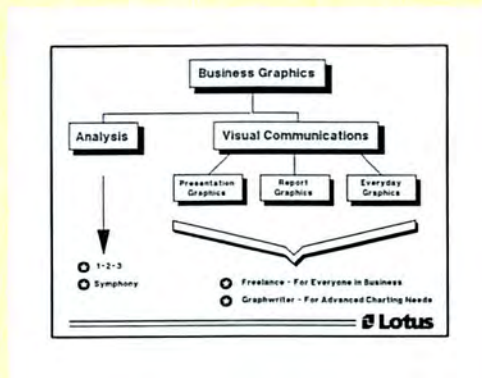
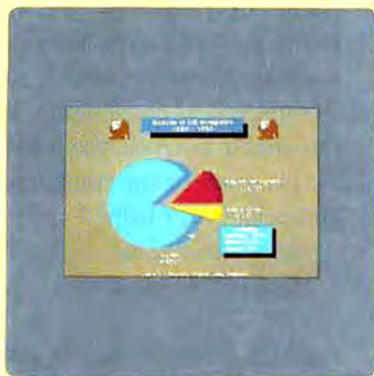
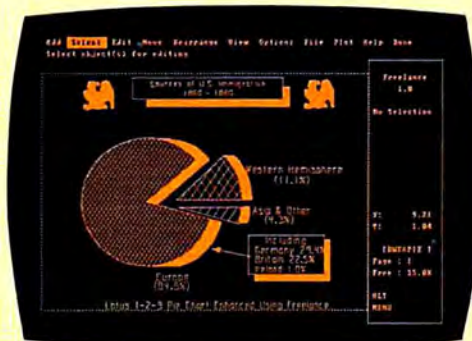
already knew all about Freelance: They'd been using it in presentations for months.

They even took what I'd just done and turned it into a presentation-quality slide. Total time: Seven minutes.

Then to prove that fancy graphics are no longer reserved for stuffy presentations, they pulled out this simple diagram. Using stored symbols, our logo and simple drawing commands, it took only a few minutes from concept to final copy. Instant diagram!

My conclusion? Freelance is the 1-2-3 and Symphony of graphics, all rolled up in one great product.

My suggestion? If you're looking for a business graphics package that's powerful enough for presentations and convenient enough for everyday communications, do what Lotus did: Buy Freelance.



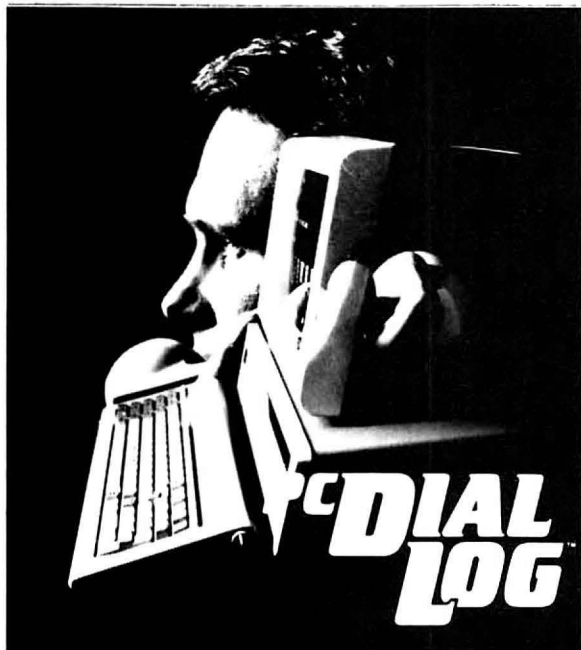
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Letters

building in the late nineteenth century, not only demonstrates how to lay track, but also teaches how to secure loans and how to trade in stocks and bonds. *Conflict in Vietnam* from MicroProse is a challenging and fact-filled program whose manual alone is equivalent to a course in history and tactics. The list could go on. Computer games are definitely more than "something for kids to do when they want to vegetate electronically." We can exercise our minds *now*.

Kent Synder
 Bayside, New York

Reality Check

I read with great interest David Bunnell's "Personal Computer Games Come of Age" [PCW, May 1986]. Reality Development's *Business Simulator* sounds most intriguing and challenging, but I'm unable to track down either the program or the company. I'd appreciate your help.

Mary Marciniak
 Hopkins, Minnesota

Aspiring business moguls can contact Reality Development by writing to 3624 Market St., Philadelphia, PA 19104, or by calling 215/387-4000. —Ed.

Tandy Is Dandy

The criticisms from John Heckers, Jr., about Tandy [Letters, PCW, May 1986] make me wonder if he deals with the same company I do. I've personally owned 8 different Tandy computers, and I'm in

(continues)

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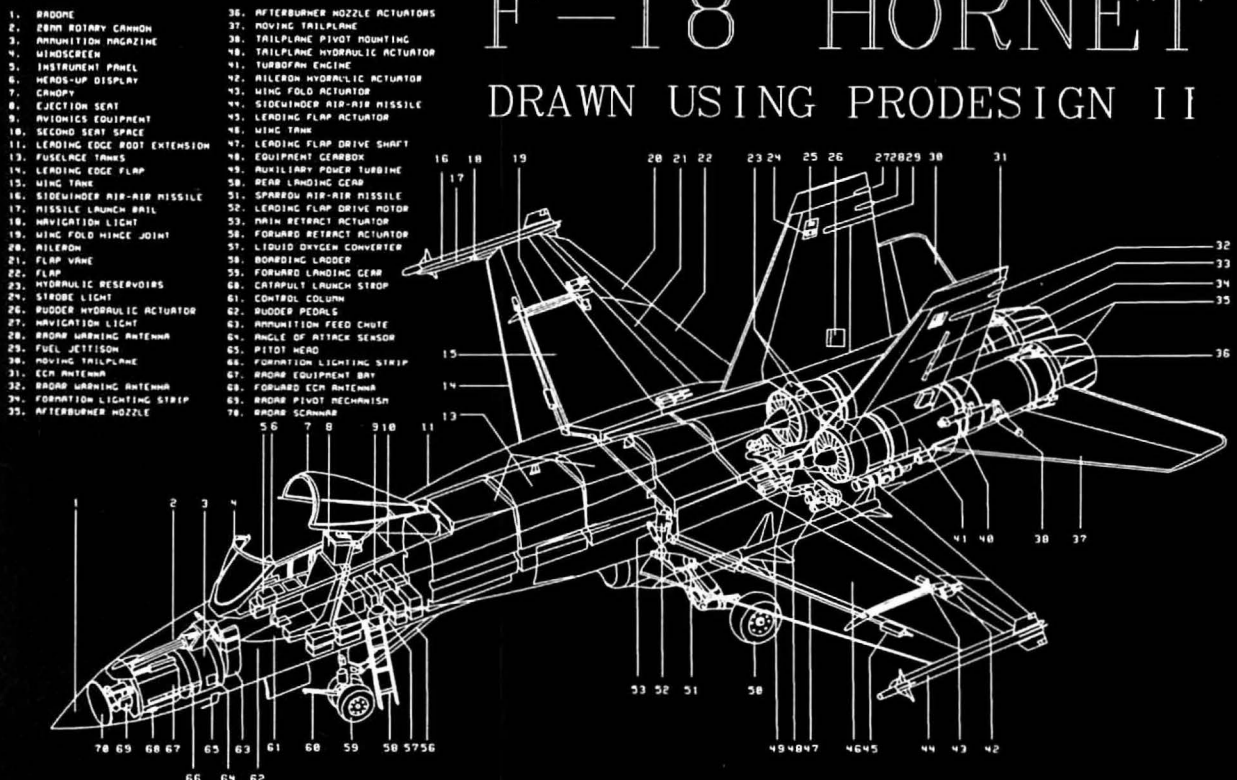
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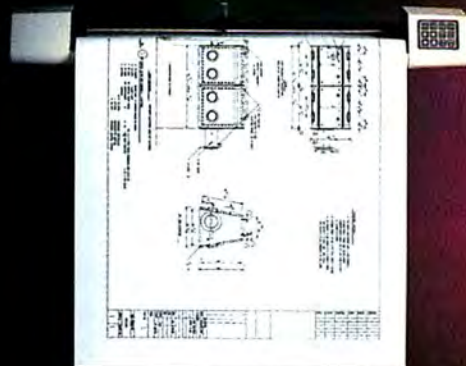
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charge of over 250 pieces of Tandy computer equipment for a local school district. In three years we've had a repair rate of less than 10 percent. This may seem high, but last year alone our students logged 106,426 usages. My own computer is a Tandy 1000 with 640K of RAM, a 2400-bps modem, and two 20MB hard disks. It boots from a hard disk and is fully reliable.

While Tandy programs support Tandy printers, I suggest that Mr. Heckers try regular PC versions of the same programs for printers from other manufacturers.

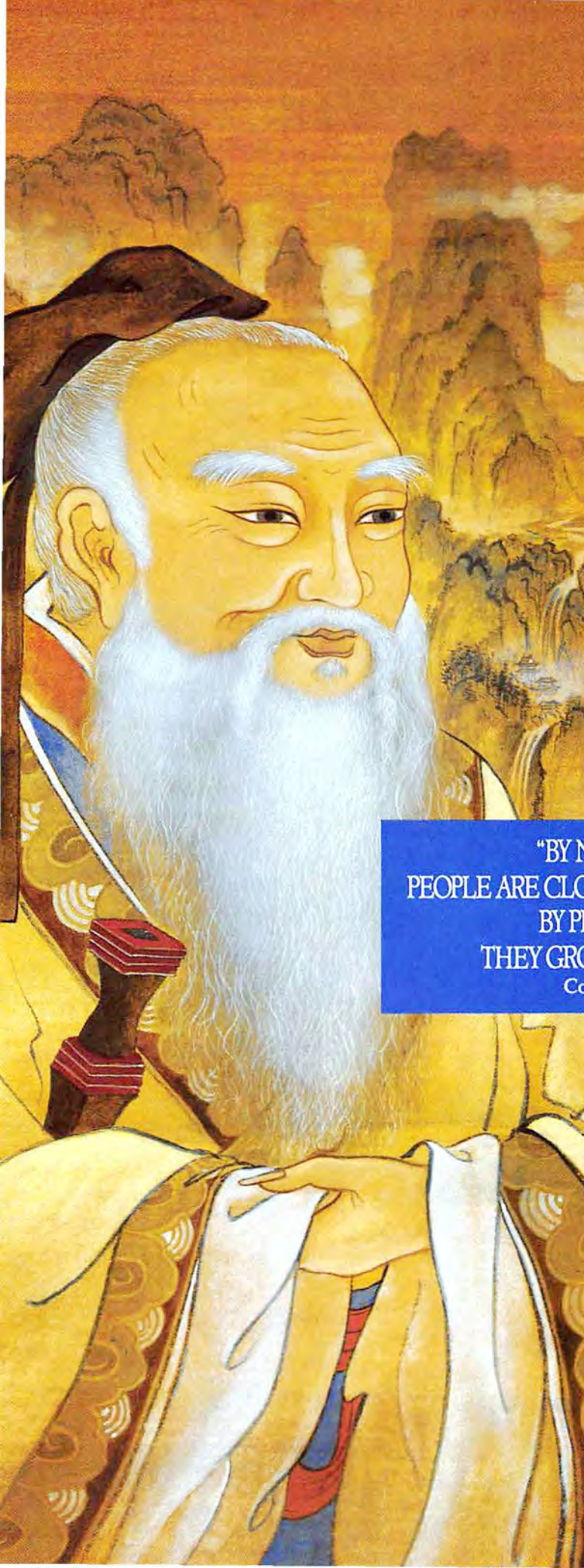
Removing and inserting chips on the Tandy motherboard is child's play. My 9-year-old son replaced the 8088 processor in his computer with a NEC V20 chip without any help from me. Perhaps Mr. Heckers would like to employ my son's services to install a new ROM BIOS...

*Richard Gans
Director of Computer Services
Isaac School District
Phoenix, Arizona*

Our Copy Protected

A debate has been raging for the past few weeks on a local BBS [bulletin board service]. The topic: conditions under which articles and programs published in magazines may be posted. At the center of the controversy is whether or not programs from *PC World* can be put in the Upload/Download section of the BBS. What is *PC*

(continues)



"BY NATURE,
PEOPLE ARE CLOSE TO EACH OTHER;
BY PRACTICE,
THEY GROW FAR APART."

Confucius



ITT helps a growing company work together.

Today's leading business computers deliver tremendous power to individuals. One business microcomputer—the ITT XTRA™ XL—can join those individuals together in high-performance multi-user or network office environments.

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World's policy regarding placement of programs from the magazine in the U/D section of a BBS? What is your policy regarding published codes, algorithms, or parts thereof being incorporated into programs written by PC World readers?

Harrick Wilson
Hamilton, Ontario
Canada

PC World fully protects all copyright material unless otherwise stated. Programs, code, or algorithms contained within PC World cannot be reprinted in any form without our express written permission. —Ed.

A Word From Wang
"Random Accessed" [PCW, May 1986] contains a few inaccuracies that we would like to correct. The article implies that Reference Software has licensed Roget's Thesaurus. Actually Wang offers Roget's International Thesaurus, but only Borland International has licensed this material. Reference Software has not. Also, Wang has not made The Concise Columbia Encyclopedia and John Bartlett's Familiar Quotations available for licensing as stated in the article. Since Wang holds the electronic publishing rights to several published reference works, we'd like

to ensure that public description of these licensed works is accurate.

Andrea O'Shaughnessy
OEM Account Manager
Wang Laboratories, Inc.
Lowell, Massachusetts

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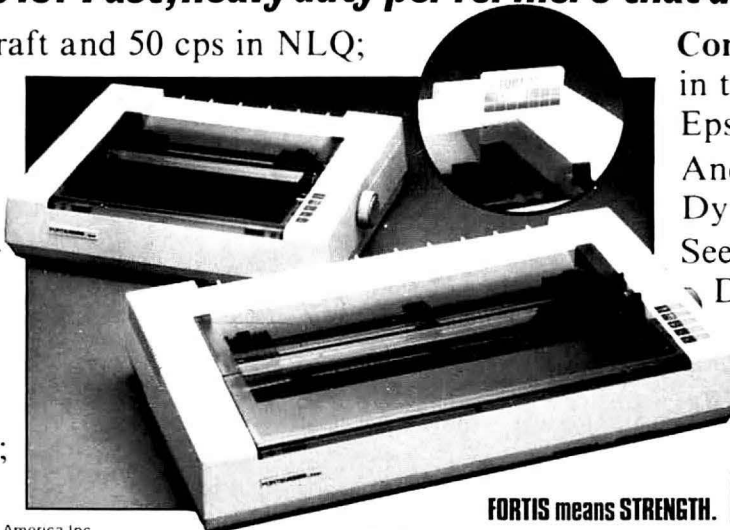
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The Personality. IBM®, Epson®, Diablo® – the Genicom 1000 can be all of these printers and more. Because we've built their personalities into plug-in cartridges. Changing personalities is as easy as changing your mind. Simply plug in the personality cartridge of your choice, and your Genicom 1000 is off and running. Working with almost any PC or software program you care to mention. Effortlessly.

Express your personality. With font cartridges that plug right into the front of the printer. Pick your type; you've got hundreds of fonts to choose from. Insert up to three cartridges at once, and vary type styles within the same document.

The Design. The Genicom 1000 is the first desktop printer designed with common sense, right down to its built-in printer stand.

The unique design also makes paper loading faster and easier than ever before. Feed tractor paper straight through the bottom. Or from the rear. With Genicom's automatic, zero tear-off bar, no matter how you feed it, you'll never waste a piece of paper again.

When you want to print on letterhead, just feed single sheets of paper, typewriter style. You don't even have to remove the tractor paper.

But the 1000 Series was designed for more than ease of use. It was also designed for performance. Its 18-wire printhead delivers high resolution graphics and word processing printing that can only be called letter quality.

The Controls. Easy to adapt. Easy to use. And easy to control. With the Genicom 1000's front panel, total command is at your fingertips. Choose fonts, character spacing, line spacing, form length and print quality with the push of a button. No dipswitches. And no fumbling inside the printer.

The Track Record. When it comes to reliability, Genicom stands by its record. We've created a full line of printers: from desktop models to machines that print 800 lines per minute. Our printers have proven their rugged dependability performing for some of the world's largest corporations. Now we're ready to prove it to you.

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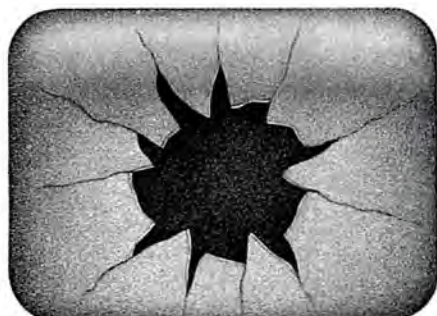
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NOW. POWERFUL WITHOUT POWER



A typical DBMS user's screen, after the 497th line of code.

SELECT ALL FROM callpr SORTED BY caldate WHERE

—Choose an operator to combine conditions—Choose (Done) when done—
AND OR AND NOT OR NOT (Done)

	Column	Operator	Value
OR	district	EQ	Boston
AND	district	EQ	New York
AND	caldate	GT	March 12, 1985
	comment		American Baking Company

An R:BASE System V Prompt-By-Example (PBE) screen. With PBE's query capabilities, you can retrieve just the information you need. Without programming.

Aunt Betty's Baked Goods

Transaction date: 6/23/86 Date: 6/23/86
Transaction number: 4609
Customer number: 666

Name: Speedy Shopper, Inc.
Address: 4092 Industrial Way
City, State, Zip: Oryden, New York 13053
Phone: 800-555-0661

Stock #	Brand	Qty	Price	Extended Price
207	Bake-A-Batch Cookies	95	2.00	186.00
308	Peanut Butter Crunch	100	2.50	250.00
619	Double Rich Brownies	150	4.95	742.50

A data entry screen designed without programming, using Forms EXPRESS.

With most database management software for the IBM PC family and compatibles, you're quickly confronted with a painful reality: the only way to make your package live up to its promise is to learn its programming language. Which can take months. Then you have to write the code, line after frustrating line.

But now, there's R:BASE™ System V. And for the first time, you can quickly create programs that automate your most important data management tasks. Without programming.

Of course, with R:BASE System V, you can enter, query, and report on data in a non-automated, ad hoc fashion. Without programming. And there's a high-level procedural language for programmers. But that's just the beginning.

R:BASE SYSTEM V. IT GIVES NON-PROGRAMMERS POWERFUL PROGRAMS.

With the EXPRESS System in R:BASE System V, you can access powerful features, without programming, that other data management software can't touch.

With Definition EXPRESS,

you can build a database structure with advanced features like computed columns, and *searchable* note fields. VIEWS that combine up to five tables in a single, powerful table. Data validation rules that check incoming data for errors. All without programming.

Then you can use Forms EXPRESS to create customized data entry forms. The forms you create can load data into five different tables, linked in One-To-Many relationships. You can also include scrolling regions, custom borders, and custom colors, all without programming.

And with Reports EXPRESS, you can design reports exactly the way you want. And see what they'll look like, right on the screen. To see how complex your reports can be, take a close look at the example at the end of this page.

Finally, you can tie it all together with Application EXPRESS. First, you design your own multi-level system of menus. Your first menu level might look like this:

Aunt Betty's Sales Reporting System

- (1) Enter Sales Data
- (2) Edit Sales Data
- (3) Print Daily Sales Report
- (4) File Processing
- (5) Exit

For each menu choice, you assign an action. For example, to define

menu choice #3, choose the action "PRINT," select the report you just created in Reports EXPRESS, and specify the appropriate data sorting and selection criteria. Then Application EXPRESS automatically writes the program code.

Which means you've just created a very sophisticated program to deliver the full power of your DBMS. And you've done it all without learning how to program. From this point on, every time you want to run a report, all you do is choose item #3. With one simple keystroke, you've got it.

R:BASE SYSTEM V. IT GIVES PROGRAMMERS A POWERFUL ENVIRONMENT.

If you're an experienced programmer, you can use R:BASE System V to tackle the most demanding applications. You can use Application EXPRESS to create prototypes faster than with any other microcomputer-based DBMS.

There's a high-level procedural language, and a full set of relational operators that can leverage up to 80 tables, all of which can be open at once. While you're racing along, a data dictionary

DBMS PROGRAMS R:FUL DBMS PAIN.

keeps track of the action.
Automatically.

For demanding analyses, there's a set of 70 math, statistical, financial, scientific, and string manipulation functions. You also get more capacity for your data. Comprehensive menu-driven import/export capabilities. Superior relational power. And much, much more.

THE MOST POWERFUL DBMS FOR ONE USER OR A WHOLE NETWORK— ALL IN ONE PACKAGE.

In addition to its standalone personal computing power, R:BASE System V has all the features you need to share data on a local area network (LAN) built right in. When you're ready to network—now or later—this is the only DBMS package you'll ever need. And no matter how many users you add, you'll never have any growing pains. Because an unlimited number of users, attached to a LAN, can access R:BASE System V.

SEE FOR YOURSELF:
\$15.95.

We're confident you'll find R:BASE System V the shortest distance to your data management solution. Visit your computer dealer for a trial run. Or, if you prefer, we'll send you a Trial Pack

for only \$15.95, plus shipping. It's a fully functional, row-limited version of R:BASE System V. Just call 1-800-547-4000, Dept. 958. In Oregon or outside the U.S., call 1-503-684-3000, Dept. 958.

What if you already own R:BASE 5000? If you bought your copy before June 30, 1986, you can trade it for the full power of R:BASE System V. For only \$99. (Offer expires January 31, 1987.) Just give us a call at 1-800-248-2001. Outside the U.S., call 1-206-885-2000.

A program to print this report daily, with a one-keystroke menu pick, was developed without programming using R:BASE System V's EXPRESS Technology. Whether you know how to program or not, R:BASE System V is the shortest distance to your data management solution.

15 line header (up to 65 lines possible)

Four levels of grouping... (up to 10 levels possible)

Time and date stamping

Supports italics and other special printer commands

Prints summary line for grouping

Draws boxes anywhere in report

Page: 1		
Date: Tuesday, June 24, 1986		
Time: 8:00 am		
Aunt Betty's Baked Goods, Incorporated		
California Division		
Daily Sales Report		
For June 23, 1986		
Confidential Information		
1 01-1986		TOTAL SALES
2 Southern California		
3 Cracker Products		
4 Wheat Crisps		
5 Rye Crackers		
Total Cracker Product Sales		97,536.22
Sweet Goods Products		
Bake-A-Batch Cookies		
Peanut Butter Crunch		
Coconut Macaroons		
Double Rich Brownies		
Total Sweet Goods Product Sales		235,223.11
Total Sales, Southern California		332,759.33
Northern California		
Cracker Products		
Wheat Crisps		
Rye Crackers		
Total Cracker Product Sales		25,006.23
Sweet Goods Products		
Bake-A-Batch Cookies		
Peanut Butter Crunch		
Coconut Macaroons		
Double Rich Brownies		
Total Sweet Goods Product Sales		8,623.30
Total Sales, Northern California		19,446.90
Total Sales		113,636.01
		166,712.44
		499,471.77
		57,406.25
		175,223.56
		232,629.81
		45,146.55
		47,123.80
		9,390.99
		517,446.25
		619,107.59
		851,737.40
		1,351,209.17

NEW R:BASE SYSTEM V FROM MICRORIM

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Hercules compatible graphics:
720x348.



Plantronics compatible graphics:
640x200x4 colors.

Introducing The Paradise Hi-Res Graphics Card.[™] Two Upgrades For The Price Of One.

Now you can have much higher resolution than your current video card gives you. Without buying new software. Or an expensive monitor.

All you need is the new Paradise Hi-Res Graphics Card.

It gives you the highest resolution possible on a standard monitor. With monochrome displays, you get Hercules compatible 720x348 graphics. With RGB and composite displays, you get Plantronics compatible graphics: 16 colors in 320x200, and 4 colors in 640x200. That's two upgrades for the price of one.

And no matter which monitor

you choose, the Paradise Hi-Res Graphics Card gives you full compatibility with standard video modes.

Better yet, you can use your existing software to its best advantage. Because Hercules and Plantronics graphics are widely supported by packages like Lotus 1-2-3, Symphony, Framework, and lots more.

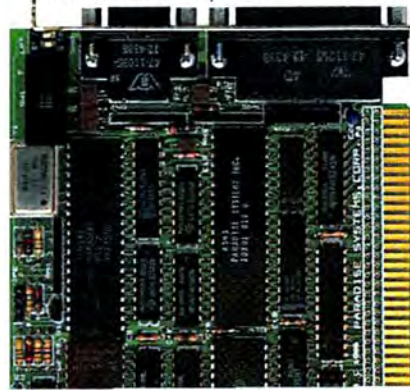
And Paradise gives you all this, plus a parallel port. On one short card.

If you'd like to know more, we'll send you full information. Including a free Hi-Res software compatibility guide. Just call (800) 527-7977, Ext. 342, toll-free. From California,

(800) 822-2020, Ext. 342. Or check it out at the best PC dealers.

PARADISE
SYSTEMS, INC.

The Paradise Hi-Res Graphics Card



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LIGHTNING Fast!
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with some limitations

**Loads with the DOS — always ready as a background
program (like Sidekick) to accelerate disk access.
You do nothing — everything is automatic.**

You are going to be so amazed when you start to work with **LIGHTNING**™ installed. Most programs that frequently access the disk (hard disk or floppy) are made instantly faster — up to 2 to 4 times faster.

It is so easy to install and you never have

**Disk intensive programs
(like databases) can run 2 to
4 times faster.**

to do anything again; it does it all for you — like lightning.

LIGHTNING™ comes to you on a diskette. You simply load it onto your DOS diskette if you are using floppies, or if you have a hard disk, into the DOS area. Simple A-B-C instructions let you get it started the first time in five minutes. Then it is always ready, working automatically in the background any time you boot up. (The copy protected version is a "key diskette" and doesn't boot with the DOS.)

What's it like to use it? If you have ever worked with or seen a RAM Disk you know what a difference speed can make when working with any program that frequently accesses the disk. Well, **LIGHTNING**™

enables those programs to approach the same rapid speed as a RAM Disk, but it does it without the disadvantages. With a RAM Disk there is a constant danger that you can lose your precious data if you forget to copy it back to the disk drive. With **LIGHTNING**™ you just use your programs normally. You don't have to remember anything.

LIGHTNING™ has a fun feature that shows you just how fast you're operating. Any time you want, with a couple of keystrokes you can see a screen that keeps a record of how many times you've accessed the disk, and how much time **LIGHTNING**™ has saved you. It's fun to check it out, and it's always astounding. Speed-up varies, depending on your application, frequency of disk access, and amount of RAM you can allocate. For example, best results occur with indexed databases.

When you work with a database program or most word processors, or any time you need to frequently load files into RAM or save them back, you are accessing your disk. It is such a pleasure to cut those times often in half and up to one-fourth.

Spreadsheets can speed up their loading

and saving. Recalculation speed is not affected.

Another plus — **LIGHTNING**™ fully exploits Above Board™ memory for PC's with that addition.

PCSG since early 1983 has dominated

**If you have an IBM PC or
clone and don't have
LIGHTNING™, we simply
have done a poor job
explaining it to you.**

the lap portable market with ROM software such as Lucid spreadsheet and Write ROM that reviewers rated as excellent. We are proud to enter the IBM PC market with **LIGHTNING**™. It's a great product that we not only enjoy offering, but enjoy using on our own PC's. It will support IBM PC, XT, and AT.

This is an exciting program. A typical comment from **LIGHTNING**™ users is "I don't know how I ever did without it."

*PCSG provides hotline support
for the IBM PC.*

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Above Board™ Intel Corp.

Circle 236 on reader service card

Before you invest in a DEC*VT240 terminal, consider the software alternative.

Stop and think about what you really need: A text terminal. Tektronix* graphics. ReGIS* graphics. File transfer capabilities. Communications.

Purchasing a state-of-the-art terminal may be one option, but Persoft has a smarter solution—**SmarTerm® 240**, the ultimate in terminal emulation software.

SmarTerm can do everything the state-of-the-art terminal can do—and more. That's why we call it **state-of-the-smart**.

With SmarTerm 240, the emulation is so exact you'll forget you're using a PC. It features superior text emulation, ReGIS graphics, Tektronix graphics, outstanding communications and file transfer capabilities.

You also get on-line help screens, remappable keyboard layouts and programmable softkeys which can simplify your most frequently performed tasks. You can even customize your own menus!

And because SmarTerm runs on your PC, you've always got a wealth of computing power right at your fingertips.

All SmarTerm products are backed by Persoft's strong technical support network. It's a service you expect from the industry leader in terminal emulation software.

No matter which terminal you're currently using—Data General Dasher* D400, Tektronix 4010/4014, DEC VT100, VT125, VT220 or even the new VT240,



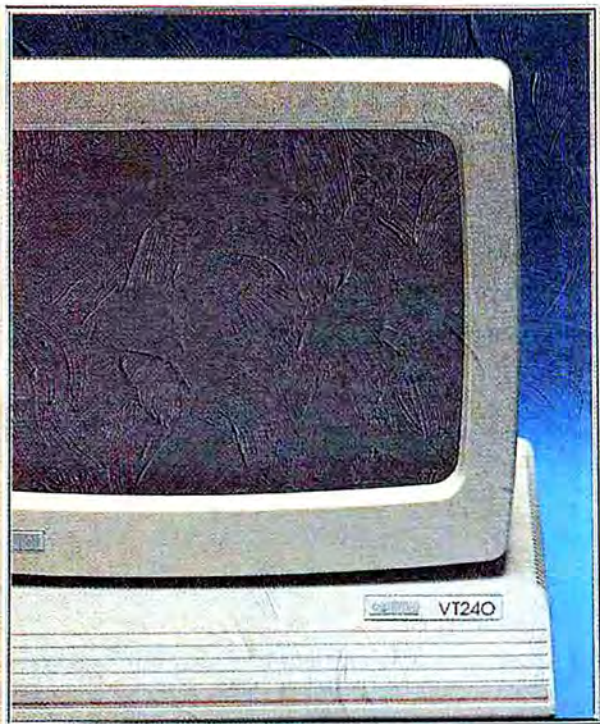
SmarTerm has a state-of-the-smart solution for you.

To find out more about the SmarTerm family of terminal emulation software, see your local dealer. Or contact:
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Circle 142 on reader service card

persoft



Daniel J. Rosenbaum

REMark: The Big-Bang Theory of Standards

In the perplexing world of computer industry standards, the only reliable arbiter is the user community itself.

After reading computer journals of one sort or another for what seems an eternity, I've finally figured out what's wrong with them and what to do about it.

The problem is a flagrant lack of standards. In the current environment, authors use whatever words they want, story lengths range all over the map, and article subjects are completely unpredictable. It's essential that we get some order into this industry. It is therefore my pleasure to announce the Rosenbaum International Standard for Computer Writing (RISCW).

To be compatible with RISCW, an article must be 750 words long, give or take 250 words, must appear in major trade or special interest publications, and must deal with one of a specific set of subjects. I'd go into further detail, but the technical committee is still refining the exact specs. The full 500-page version of the standard should be available soon.

Because demand will persist for certain columns that do not precisely conform, we will issue a

number of substandards. These edicts will encompass the Bunnell, Dvorak, Strehlo, Norton, and Pournelle specifications. Others will be added as the standards committee deems fit.

Please be assured that we will expand RISCW in response to market pressures should other writers require certification. We anticipate that the certification process should take about two to three years.

I have every confidence that RISCW will catch on like wildfire—after all, it's not much different from what some computer vendors assert as a matter of course.

Computing today is held captive by three kinds of standards: international or industry standards, vendor standards, and de facto standards.

International standards are developed by a board of interested vendors and users. These august panels generally meet in places like Zurich, Geneva, or Brussels and

(continues)

AT Power, Toshiba-Style.



The Toshiba T3100.



Try tucking *this* into a drawer when you're done! Until now, you had to be tied to your desk in a tangle of cables and hardware to get AT power. Toshiba's T3100, on the other hand, puts AT performance anywhere you want.

Toshiba technology improves on AT functionality: The T3100 gives you the power of an IBM® PC-AT™ in a lean, 15-pound computer that looks superb on your desk, and slips into a drawer when you don't need it. Take it home, take it to a meeting, take it around the world—wherever your work takes *you*.

Don't let its size fool you.

The T3100 is less than a third the size of the Compaq™ Portable II, yet every bit as powerful. It uses the same 80286 microprocessor as the AT, and is fully IBM-compatible, so you can share data with the other desktop computers in your office. The T3100's 10MB internal hard disk gives you ample storage for sophisticated applications. A dual-voltage power supply lets you plug in and go to work just about anywhere in the world. And Toshiba built in an advanced gas plasma screen, to give you the clarity and brightness of a CRT display—without the bulk.



Compact is as compact does: The T3100 is less than a third the size of the Compaq Portable II.

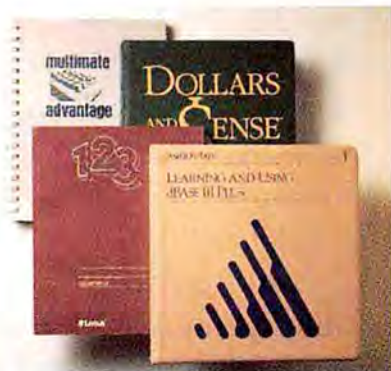
More memory for more applications.

The T3100's full 640KB RAM lets you work with the most popular IBM PC/XT™ and AT software: Integrated financial and analysis programs, large spreadsheets, lengthy documents, electronic filing and more. A built-in 720KB diskette drive handles the new industry standard 3½" diskettes. Each IBM-compatible pocket-sized disk holds *twice* as much information as a conventional 5¼" diskette! And you can easily transfer data to and from other desktop computers using Toshiba's optional external 5¼" diskette drive.

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deliberate for a decade or so before formulating and implementing their proposals. These weighty stipulations may ultimately be ignored or supplanted by other standards. There are, for instance, no fewer than 12 different RS-232C standards. At last count, 4 distinct international local area network standards "prevailed," and there's some question about whether IBM's Token-Ring network adheres to any of them. The emerging standard for digital telephony, designed specifically to ease international traffic, now looks as though it will tolerate different bandwidths for Europe and Japan. These aren't standards; they're embossed invitations to chaos.

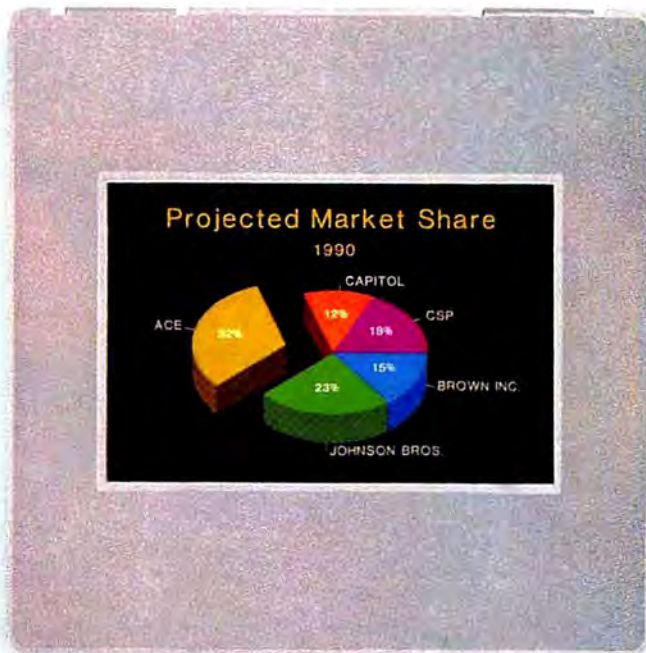
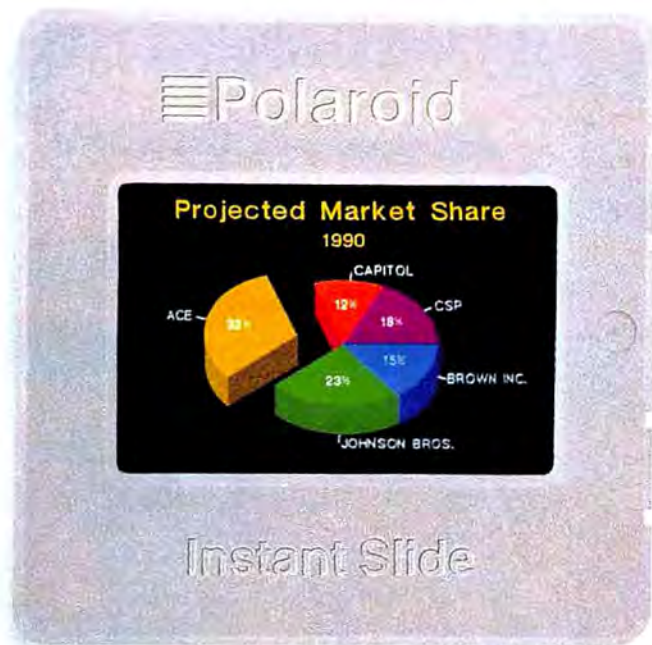
Vendor standards are often preferable to international standards, but they can be worse. The IBM PC standard has become notorious by moving just a smidgen with the release of each new machine. AT&T spent millions to rally the minicomputer world behind the current version of UNIX. Lotus, Intel, and Microsoft are trying to impose their "standard" for expanded (or is it extended?) memory, while AST counters with its enhanced expanded (or is it extended enhanced?) memory scheme.

IBM, of course, is renowned for imposing its own standards, regardless of what the rest of the industry (or the world) says. IBM's SNA (Systems Network Architecture) bears no resemblance to any international or vendor standard

(continues)

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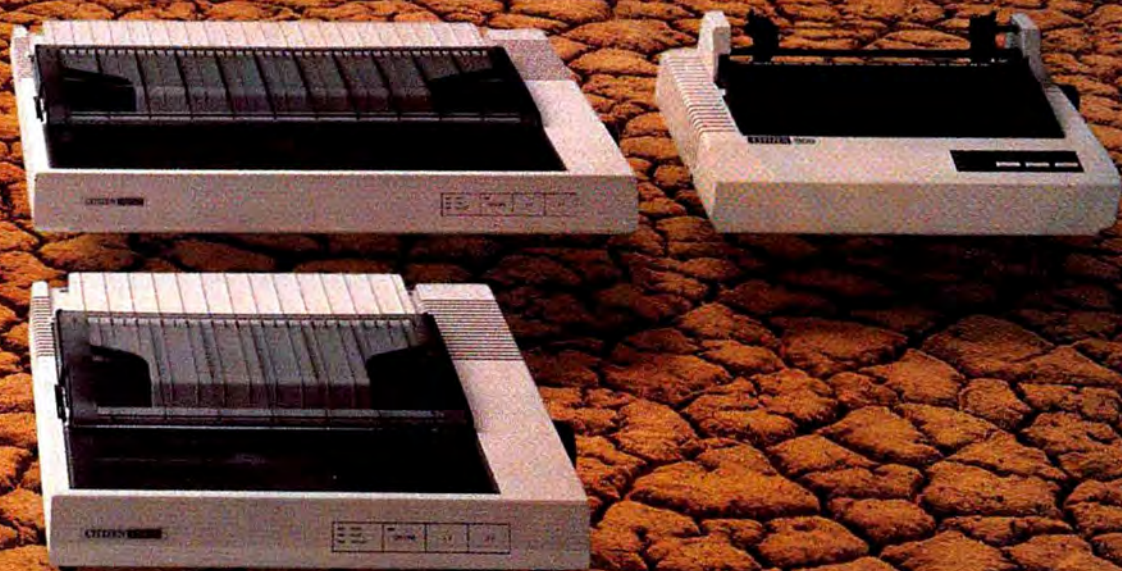
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Sybil™ works on the IBM-PC family and most close compatibles. DRP will only work with PC-DOS, all the other utilities will work with both PC-DOS and MS-DOS.



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but is nonetheless a robust benchmark even in the intransigent European market.

Of late, IBM has joined the chorus line in the Corporation for Open Systems (COS), which exists to develop interconnection standards among incompatible vendors. So important is COS to Big Blue that a high-ranking IBM executive sits on the COS board of directors—something like appointing Moammar Khadafi a director of Amnesty International. To IBM, ideal interconnection resembles Troy, New York, where, it is said, all the roads are one-way, all leading inward.

In short, everyone wants to standardize. But everyone wants to control the standard.

Why? Money. If you control the standard, you control the industry, or at least a good chunk of it. If magazines would print only articles that adhere to RISCW, I'd make a fortune both by selling more of my writing and by certifying other authors for compliance with my standard. It's also great publicity; people may lampoon the Rosenbaum standard or the PC standard or the "expended" memory standards, but they talk about them, worry about them, and give them priceless credibility.

On the surface, the existence of international technical standards committees suggests effective resistance to monopoly control. If everyone can contribute to a standard in an open, negotiated fashion, no single company or cartel will control it. Unfortunately,

(continues)

READ ONLY



A review of the IBM Personal Computer Family. Vol. 3, No. 1

Welcome To Read Only.

Here's great news for IBM PC users. IBM has expanded its already expansive PC product line to bring even more power and flexibility to your desktop.

In this issue alone you'll be reading about new enhancements to the IBM PC/XT, the IBM Personal Computer AT,[®] the IBM PC Keyboard, the IBM Proprinter, the Mainframe Communications Assistant, and more.

And, as if that weren't enough, IBM has also found time to expand your computing horizons even more by introducing exciting new PC products. This issue of *Read Only* will tell you about the new IBM PC

Convertible, new 3.5" diskettes, the new IBM PC 3.5" External Diskette Drive, and two new accounting software packages.



HARDWARE NEWS

The Right Touch.

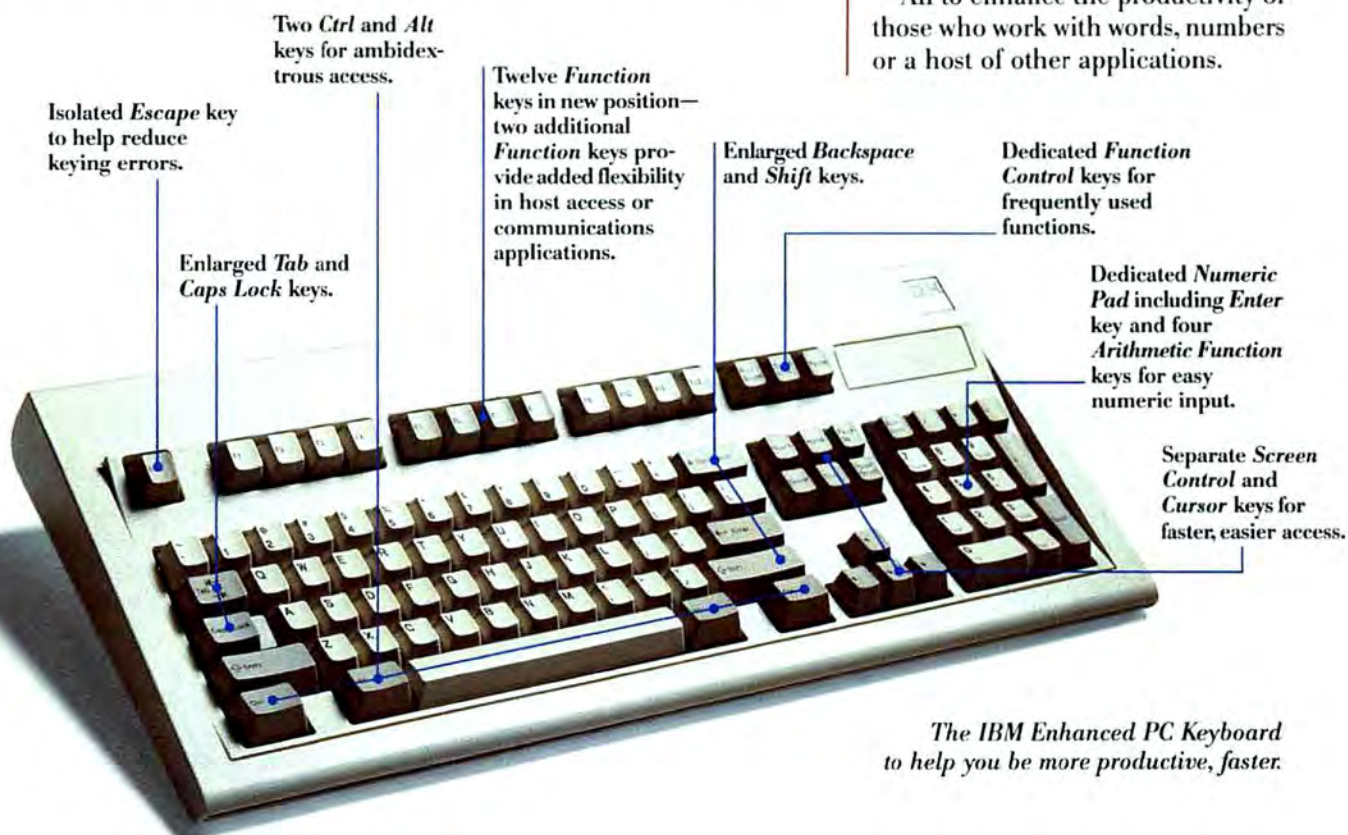
To make it easier than ever to work at an IBM PC/XT or Personal Computer AT, IBM has introduced the new IBM Enhanced Personal Computer Keyboard (shown below).

IBM redesigned its classic keyboard to better meet the needs of PC users, office system users, as well as users who communicate with larger computers.

To accomplish this, IBM included separate cursor and screen control keys, making it easier for users to dedicate the numeric keypad to numeric input when working with number-intensive applications. Plus, the keypad can still be used for cursor and screen control when not in the num/lock mode.

IBM also increased the number of function keys from ten to twelve, arranged across the top of the keyboard. This gives users two additional keys for increased automatic operation.

All to enhance the productivity of those who work with words, numbers or a host of other applications.



*The IBM Enhanced PC Keyboard
to help you be more productive, faster.*

Small Wonder.

Proof positive that good things come in small packages is the new 3.5-inch diskette.

And that's big news for anyone who uses an appropriately configured IBM PC, PC/XT, Personal Computer AT and the new IBM PC Convertible.

Durable 3.5" diskettes, allow you to carry over 350 standard typed pages (720KB) in your shirt pocket. That's twice as much information as on a 5.25" (360KB) diskette, in a much more rugged, portable form.

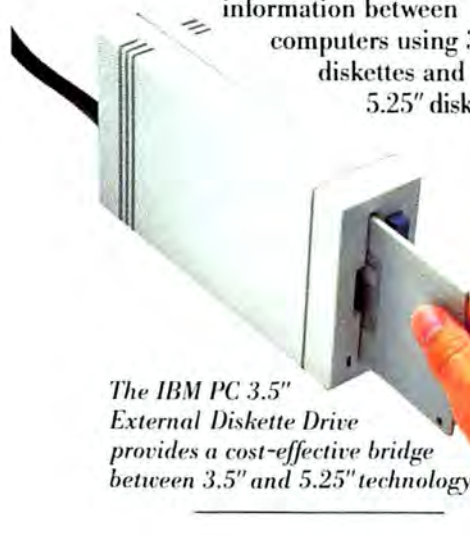


The new 3.5" diskette stores up to twice as much (720 KB) as a 5.25" (360KB) diskette.

Now IBM PC users have the option of using programs and data in either size, and the flexibility to work with other members of the IBM PC family using 3.5" diskettes.

Translation Services.

The new IBM Personal Computer 3.5" External Diskette Drive provides a vital bridge between your IBM PC and 3.5" technology. This compact unit makes it easy for you to share information between computers using 3.5" diskettes and 5.25" diskettes.



The IBM PC 3.5" External Diskette Drive provides a cost-effective bridge between 3.5" and 5.25" technology.



The new IBM PC Convertible is a

The IBM Personal Computer 3.5" External Diskette Drive comes in two models, one for the IBM Personal Computer AT and one for the IBM PC, PC/XT or IBM PC Convertible.

Information and applications can be shared* between 3.5" diskette drive machines and an IBM PC running DOS 3.2 with the IBM Personal Computer 3.5" External Diskette Drive attached.

Transferring files and programs between 3.5" and 5.25" diskettes is as easy as making a backup copy of a diskette. So, you can very quickly have a "database to go" for your IBM PC Convertible. Or, a week's worth of sales call information in a ready-to-use form for your secretary when you return.

Print Evolution.

The new IBM Proprinter XL is especially designed to make life easier for those who work with accounting applications. Its wide carriage design and switchable printing speeds of up to 200cps are perfectly suited for spreadsheet applications.

The IBM Proprinter XL also features an easy-to-use front operator panel that lets you choose from the XL's extensive menu of features, even if you have little or no programming skills.

Plus, the new Proprinter XL offers a long list of standard, labor-saving features to make many printing jobs easier: easy printing of single sheets and envelopes without removing your continuous forms paper, power-assisted paper

loading, all-points-addressable graphics capabilities, near-letter-quality printing (40cps), and emphasized text printing (100cps). Plus, you can set the printer in double high, double wide or emphasized print through the operator panel or through software.

Power To Go.

The new IBM PC Convertible can play two powerful roles in any business person's life.

In the office, with an optional IBM PC monochrome or color display and adapter, the PC Convertible fills the bill as a space-saving desktop PC.

But when you're ready to hit the road or runway, just attach the high-quality, 80-column x 25-line detachable LCD display, and the PC Convertible is ready to travel, too.

Weighing in at a scant 12 pounds, the IBM PC Convertible delivers full-size PC performance in a portable computer with heavyweight features including:

A full-function keyboard with full-size keys and the same center-to-center key spacing as a standard IBM PC keyboard.

A fast, very efficient 80C88 microprocessor with up to 10 hours of non-stop computing power between battery recharges (with average use).

Up to 512KB of user storage (through 128KB expansion cards from a standard 256KB).

Dual 3.5" diskette drives supporting 720KB capacity 3.5" diskettes.

Additional IBM PC Convertible features help ensure that work done on the road doesn't get lost in transi-



never PC that works wherever you do.



These optional features include:

An internal modem feature to let you communicate with other computers simply by plugging the PC Convertible into any standard modular phone outlet.

The IBM PC Convertible Printer for system battery powered, near-letter-quality printing anywhere.

Plus, the IBM PC Convertible can come with a helpful set of programs to get you up and running on the road to enhanced productivity. Fast.

Planned For Growth.

It's a classic case of a very good thing that just keeps getting better.

IBM has now introduced the enhanced PC/XT product family: increased flexibility in storage, memory and option configuration for maximum productivity today, and



The new IBM PC/XT—enhanced power and flexibility for today. And tomorrow.

plenty of room to expand as your business does.

The XT is now available with a 20-megabyte hard file that can store up to 10,000 pages of information.

There's also an easy, low cost way to increase memory to a full 640KB on the system board without tying up valuable expansion slots. And the XT now has 3.5" diskette capability, utilizing the new IBM Personal Computer 3.5" External Diskette Drive.

Plus, full IBM PC compatibility means that no matter which XT model you choose, you can benefit from the extensive IBM Personal Computer software library.

The new IBM PC/XTs, because one size should not have to fit all.

Power Play.

If you thought you'd seen all the IBM Personal Computer AT has to offer, think again. Twice.

IBM has increased processor speed in two new models of the IBM Personal Computer AT by an impressive 33% (from 6mhz to 8mhz). So, they're sure to become your fast friends if you work with large spreadsheets and volumes of data.

The new models offer a standard 30MB hard file and the option to add an additional 20MB or 30MB hard file. That's a grand total of 60MB, or approximately 30,000 pages of words and numbers.

These two newcomers are born communicators: Sharing files with other PCs from a variety of popular software programs. Working as a server for data storage and file processing in an IBM PC LAN running

the IBM PC Local Area Network program. Utilizing IBM TopView™ and one of the IBM PC 3270 Emulation Programs to access mainframe information and to execute PC DOS and mainframe applications concurrently.

And the best news of all is that you can get all this increased power without an increased price.



Now the IBM Personal Computer AT offers a choice of hard files to meet your storage needs.



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Keeping the books for a small business is a very big job. So, IBM thought you could use a friendly, versatile, highly skilled assistant. The new IBM Accounting Assistant Series.

This complete series of automated bookkeeping application programs for small to medium size businesses can help cut any job down to size. And, its modular design means that you can start out with just the programs you need today, then expand your series as your business grows.

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The IBM Accounting Assistant Series. Big help for small to medium size businesses.

Control and Purchasing, and Job Cost bidding software.

Plus, thanks to the IBM Accounting Assistant Series' user-friendly attributes and easy-to-follow instructions, you can start profiting from your system from day one.

High-Powered Advice.

Perhaps your business has progressed past the need for basic accounting software. Then you should consider getting powerful, sophisticated help: the IBM Business Advisor.

IBM Business Advisor PC accounting software takes integrated software to a new level of sophistication and ease-of-use.

Business Advisor's seamless architecture allows functions from each of its modules to play together. Passage back and forth among the General Accounting, Accounts Payable, Accounts Receivable, Payroll, Inventory Control, Order Entry and other applications is intuitive. Menu guide you easily from one task to another.

And when you make a change anywhere, consider it made everywhere it applies. Automatically, through Business Advisor's real-time posting feature.

This Business Advisor speaks your language, too. It uses business language instead of accounting language, and has over 80 easily customized financial report formats built in. And you don't have to keep this all to yourself, because in an IBM LAN

different people at different PCs can work on the same file at the same time.

And you always go further when everyone is working together.



"NEWS" BRIEFS

The 3270 Emulation Programs. Entry Level, Version 2 and Version 3, give you an easy and inexpensive way to attach your IBM PC to your host computer.

Working at your IBM PC, stand-alone or in an IBM LAN, you can now utilize the local power and user-friendly attributes of your PC for DOS applications, plus have access to the vast memory, number-crunching capacities and other productivity-enhancing capabilities of your host computer.

The Entry Level product offers up to 40% faster file transfer between your



IBM PC 3270 Emulation Products can put your IBM PC or IBM LAN in touch with the big time.

PC and host computer. A "Hot Key" for easy switching between host and PC applications. Keyboard remapping so you can always work in a familiar keyboard format. And much more.

Versions 2 and 3 can provide an economical gateway which lets you

share the wealth of host knowledge with the members of your IBM PC Network or Token-Ring Network.

Versions 2 and 3 support the new PC DOS 3.2, 3.5" media, the IBM Local Area Network program 1.10, a host of printers and the TopView 1.1 interface, for multitasking and windowing capabilities.

All of which adds up to added productivity for you and everyone on your IBM Local Area Network or token ring.

To find out more about the entire family of 3270 PC Emulation Programs, as well as a wide range of other IBM connectivity hardware and software, watch for the next *Read Only*.

Mainframe Communications Assistant enhancements include 3.5" media support and increased IBM PC family communications capabilities.

The IBM PC Voice Communications Option speaks for itself. This multifunction adapter card can allow your IBM PC to recognize and respond to voice commands, speak text that appears on the screen, initiate and receive/record/playback phone calls, provide remote, tone push button phone access to your PC (and host), and transmit voice and data simultaneously.

IBM

For more information on any of the Personal Computer products discussed in this issue of *Read Only*, see your Authorized IBM Personal Computer Dealer. Or, call 800-447-4700. In Alaska call 800-447-0890.

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many standards developed in this manner emerge looking strikingly like the proverbial camel: a horse designed by committee. And that's unacceptable.

In the final analysis, the only standards that mean anything are de facto standards—those awarded by the marketplace. If everyone uses something, it becomes a standard. Period. No ambitious vendor or clique of well-intentioned international savants can do anything to alter that.

So what if SNA flouts international standards? It is an international standard. IBM continues to tinker with the PC standard, gambling (successfully, so far) that people will faithfully follow. The

jury is out on "expended" memory, at least this week; its fate is in the market's hands—yours and mine—as are the fates of all current and would-be standards.

Make no mistake: We need standards. Telephone and data communications wouldn't exist without them. You could make a convincing case that the personal computer industry didn't really take off until PC-DOS was accepted, for whatever reason, as a central standard. What we don't need are arbitrary standards imposed by a single vendor or by a cadre of vendors with a vested interest in the outcome.

There's an obvious irony here. PC-DOS, after all, is an imposed standard that the computing public subsequently embraced. On the other hand, the industry that grew up around the PC standard will keep IBM from moving the standard wherever it wants.

Perhaps, in the end, that's the best measure of a standard's success: the inability of its creators to fundamentally change it without losing the market the standard was intended to capture. ●

Daniel J. Rosenbaum publishes Wiretap—an information industry newsletter that adheres to its own standard.

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PC WEEK

"Iomega's Bernoulli Box is a no-compromise disk drive that solves the problems of floppy and hard disks, offering their benefits while eliminating their shortcomings."

PC Magazine

"An add-on storage device that combines rugged durability with high speed, it offers the portability and low cost for which floppies are noted plus the huge storage capacity and snappy access speed that are the hallmarks of hard disks."

New York Times

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PC World

"The Bernoulli Box operated flawlessly during my long evaluation period."

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"Attached to an AT, the Bernoulli Box is faster than the AT's own hard disk. Attached to an XT, it is faster than an XT hard disk and even a smidgen faster than an AT. If you install a Bernoulli Box on a standard PC, its performance will make you forget any thoughts you had of eventually upgrading to an XT."

PC News



"...we now have unlimited storage capacity with greater performance than that available on the IBM XT."

Datapro Research Report

"When you add the convenience of the removable cartridge, with its instant backup potential and easy swapping of data files, the speed of data access and transfer, and the reduced risk of head crashes, you've got what could amount to a 'best buy' in mass storage systems."

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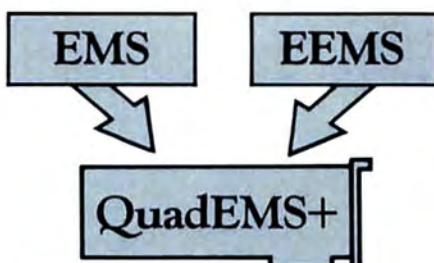


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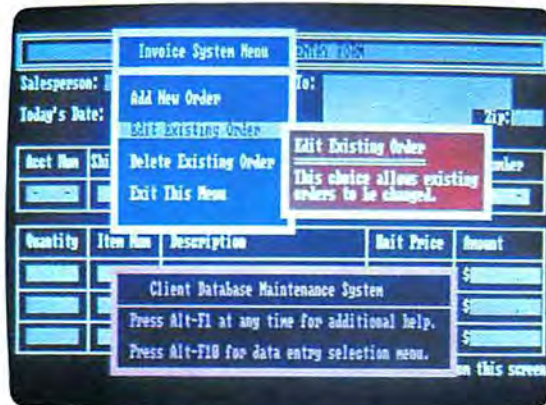
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Build an index on 2000 names	1:43	8:40	6:13	1:01	3:08
List company names and phone	1:56	3:12	2:25	2:17	0:32
Sort on indexed field	4:42	>60:00*	13:08	10:19	7:52
Count to 5000	4:10	9:04	9:43	11:35	18:51

(all times in minutes:seconds)

*test terminated after one hour

And, because development speed is as important as processing speed, *VP-Info*'s one-step compiler doesn't get in your way. A single command compiles any application. Programs can even be run without pre-compiling for speedier debugging.

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IBM PC, PC-XT, PC-AT or compatible computer with 80 column color or monochrome monitor, at least 256K memory, 1 double-sided floppy disk drive (two floppy disk drives or fixed disk recommended) and DOS version 2.xx or 3.xx. 320K required for DOS 3.xx.

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While Remote itself becomes transparent in use, it offers some very tangible benefits:

- You don't need a second PC to do the job of two. Almost any terminal or terminal emulator will do. The only software you need is the software in your host PC.

- Each of several different users can call in from anywhere in the world and use the host PC and software. Remote includes a sophisticated electronic mail system with encrypted messages and individual password protection.
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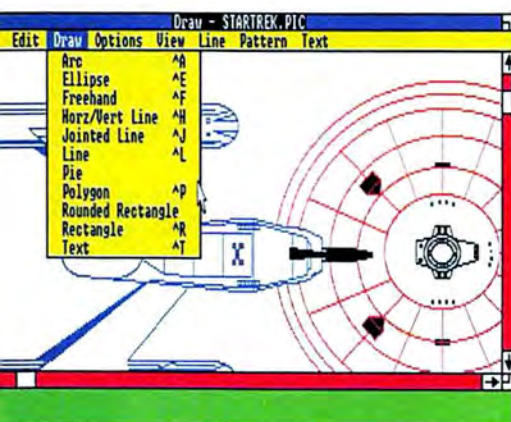
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—Ken Greenberg

Waiting for GoDOS

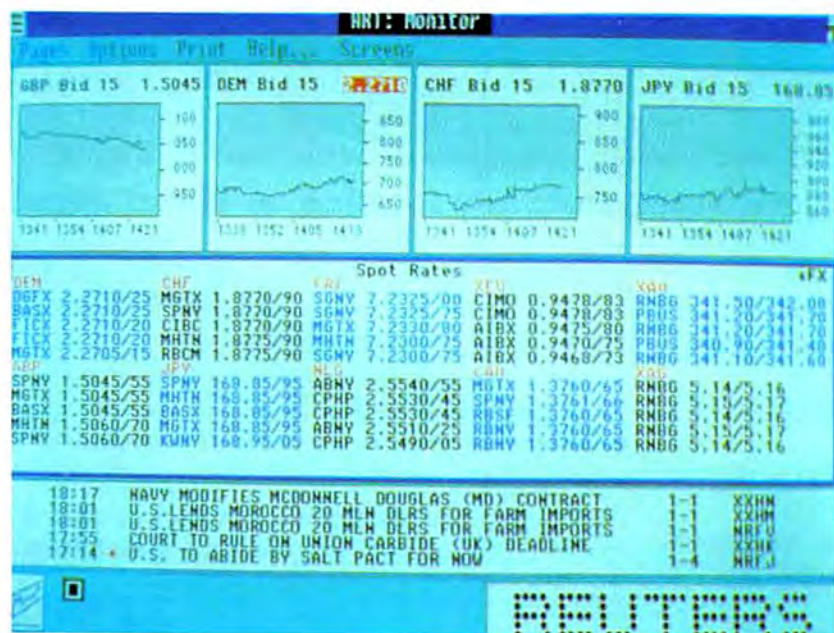
In which developers ask Microsoft, How much is that operating system in the window?

While it's hardly news that Microsoft is enthralled with Windows, the success of the sophisticated graphics-based environment manager hinges on software developers' matching that enthusiasm.

Mutual admiration could be at work even now. Microsoft's second Windows development seminar, convened recently in New

York, was distinguished by the relative absence of cheerleading from Redmond. In the main, the battle for the hearts of the several hundred corporate software developers on hand appeared to be over. Microsoft aimed squarely for minds and pocketbooks, with nuts-and-bolts guidance and well-oiled demos of products from such financial community notables as Merrill Lynch and Reuters.

These are the selfsame developers IBM is said to be courting for TopView. But as IBM stewes about infusing graphics into its environment manager, Microsoft continues to trot out key Windows extensions. The latest include the Dynamic Data Exchange (DDE) protocol and the Rich Text Format (RTF). DDE permits Windows applications to share data in real time, bypassing the Windows clipboard; the RTF spec allows docu-



The Advanced Reuter Terminal greets foreign currency traders with a Microsoft Windows face, offering dynamic graphics and flagging rate updates in color.

View

News and notes for the computing community

ments to exchange text without corrupting font, spacing, color, size, or style—a capability vital to personal computer publishing. (Microsoft has also abbreviated the distance between *TopView* and *Windows*. The company's recent acquisition of Dynamical Systems Research—developer of *Mondrian*, a *TopView* look-alike—should make *TopView*-specific applications hospitable to *Windows*. Just in case.)

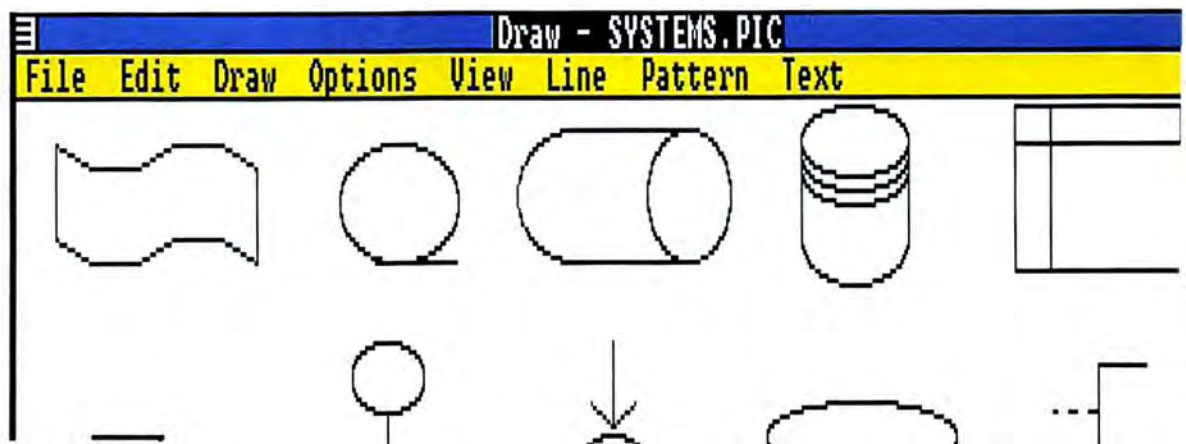
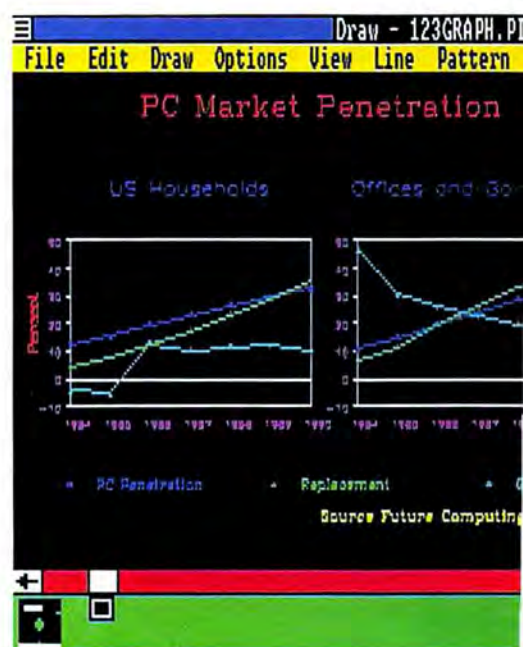
Perhaps more significant, Microsoft continues to drape *Windows* in the overall architecture of DOS. Said Microsoft's Scott Treseder, "Writing to *Windows* means writing a future DOS application." Treseder offered a tantalizing recipe for a DOS as yet without a number—an operating system that addresses 16MB di-

rectly, provides data security and micro-mainframe communications, supports access to mass storage devices in the optical disk league, and performs multitasking with aplomb.

Multitasking has a special allure: Such a DOS incarnation (presumably, DOS 5.00) would tame the 286/386 protected mode, run multiple programs, and enable a single program to do several tasks at once—safely. This DOS would deliver, in Treseder's words, "superminilike functionality." No overkill here; Microsoft anticipates quantum leaps in communications, graphics, printers, and optical storage hardware that will make the new DOS mandatory. The hard part will be staying the course with existing DOS applications.

Unclear in all this is what has become of DOS 4.00, the DOS version that apparently won't be

paired with a new IBM machine. DOS 4.00 is reportedly available in Europe, but on these shores version 4.00 may be little more than a signpost en route to DOS 5.00.



On Line to Success

Henry Kisor does what many of us do—he uses a computer at work and to freelance a bit. Supplementing his duties as book critic for the *Chicago Sun-Times*, Kisor writes and edits a syndicated column on personal computing.

Kisor's love affair with computing began in 1982 when he bought an Osborne 1. Sensing Henry's zest for the technology, a colleague suggested he begin writing a column. Kisor's insights on computing are now a mainstay at the *Seattle Times*, the *Orlando Sentinel*, and the *Los Angeles Herald-Examiner*, as well as his own paper.

From the outset, Kisor's enthusiasm for computing packed additional significance, because he's deaf. For him, the PC has been more than a source of edification and income; it has materially changed his life. Kisor characterizes hooking up a modem for the first time as liberating—his maiden opportunity to use a telephone. "Imagine going through high school having your mother call your dates," he quips.

From the mundane business of phoning home to conducting an interview on line, Kisor's new freedom remains revelatory. Computer-to-computer communication ensures truly equal encounters, with none of the frustrations of lipreading.

Kisor is a minority among a minority; he's among the "oral deaf." He works in a hearing world and

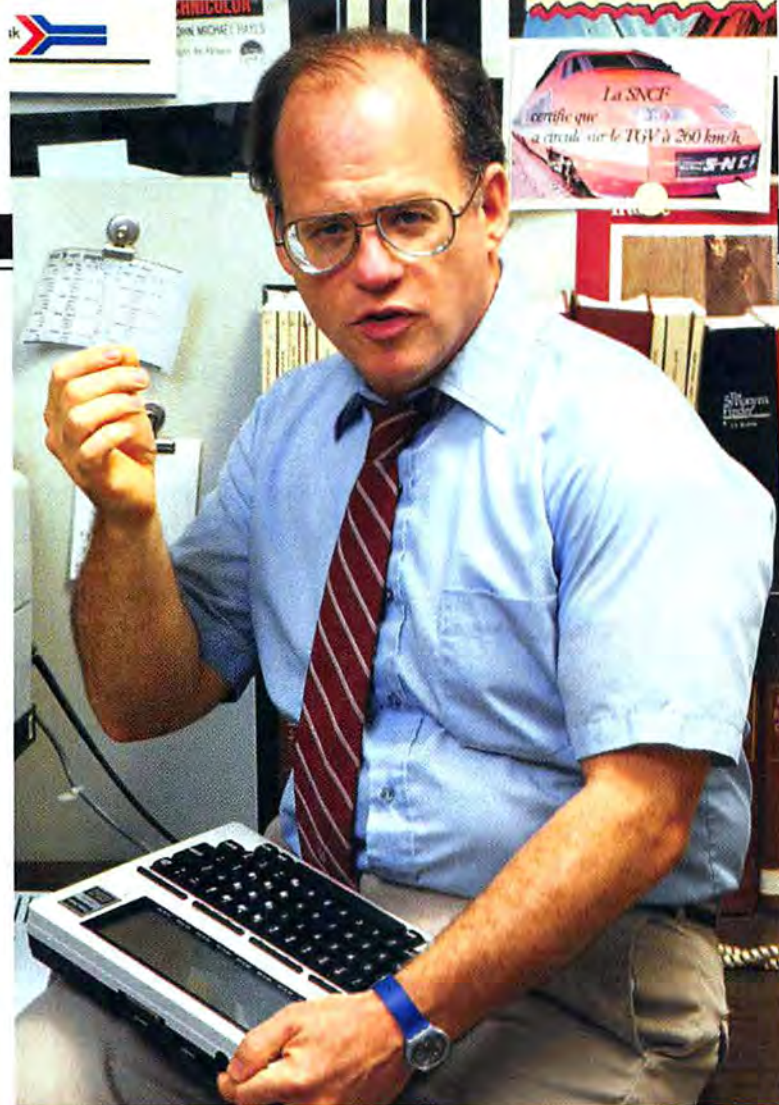
has a hearing spouse and children. He notes that the computer industry likewise dwells in a hearing environment, and thus is not especially appealing to the deaf. Most deaf individuals communicate with teletype-like telecommunications devices for the deaf (TDDs) that use a code most PCs can't read. With the advent of equipment like Novation's TDD board—a plug-in device that translates the special TDD code into ASCII—this widespread detachment from personal computing may be on the wane.

As a novice telecommunicator, Kisor had big plans to conduct

On-line communications is sweet indeed for computer journalist Henry Kisor, who brandishes a Novation TDD board—the medium for his message.

most of his interviews via modem. To his chagrin, he's learned that few authors are equipped with the necessary hardware, even if they are committed to word processing.

Pending modems for the masses, Kisor has set up his own bulletin board. Thus far, it's proved a rich source of column ideas and product feedback. The only downside to telecommunicating, says Kisor, is that people tend to lose their inhibitions and occasionally "lie like hell." —Nancy Andrews



Richard Fawcett

The Ties That Bind

Collecting one's ancestors—or at least the data about them—is fast becoming a hobby that rivals even the old standbys of numismatics and philately.

So says Paul Anderreck, author of *Computer Genealogy* (Ancestry Publishing, Salt Lake City, 1986). Lest the title throw you, Anderreck's book doesn't address the genealogy of computers—as in PC begat AT—but the use of personal computers to record and chart one's family ties.

Climbing the family tree doesn't stop with the etching of names in a data base, and professional genealogists worry about the proliferation of computer jockeys with turbocharged ATs processing data that doesn't stand up to the rigorous tests of genealogical evidence. According to one estimate,

of the 10,000 family histories already in print in this country, at least 90 percent are inaccurate and of dubious value.

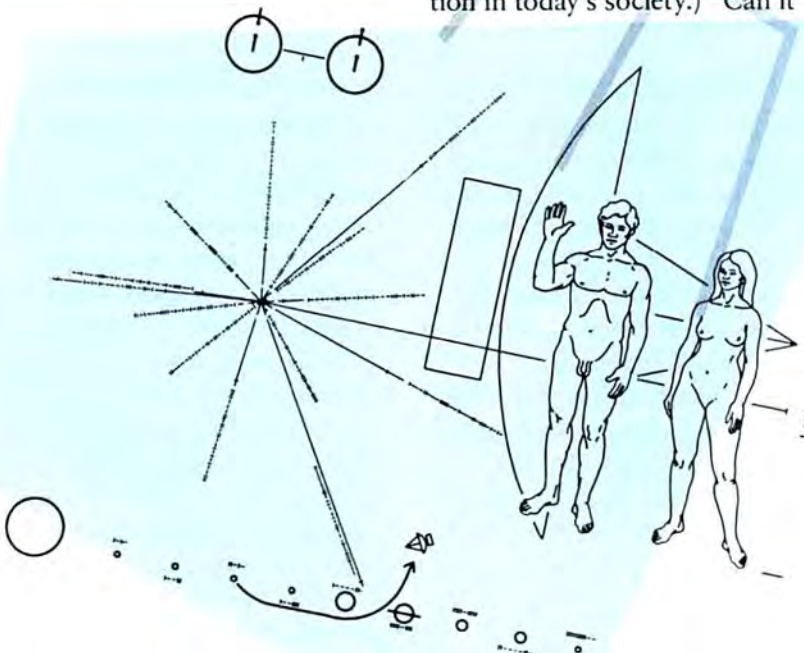
Even if the veracity of your family data is suspect, Anderreck tries to help you select software that isn't. Cutting through programs fatuous and marginal, he homes in on the selection criteria that matter. "Can the program handle multiple marriages?" (A timely question in today's society.) "Can it

track at least 30 children per marriage?" (God forbid.) "Can you return the software and manual for a refund if it doesn't satisfy your requirements?" (Anderreck obviously knows more about genealogy than software marketing.)

Anderreck additionally steps through several noteworthy packages, among them *Roots II*, \$195, from CommSoft; Quinsept's \$185 *Family Roots*; and *Personal Ancestral File*, prepared and distributed by the Mormon church—a bargain at \$35.

Who's to say what lies ahead, even as more of us avidly look back. It may be only a matter of time before we can dial up a mammoth data base and trace it all back to Adam and Eve. A couple of compact disks ought to accommodate just about everyone.

—Donald B. Trivette



Blame the Program!

The notion of no-fault tax preparation software is kaput.

At tax time this year you were cool as a cucumber, even though it was April 12 and you had just begun organizing your receipts. It didn't matter that your accountant was so inundated with other people's tax returns that she looked like a refugee from a ticker tape parade, because your hot new software would not only calculate your taxes, it would also fill out the proper forms. Best of all, the program was deductible.

Except something went wrong. When prompting you by category, the program forgot to ask for your interest income, so you left it off the return. Not only does the IRS hit you for back taxes on the income you excluded, it also requests interest and penalties. "It wasn't my fault," you whimper. "The software messed up, so the publisher should pay."

Good try. You glance at the package, and there, in uncomfortably bold letters, is a disclaimer stating that the manufacturer is not responsible for what the program does (or, by implication, doesn't) do. Sadder but wiser, you call your accountant to book a reservation for next year. "There oughta be a law," you mutter.

Well now there is. Sort of.

The IRS recently issued this warning: "Software companies and others who prepare and sell



Mercedes McDonald

computer programs for use in preparing income tax returns may be considered return preparers and subject to certain return penalties." This admonishment, which has the force of law, affects programs that provide "substantive" tax instruction rather than mere "mechanical" assistance.

Those sounds you hear are shivers traveling up the backs of some software developers. The IRS warning makes software manufac-

turers liable, in a limited way, for the actions of their programs, regardless of any warranties they put on the package. Developers are acutely concerned about the definition of the term *substantive*, which thus far remains foggy. If a program evaluates your finances and tells you to income average, is that substantive? Almost certainly. On the other hand, if a program simply adds various entries on the tax form, that is almost certainly mechanical. Between these extremes lie the truly hard cases.

Suppose you buy a 1-2-3 1040 template. You fill in the numbers,

and it does the dirty work. Due to a bug, the program subtracts two entries instead of adding them; substantive or not? It doesn't take much imagination to conclude that almost any program that automatically performs tax calculations might be deemed substantive.

So next time you're eyeball to eyeball with an IRS auditor, consider the retort, "The program made me do it." Even if that gambit doesn't work, you can rest assured that the software vendor is squirming right beside you.

—Richard Anders

Garlands and Glitches

PC World View's *picks and pans in the PC parade*.

▼ **Glitch** Tandy Corporation, for confirming that cleanliness is next to profitability. Tandy moved boldly to spruce up its image with corporate America, ordering Radio Shack salesmen to don dark suits and white shirts and shave those beards and mustaches. Makes you wonder whether the dishevelment is all that has kept Tandy 3000s from dominating Fortune 500 desktops.

▼ **Glitch** Sytek and Eagle, two stars of yesteryear that are now feeling the big squeeze. Sytek was seduced and, this season, abandoned by IBM, which quietly

shut off the spigot on its PC Network board contract. Eagle, once a high flier among PC clone makers, finally filed for Chapter 11 bankruptcy protection, ending one of the most protracted declines in an industry rife with such falls from grace.

▲ **Garland** Lotus Development, for yet another smart acquisition. In swallowing Graphic Communications, Lotus has given *Freelance* and *Graphwriter* a good home. Keep an eye peeled for Lotus's next act; the target could well be General Optimization, whose *What's Best!* linear programming package for 1-2-3 would be a fitting complement to add-ons that already include the *HAL* natural language interface and *1-2-3 Report Writer*.

▲ **Garland** Phoenix Software Associates—the house that PC compatibility built—for a noble, if vain, attempt to organize hardware vendors around a bus standard for the 32-bit 80386, months ahead of a 386 entry from IBM. AT&T, you'll remember, similarly tried to forge ahead with its PC 6300's 16-bit bus. (Seen any AT&T-compatible 16-bit boards lately?) Unlike AT&T, Phoenix wisely spurned unilateral action in favor of signing up such heavies as Tandy, Olivetti, and—yes—AT&T. Never say die.

A Few Minutes With . . .

Earl Jones, head of AT&T's Personal Laboratory: "When you look at all the things people really do on desktops, you've got to have some level of concurrency, which we believe is only possible through a multiuser, multitasking operating system. I don't believe the operating system that people are familiar with can deliver that power. The need for compatibility with existing applications will delay, if not forestall, the notion of a multitasking, multiuser DOS."

Alan Hald, chairman of Micro-Age: "The RT PC is a straddle technology. It's both proprietary and open, and it offers both DOS

and UNIX. Its success is an 18-month proposition, during which time the new applications will have to be developed. For us, it's already doing better than the System/36 PC."

Frank Yamanaka, general manager of Computer Products Division: "If Japan Inc. were a major force in the PC market, we'd be number one by now. 'Japan Inc.' may be a misnomer. It could well be Korea Inc. or Taiwan Inc. Even the Japanese are having difficulty in the computer industry—it's very difficult to crack the territory because this is a software-driven market. But you can't buy market share on the basis of price—you can only rent it."

Macro on the Right

If you like your documentation wry with a just a touch of literary vermouth, check out the foreword to the latest release of Software Research Technologies' *SmartKey*. Therein, you'll find William F. Buckley, Jr., noted power user and sesquipedalian par excellence, engaged in unabashed macro mania. Buckley suggests that the world would be a finer place if *SmartKey* were somehow implanted in Soviet keyboards, the better to play back the Sermon on the Mount every time the commissars typed "Fire!"

Chairman Bill has even graced the manual's cover with this plug: "Can you imagine a computer without *SmartKey*? I can't, and I have a vivid imagination."

Stop the Presses

PC World View always attempts to stay on the cutting edge, but for one firm highlighted in this space recently, developments continue at a blistering pace.

Chips and Technologies is at it again. While IBM continues to welcome members of its mini and mainframe families into the Token-Ring network, Chips and Technologies—the energetic startup bent on making its silicon more compatible and compact than anybody's—has introduced a persuasive reason not to buy IBM's hardware.

Keep an eye peeled for the Chips and Technologies logo on a pair of controllers compatible with AT&T's Ethernet-based Starlan local area network. For network vendors considering pur-

chase of this OEM offering, the wrinkle is full network functionality (and NETBIOS compatibility) for the price of an RS-232C net (see "Port-to-Port LANs," PCW, June 1986). Chips' new chips deliver 1-megabit-per-second performance—half the rated speed of the Token-Ring—at \$100 or so per connection, or roughly one-sixth the Token-Ring's price.

With popular EGA and AT chip sets in its quiver, Chips and Technologies is now three for three. The company is once again in the right place at the right time for the right price, able to pirouette while some in the industry trip over their feet.

Jr Comes Home

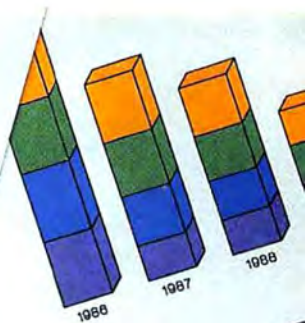
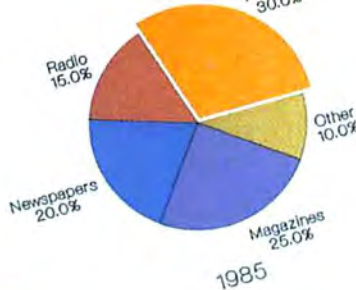
Once upon a time the word went forth from the Chicago suburb of Schaumburg that neither PCjr owners nor their beloved machines were completely forlorn.

Schaumburg is home to *The Junior Report*, an endearing type-written monthly that editor Harrison Day claims is the only national periodical to give a hoot about IBM's orphan. The newsletter is, in Day's words, "dedicated to the survival and well-being of IBM PCjrs"—all 365,000 of them, wherever they may be.

Practical and pungent interchanges among PCjr Club members make up about half the *Report*. Our sample issue was also replete with tips on tweaking Jr to work with the few peripherals extant, a review of a drawing program, a glossary of DOS commands, the requisite contact names and phone numbers, and even a few ads.

You don't suppose somebody somewhere right at this very moment is cooking up a Portable PC Users Club? Nah ... For more information, write the PCjr Club, P.O. Box 95067, Schaumburg, IL 60195.

Boston attorney Richard Anders is the president of JuriSoft, publisher of CiteRite. Nancy Andrews is an author and technology writer based in Seattle; Wes Nihei is the Editorial Assistant for PC World; and Donald B. Trivette writes about PCs and meaningful hobbies from Wrightsville Beach, North Carolina. ●



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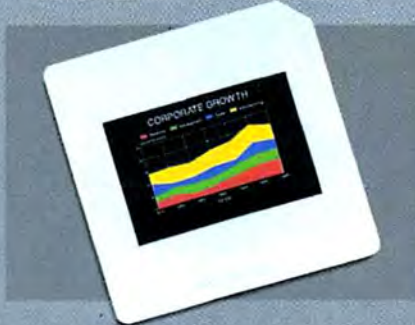
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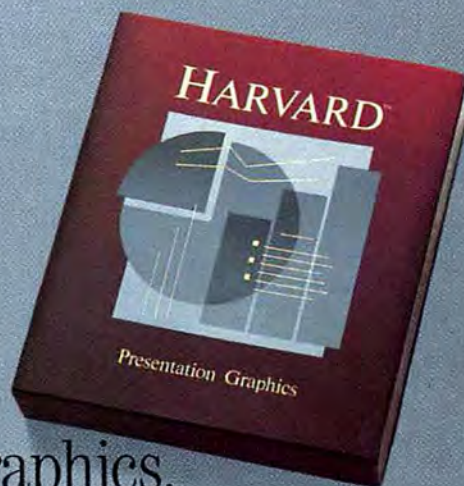
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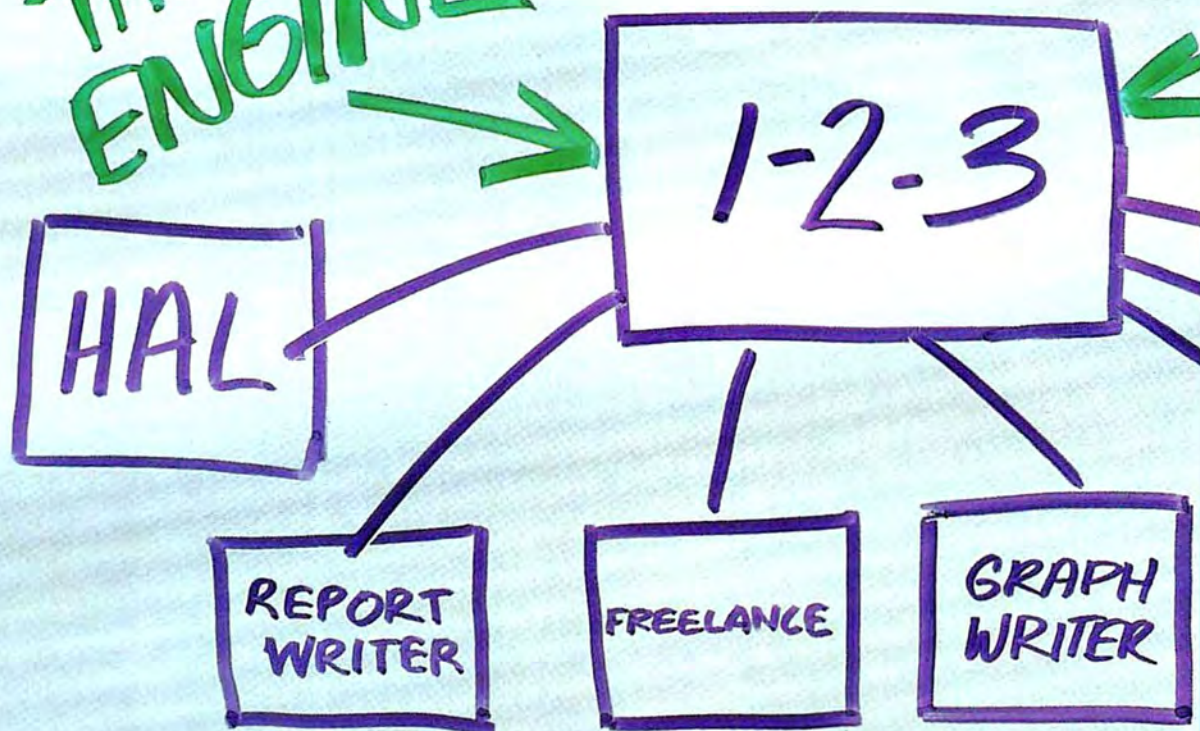


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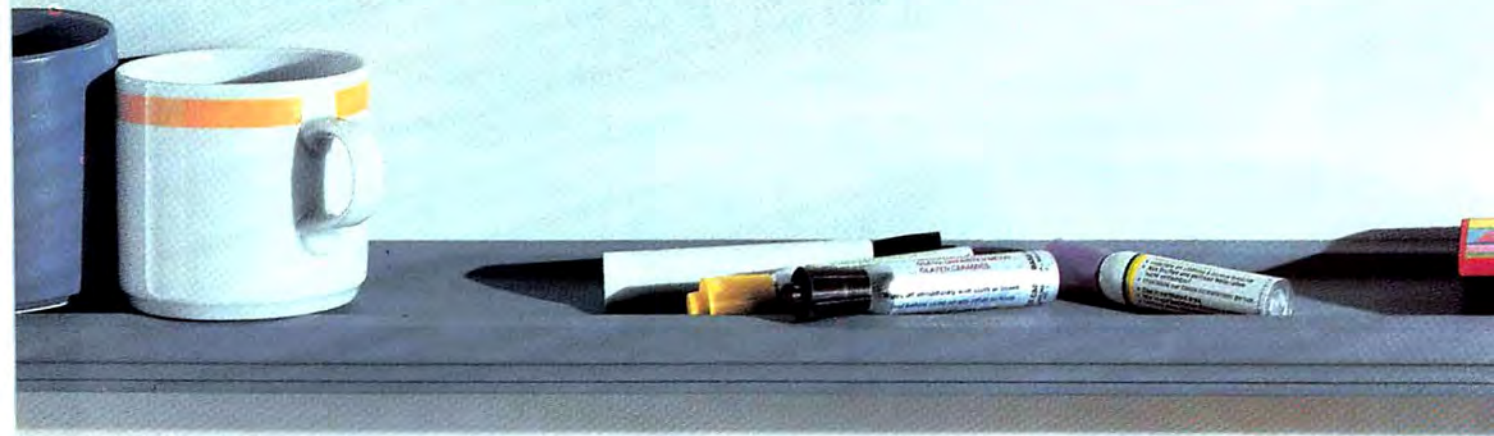
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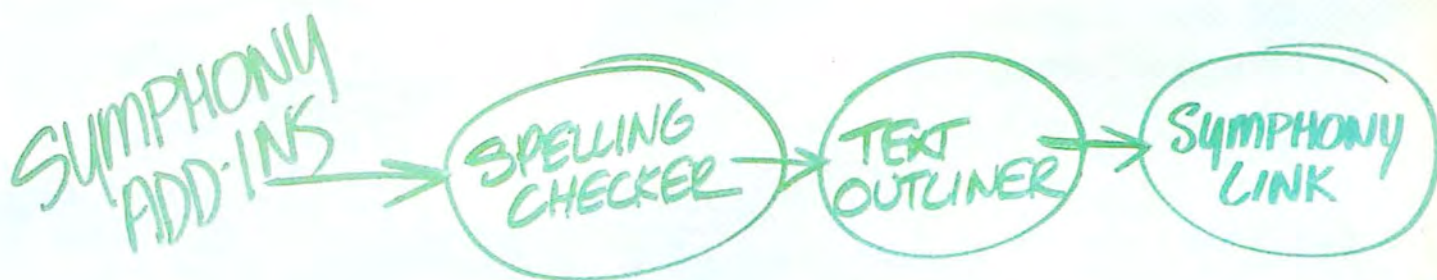
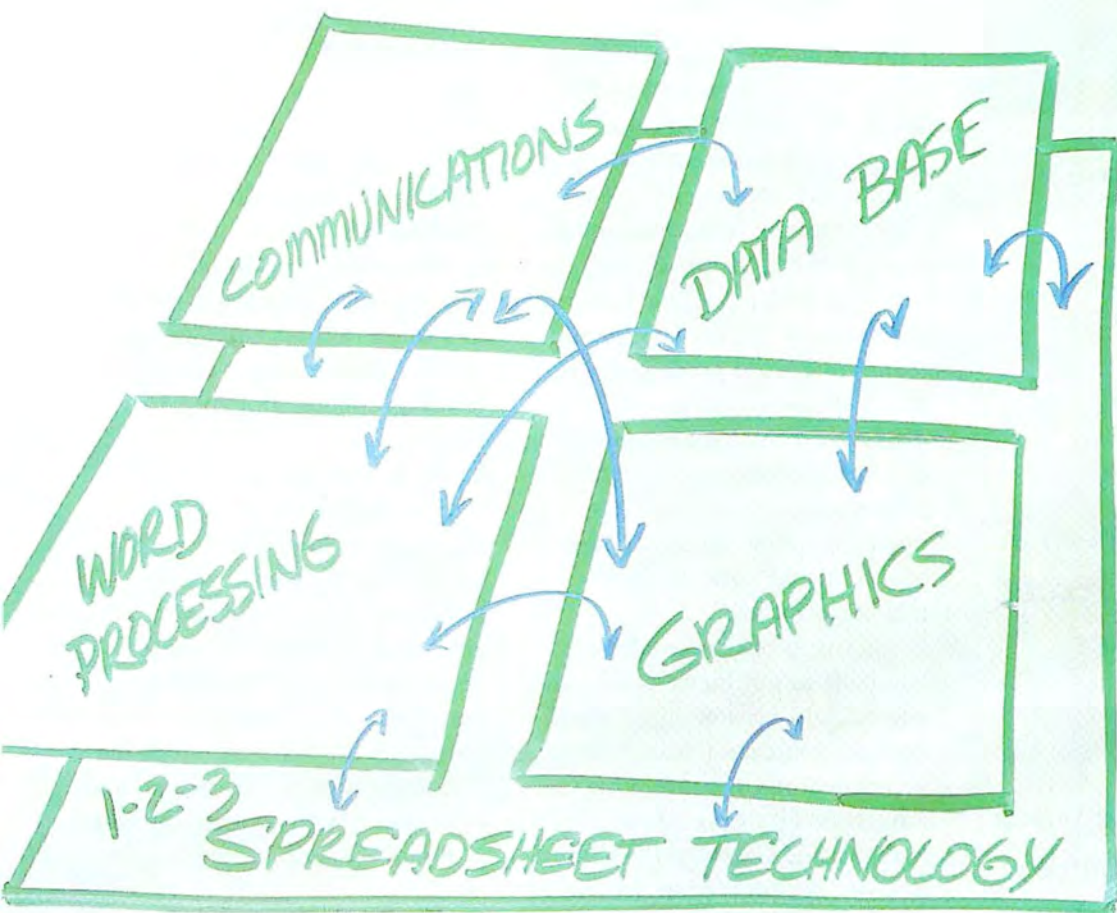
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From the Software Shelf

PC World offers first impressions of recent software releases

This month: the word on Word 3.0, thanks for the memory, better dBASE reports, graphs in a box, and beating your bookie

Edited by Robert Luhn



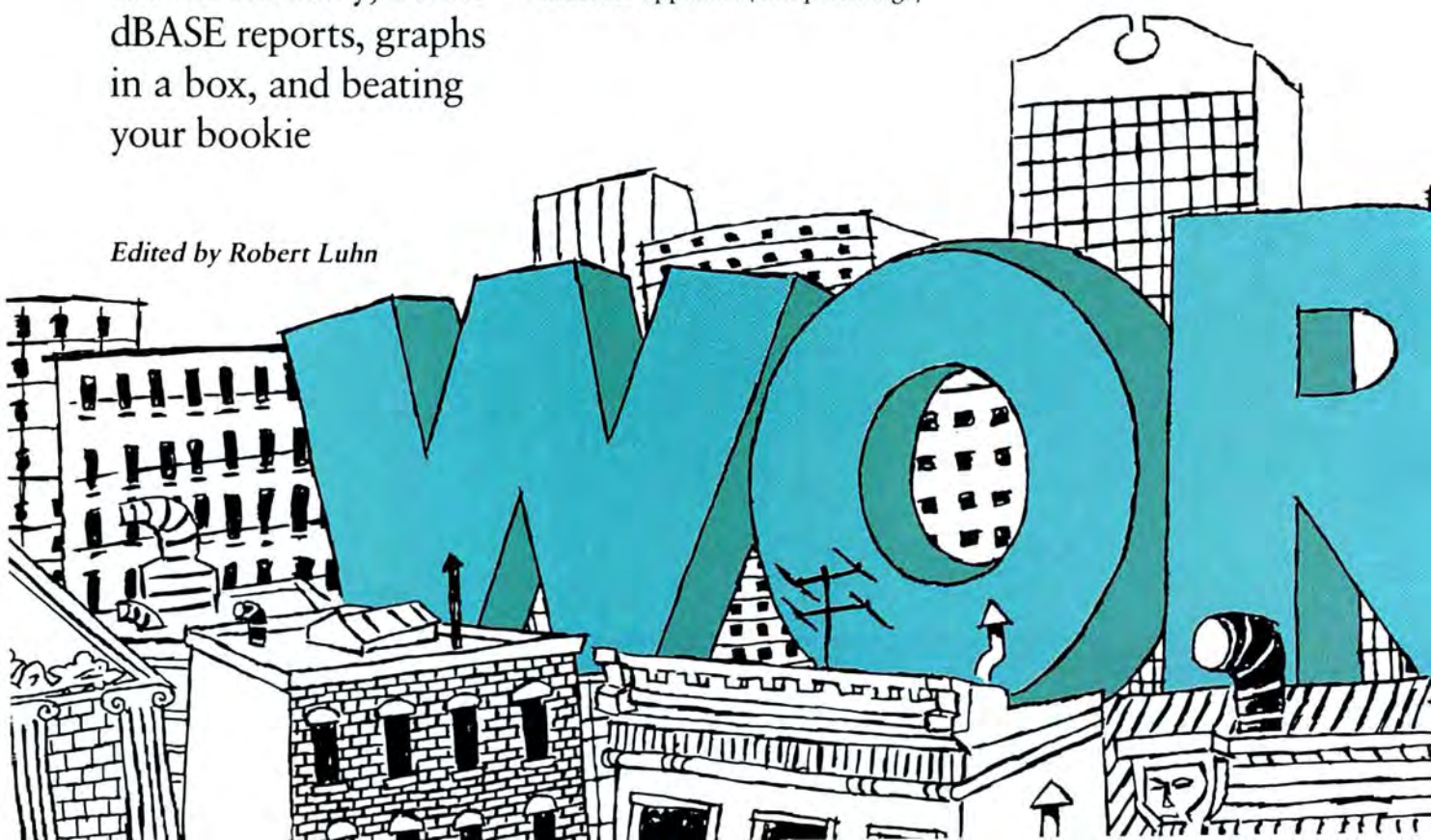
Microsoft Word

I am not one of those diehards who carries a torch for *WordStar*. When *Microsoft Word* came along, I leapt off the MicroPro bandwagon and never looked back. Over the years, Microsoft's brainchild has kept pace with the times, embodying all the features I have come to expect (and even demand) in a word processor: windows, spelling checker, on-screen display of formatting, on-line help, glossaries, style sheets, extensive printer support, superior mouse implementation, background print spooling, and powerful mail merge capabilities.

Microsoft has never been a company to rest on its laurels, and accordingly, version 3.0 of *Word* includes some notable improvements and new features. One unadvertised improvement is faster loading, due largely to the elimination of copy protection. Microsoft deserves applause (and patronage)

for its courageous decision to break with this nasty industry-wide habit. Another welcome change is significantly faster overall program operation, even in *Word's* notoriously slow graphics mode.

The most touted addition to version 3.0 is an outline processor. Although it's not on the same level (pardon the pun) as *ThinkTank*, you can create as many as 16 levels in a single outline, enter an unlimited amount of text under a heading, collapse or expand an outline, and use a Roman/Arabic, Legal, or custom numbering scheme (see Screen 1). As with *Freestyle*, outline headings can be bound to section headings in a document; reorder the outline, and the document instantly reflects the change. However, renumbering is not automatic. You must strip the numbers out of the document with one command and renumber it with another, but this is a minor inconvenience.



If you regularly create long documents, you'll find *Word's* ability to generate a table of contents and an index quite useful. Identifying a table of contents or index entry is a matter of triggering *Word's* hidden text mode and placing a .c. or .i., respectively, next to the item. (Placing a colon after the table of contents marker indents an entry four spaces.) Once the entries are marked, *Word* assembles them with page numbers in a special section at the end of the document. Index entries are automatically alphabetized, while table of contents items are sorted by order of appearance and level. The compilation process is not particularly swift, but you can use other hidden characters to create specialized tables.

Like many of its contemporaries, *Word* embraces functions once found only in data managers and spreadsheets. *Word* can sort tables and numbers, move and delete columns, and perform five-function calculations on numbers in a column or row or embedded

in a block of text. In the last instance, numbers not preceded by a plus or minus sign, asterisk, slash, or percent operator are simply added together; *Word* can even deal with simple compound statements, such as $(65.98 * .5) + (300 * 6.775)$.

Although *Word* can at last manipulate columns, it still can't display them side by side. Multiple columns appear as one long column, with a marker denoting where a new column begins. As a sop, paragraphs can be displayed next to one another, but the implementation is awkward at best. Note too that when you reformat a document, *Word* does not always renumber pages accurately or note the position of the cursor precisely.

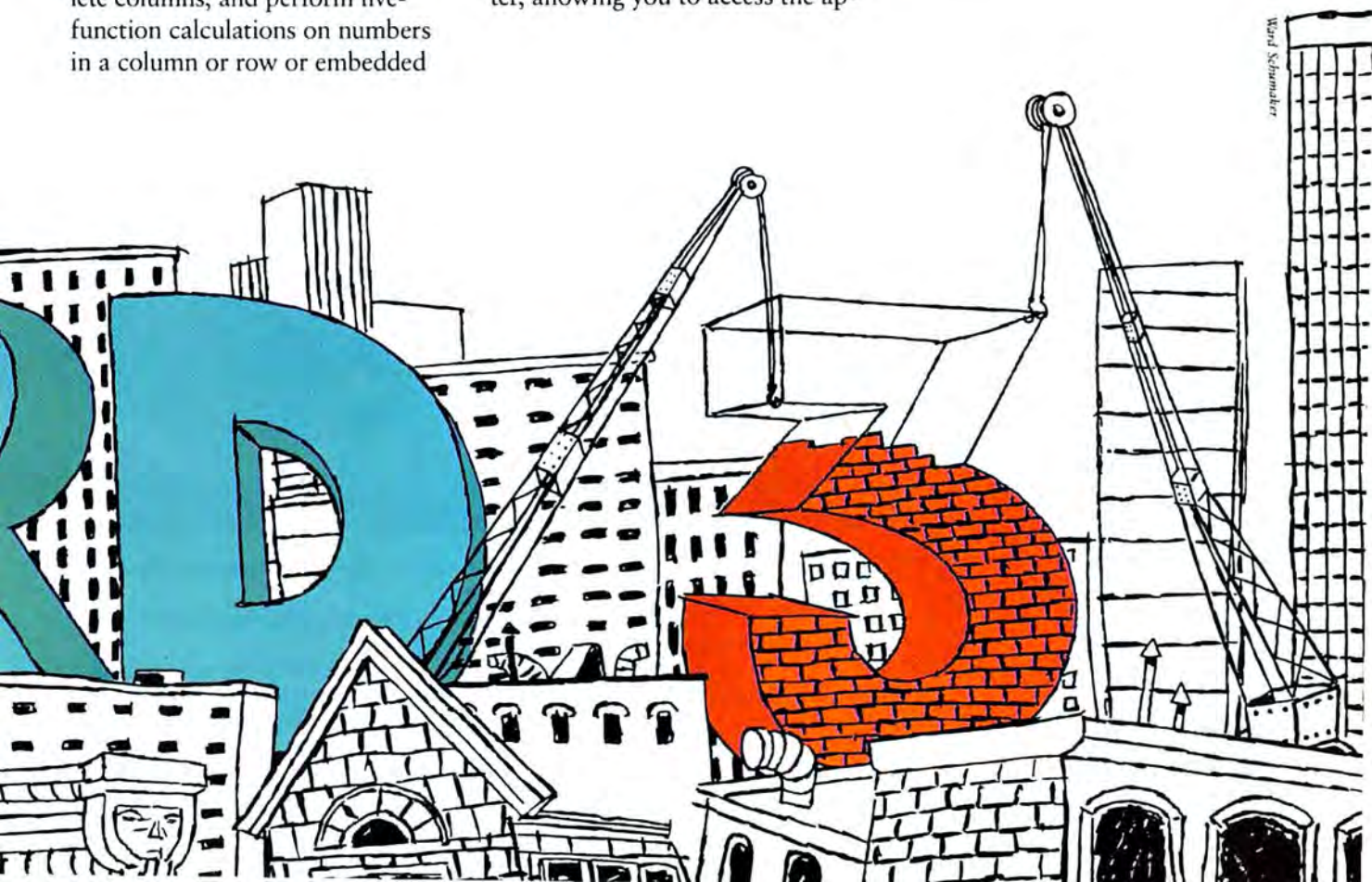
But on the whole, there's little to criticize and much to praise. While many programs come with help screens and disk-based tutorials, *Word* goes them one better, allowing you to access the ap-

propriate disk tutorials from the help menu. Printer support has been expanded to 70 printers, and for those with short memories, *Word* can print out all glossaries on demand.

The new *Word* has still more goodies: 43-line display on a system equipped with an EGA and an Enhanced Color Display or monochrome monitor, support for three single-sheet bins (letterhead, second page, and envelope), variable spacing between fixed-space tabs, and automatic hyphenation. How Microsoft manages to pack such a powerhouse program into 256K beats me. But I'm not complaining. —Bill Crider

Microsoft Word version 3.0
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(continues)





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PopDrop

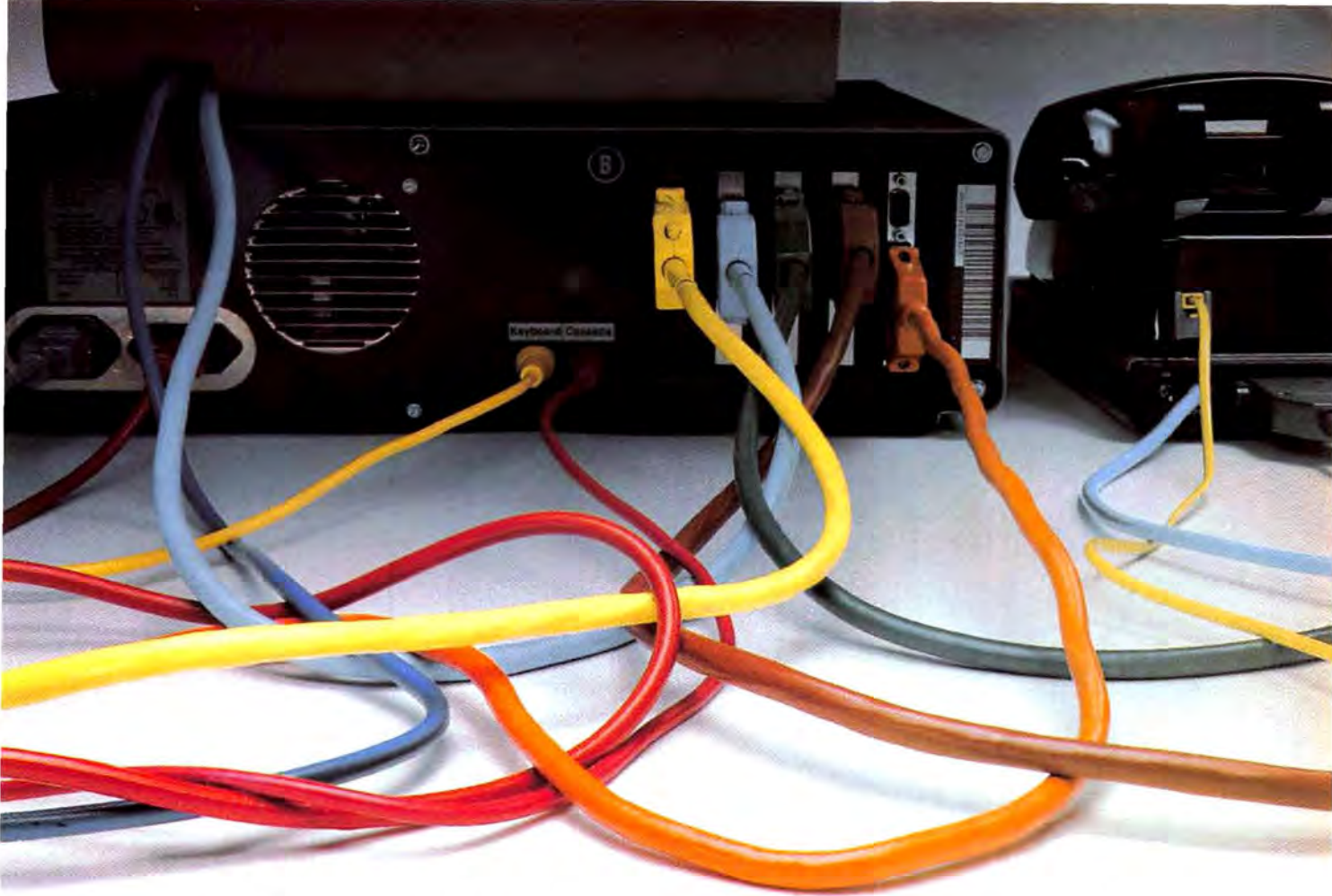
The best thing about a memory-resident utility is that it's always there when you need it. But when you don't, it often takes up memory that could be better used by other applications.

No doubt you've played out the following scenario: you're using a word processor in a RAM disk,

along with a handful of pop-up desk organizers and perhaps a spelling checker. You finish your correspondence, exit the word processor, and load 1-2-3. The disk spins and spins, and instead of that famous, familiar logo, you're greeted with, 'Program too big to fit into memory'. The problem? The PC's memory is still packed with the RAM disk, the spelling checker, and assorted pop-up impedimenta. The only solution is to restart the system and drum your fingers.

You needn't be a pawn in this DOS-inspired free-for-all (see "Battle for the Background," *PCW*, June 1986, for blow-by-blow commentary). With *PopDrop* from InfoStructures, you can speedily remove memory-resident programs with a single command. By craftily combining *PopDrop* with batch files, you can not only

(continues)



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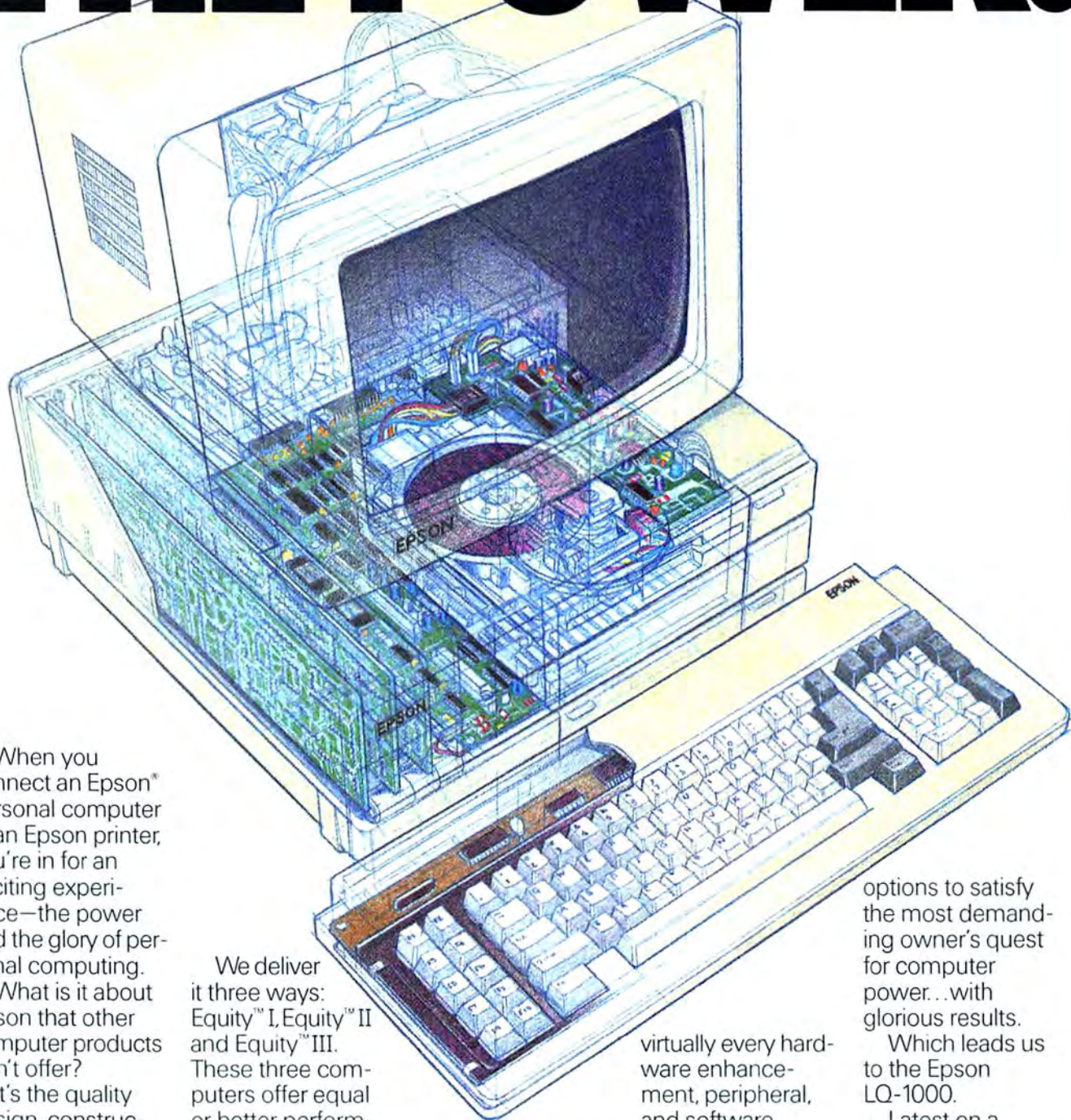
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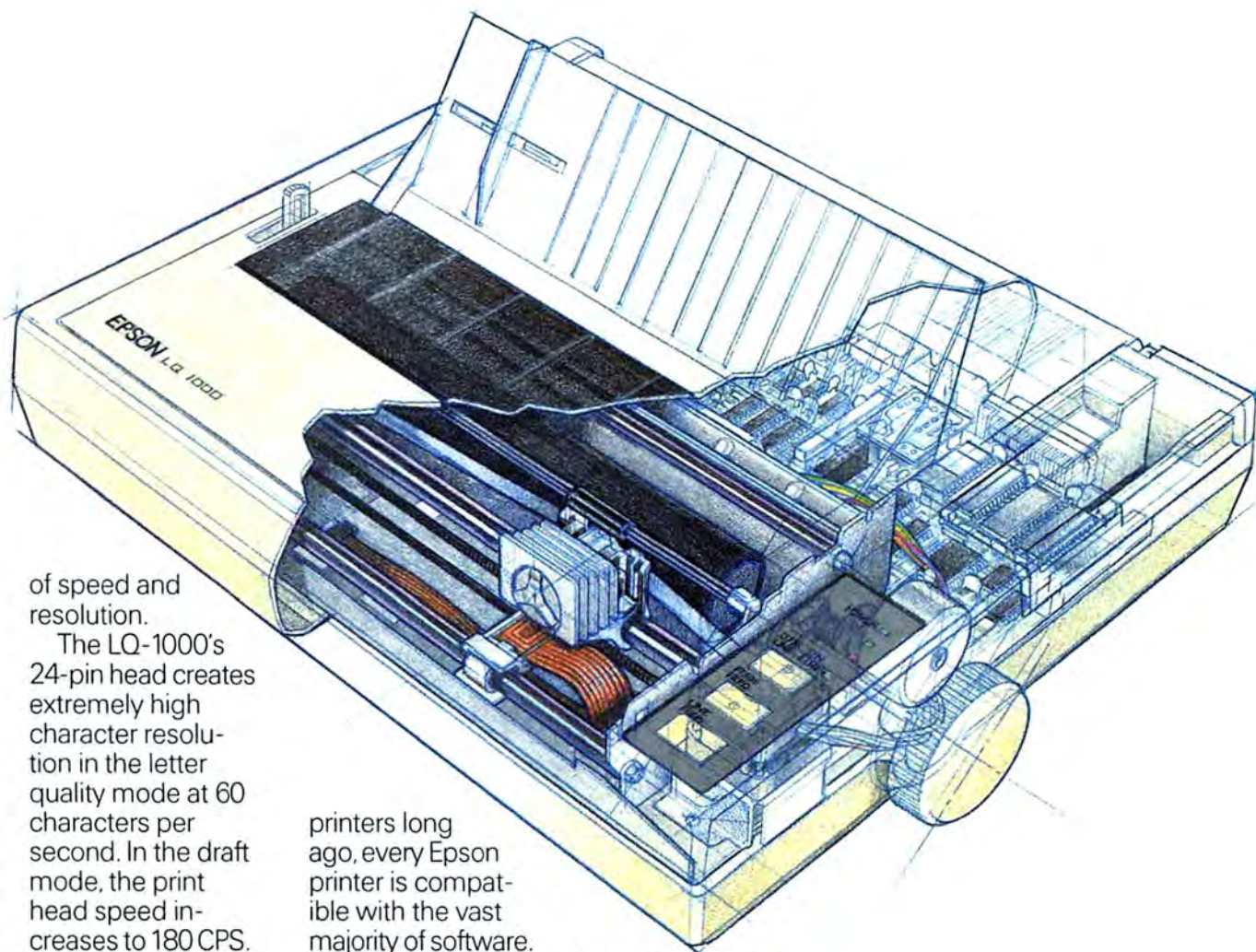
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clear memory of unneeded programs but install tailor-made memory-resident combinations in a flash. Because *PopDrop* records the essential interrupt vectors of memory-resident programs as they load, it must be listed first in an AUTOEXEC.BAT file or loaded first from the DOS prompt.

Of course, *PopDrop* can't overcome DOS's limitations in managing memory-resident programs. You can't, for example, load *SmartKey*, *Turbo Lightning*, and *SideKick* in that sequence and then extract *Turbo Lightning*. You must lift programs out of memory like plates in a stack—the last one on is the first one off. In this example, *SideKick* would be removed first, since it was the last program loaded.

Thus, using *PopDrop* effectively involves a little forethought. Purging a program (including *PopDrop*) from memory is simple. In the AUTOEXEC.BAT file, each memory-resident program you intend to remove later must be preceded by the *PopDrop Up* command; to take programs off the stack, you merely issue the *PopDrop Down* command. (The first appearance of *PopDrop* itself acts as a *PopDrop Up* command.) An AUTOEXEC.BAT file might look like this:

```
PopDrop
SmartKey
PopDrop Up
SK
CD\WORD
Word
```

To remove *SideKick* and then *SmartKey* and load *SuperKey* and

(continues)



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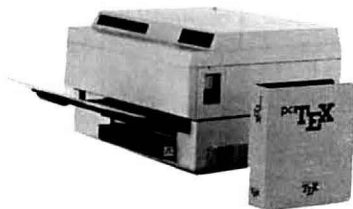
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1-2-3, you would exit *Word* and run the following batch file:

```
PopDrop Down
PopDrop Down
PopDrop Up
Key
CD\LOTUS
123
```

Though using *PopDrop* is fairly simple, the program has some limitations. You must plan ahead, because *PopDrop* cannot tell you the sequence of programs you have loaded into memory—a capability the program's developer should have provided. *PopDrop* cannot delete programs that use expanded memory (such as *Ready*) or those specified in a CONFIG.SYS file, because DOS loads them before *PopDrop*. (Most RAM disks fall into the latter category, with the exception of *Superdrive*.) Running *PopDrop* from within another program (such as *WordStar*) will often crash the system. But these are limitations of DOS rather than flaws in *PopDrop*'s design.

If you need extra memory, but not the extra expense of an expanded memory board, *PopDrop* is a dirt-cheap way to give your programs a little extra work space. —Patrick Marshall

PopDrop 1.0

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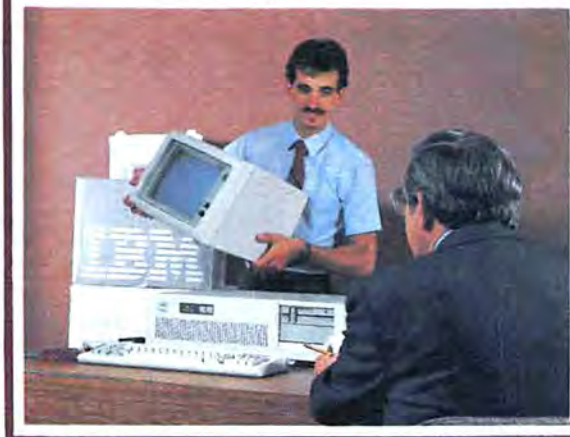
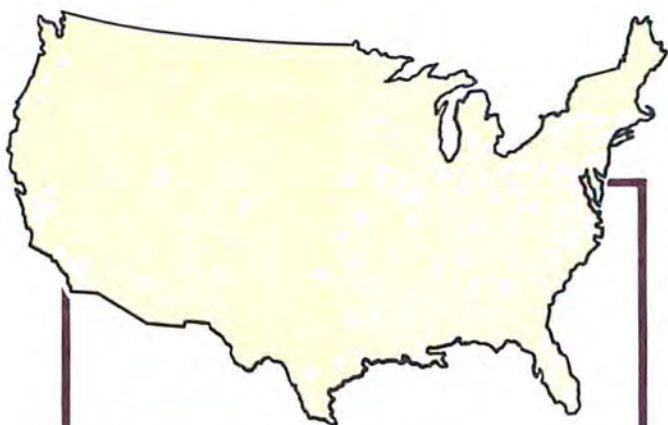
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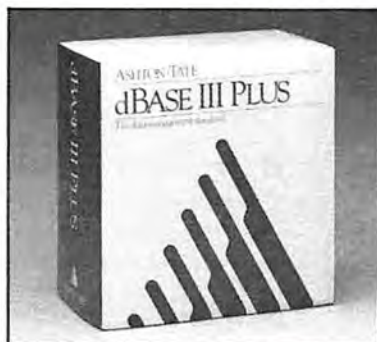
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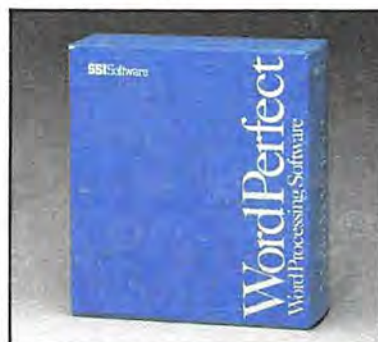


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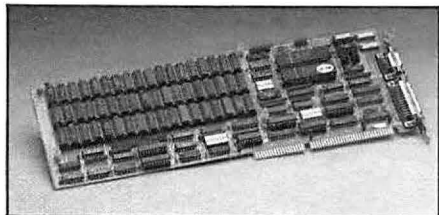
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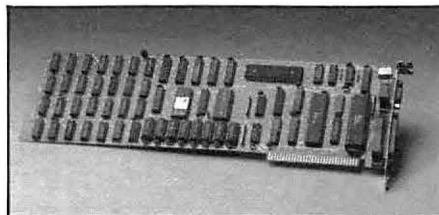
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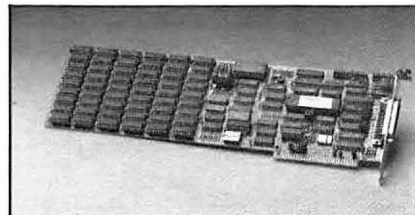
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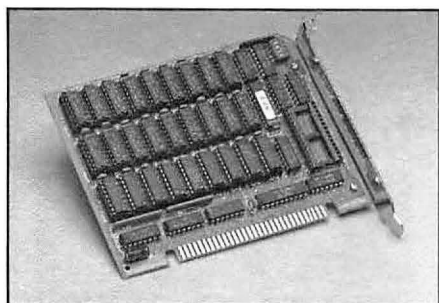
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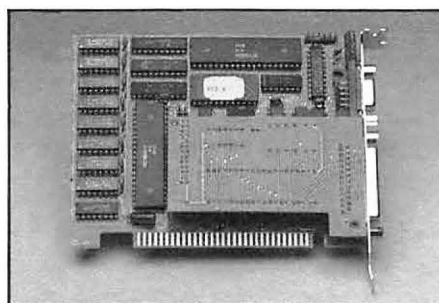
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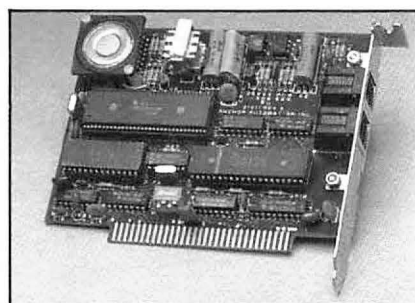
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Quickreport

What this country needs is a decent way to wrest detailed, attractive reports from *dBASE II* and *III*. And here it is. *Quickreport* from Fox & Geller is a top-notch report generator that's easy to learn and operate.

Before *Quickreport* arrived on the scene, *dBASE* users could either work with the simple but limited REPORT FORM command or write a program in *dBASE*'s not-so-simple command language. *Quickreport* is perhaps the best compromise, offering an impressive range of features that even a novice can tap (see Table 1). *Quickreport* may force a lot of *dBASE* developers (this reviewer included) to think twice before writing report programs from scratch.

I learned *Quickreport* in about eight hours and easily ventured into unfamiliar territory without relying on the manual. That's important, because even the most dedicated user is reluctant to pore over dreary manuals for any length of time. *Quickreport*'s *Frame-work*-like interface will likely find favor with *dBASE* newcomers, although I suspect some menu commands will seem a bit cryptic.

Before you can generate a report, you must define the files and fields to be used and lay out the elements of the report on a "blackboard." You first select the primary data base file from *Quickreport*'s Database menu; subsid-

(continues)

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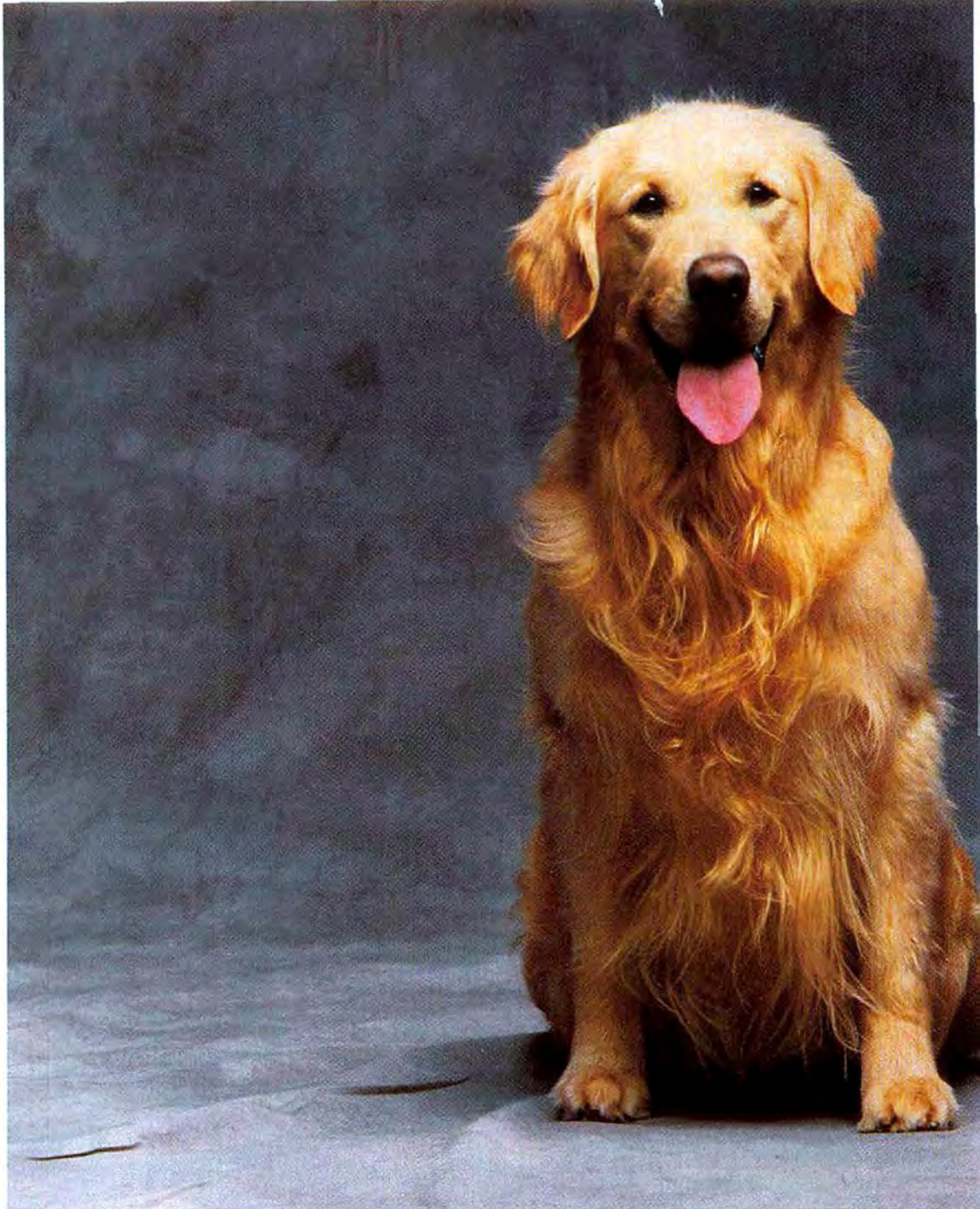
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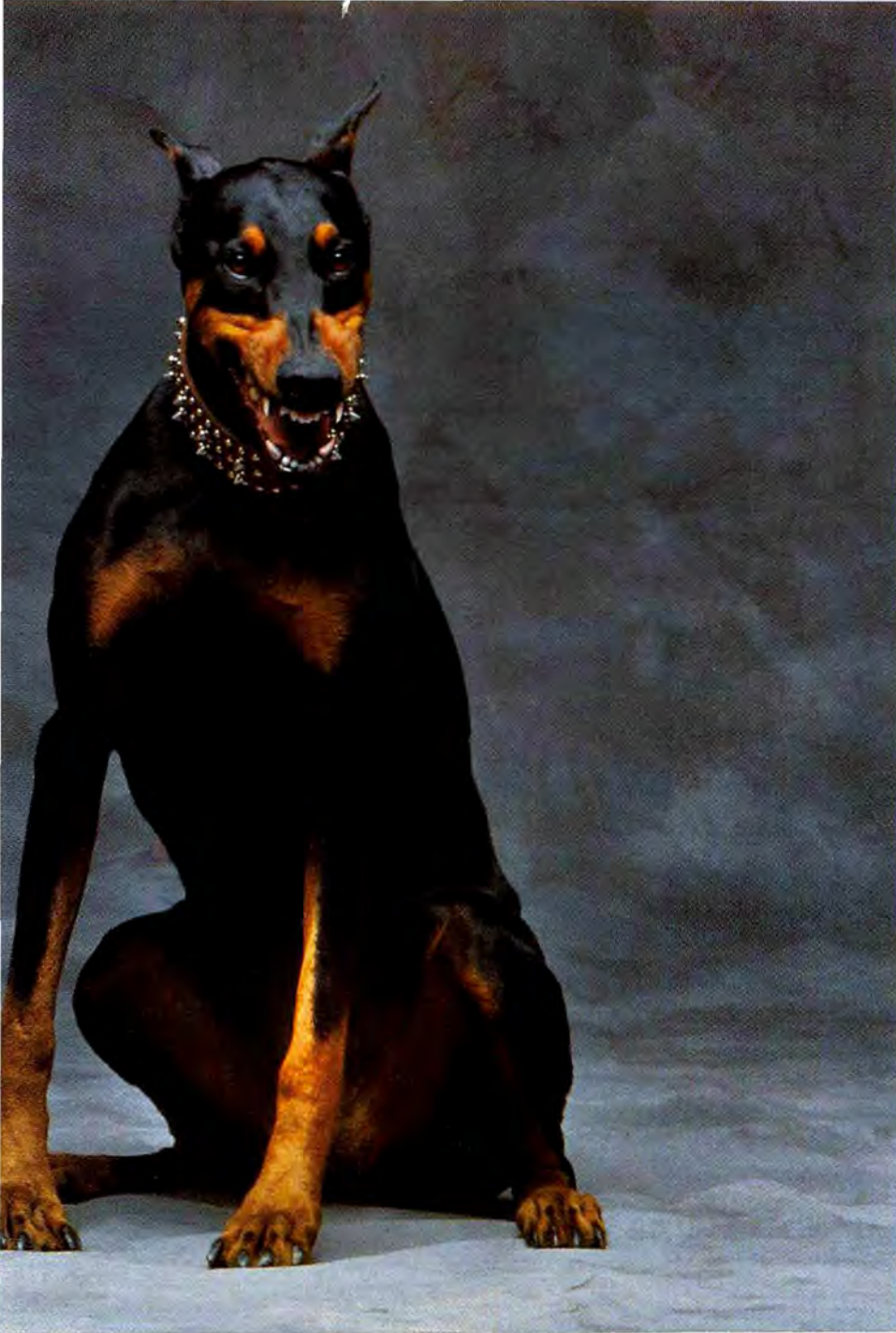
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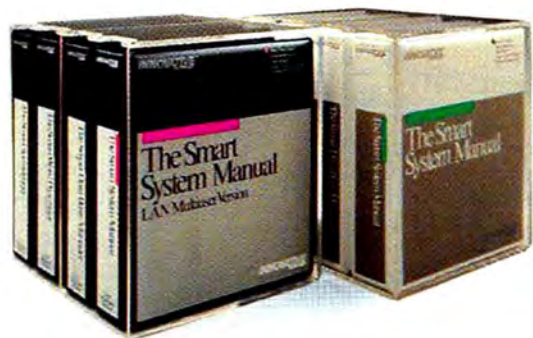
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Table 1: REPORT FORM and Quickreport compared

Features	REPORT FORM	Quickreport
Easy to use	■	■
Number of linked files	1	5
Formatted numbers		■
Alternatives to zero in number column		■
Maximum and minimum values		■
Total, average, count of records		■
Page headers and footers		■
User-formatted break headers and footers		■
Number of break groups allowed	2	16
Stop after single sheet		■
Display one screen at a time		■
Horizontal scrolling		■
Look up a single value in another file	■	■
Look up multiple values in another report		■
Suppress repeated values in a report		■
Specify selection criteria at run time	■	■
Specify files at run time	■	■
Describe a field with dBASE expression	■	■

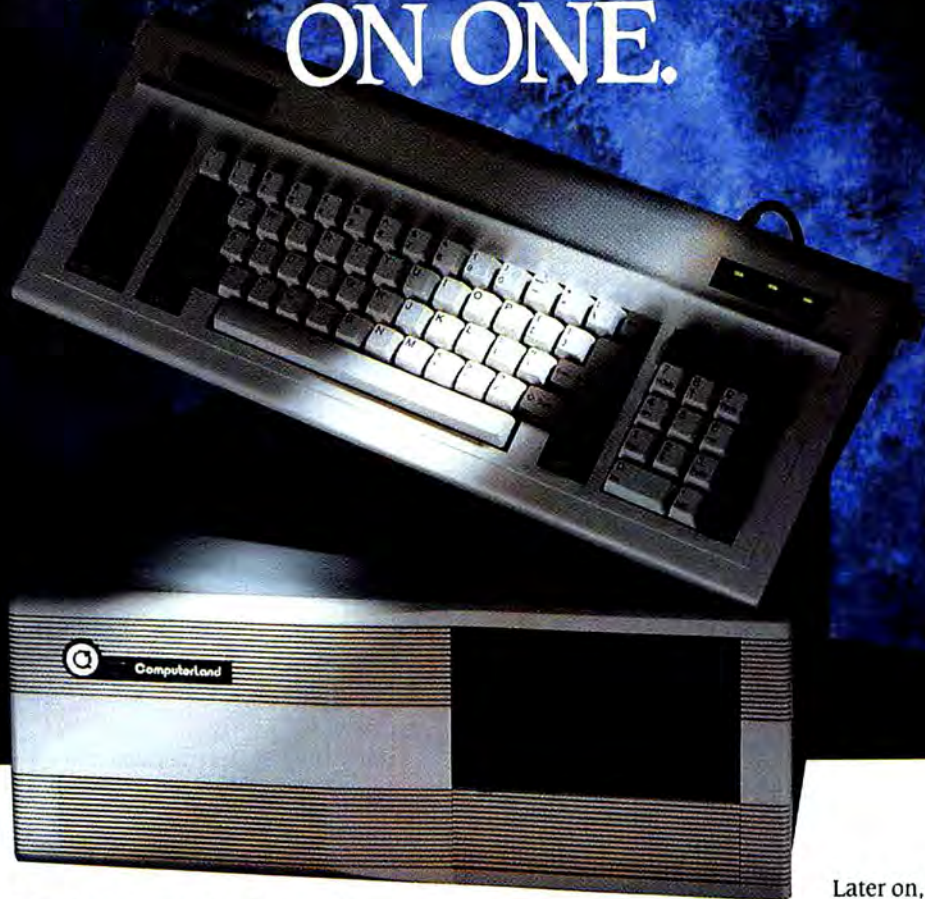
inary files and their index files and key fields are identified at the Control menu. You then return to the Database menu and designate the fields to be referenced in the report. When a field or the contents of a column are best expressed as a formula, you can add a new field from the Field menu and enter the formula using standard dBASE syntax.

At this point you display the blackboard and start laying out the report, typing headers, footers,

and prompts directly into the blackboard and positioning the fields that constitute the body of the report (see Screen 2). The entire report, each page, or subtotal levels (as many as 16) can have headers and footers. Positioning fields means moving the cursor to the desired spot on the blackboard, opening the Field menu, and selecting the appropriate field.

(continues)

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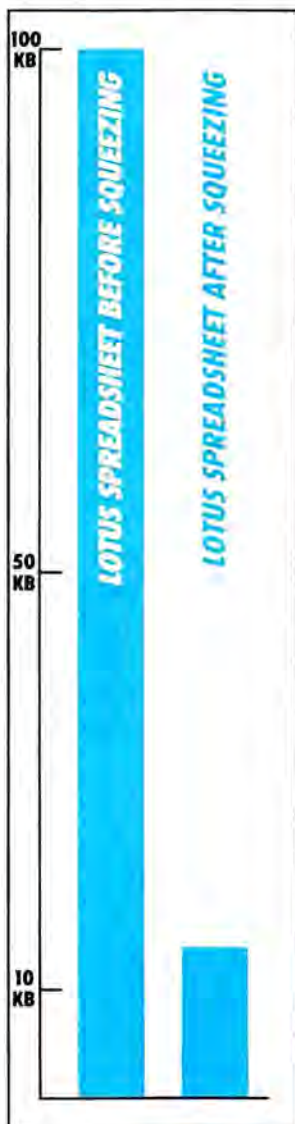
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TIME=0TIME THIS IS THE REPORT HEADER DATE=0DATE

PAGE HEADER
AND THE COLUMN HEADINGS

NAME & TEL INTERESTS & SKILLS

LASTNAME INTERESTS
FIRSTNAME SKILLS
TEL

[PAGE FOOTER]

[REPORT FOOTER]

DATE	PAGENUM	TIME	ADDRESS	ADDRESS2	ATIME	CITY
DAY	FIRSTNAME	FIRSTNAME	INTERESTS	LASTNAME	LASTNAME	REFERRAL
SKILLS	STATE	TEL	TEL2	ZIP		

Use F1 for HELP, F2 to select from the MENU

INS

Screen 2: Designing a dBASE report with Quickreport is like using a page makeup program. You type in the headers and footers and put fields wherever you want on the "blackboard."

You can add the finishing visual touches with *Quickreport's* box-drawing feature.

But pretty reports are only half the story. When it comes to linking data between files, *Quickreport* is a furlong ahead of *dBASE*. In *dBASE*, the Set Relation command only allows a main file to look up one record from a secondary file, whereas *Quickreport* allows a main file to look up multiple records in a secondary file. This makes for flexible reporting indeed.

But like Samson, *Quickreport* has a fatal flaw: It can't wrap long

strings of text into a columnar format. If your reports include a significant amount of text, *Quickreport* may be useless.

One last quirk: Reports cannot be run from the DOS prompt unless you use *Quickreport Runtime*, which the company now wisely includes with the package. If Fox & Geller irons out this wrinkle—and deals with the word wrap problem—*Quickreport* could be the report generator for pros and beginners alike. —David Jenkins

Quickreport version 1.5
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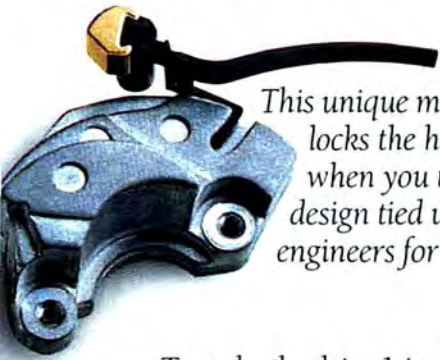
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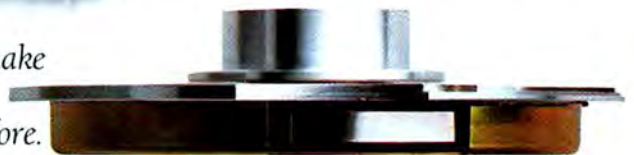


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Graph-in-the-Box

Remember the mechanical merriment of the jack-in-the-box? Like other small fry, I delighted in springing my pugnacious puppet in the face of the nearest adult. Even though the jack-in-the-box was confined to an annual appearance on my birthday, the sound of "Pop Goes the Weasel" still makes my parents cringe.

New England Software hopes to capitalize on fond childhood memories by calling its pop-up graphics program *Graph-in-the-Box*, but while it springs into action like its namesake, all comparisons stop there. This is a nonsense program that transforms data displayed by any program—memory-resident utilities included—into a compelling repertoire of business graphs.

You can, for instance, quickly create graphs to accompany a word processed business plan, generate charts from data in a graphless spreadsheet program such as *Multiplan*, or analyze data on the spot during an on-line session. Although graphs can't be embedded in another file, they can be printed out on a variety of printers and plotters and displayed on screen with an IBM CGA or EGA, a Hercules graphics board, or a compatible. The output may not qualify as first-rate presentation graphics, but the program lets you conduct a speedy trial run before you spend the time and

(continues)

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• Report program source code listings
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Attach the new report module to your system menu

Press
a key,
wait 6
secs*

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- Paint the menu screens
Paint the application screens
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• Print your listings
• Program source code listing • Datafile layouts
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Start using the completed system

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wait 6
secs*

*System Builder will generate 2,000 lines of program code in approximately 6 seconds.

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(Typical 10 screen 8 file/index application)

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Programming	2 minutes	10 hours
Elapsed time to completed system	1 hour and 17 minutes	14 hours

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System Requirements—System Builder/Report Builder: IBM PC/XT/AT¹, or similar, with minimum 256K RAM, dual floppy drives, or hard disk, color or monochrome monitor, MS² or PC DOS³ version 2.0 or later, Turbo Pascal Version 2.0 or later (Normal, BCD or 8087 versions).

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money to produce a polished presentation with a more complicated package.

Pressing <Alt>-G sinks *Graph-in-the-Box*'s hooks into video memory, capturing the data displayed by the main application, and displays the menu. Highlight the data you want to graph, press <Enter>, and an unadorned bar chart pops onto the screen.

At this point you can flip back and forth between the application and the *Graph-in-the-Box* functions that enable you to select other graph styles, add labels, view graphed data in a spreadsheetlike matrix, store the graph to disk, and print it.

In exchange for a 128K chunk of RAM, *Graph-in-the-Box* presents a palatable plateful of graphic entrées: column, stacked column, bar, stacked bar, line, filled area line, step, filled area step, scatter, mixed, and pie charts. The program offers a considerable range of enhancements, including four title lines, two x- and y-axis labels, two variable names, ten crosshatch patterns, various line and symbol styles, and manual or automatic y-axis scaling (see Screen 3). You can further embellish a graph with grid lines; exploded, centered, or ignored pie slices; observation labels; and several color schemes. Yet *Graph-in-the-Box* is easy to master and retails for under \$100—something that graphics-oriented programs such as *pfs:graph*, *1-2-3*, and *SuperCalc3* can't claim.

Keep in mind that *Graph-in-the-Box* isn't up to sophisticated data analysis. It's limited to 500

(continues)

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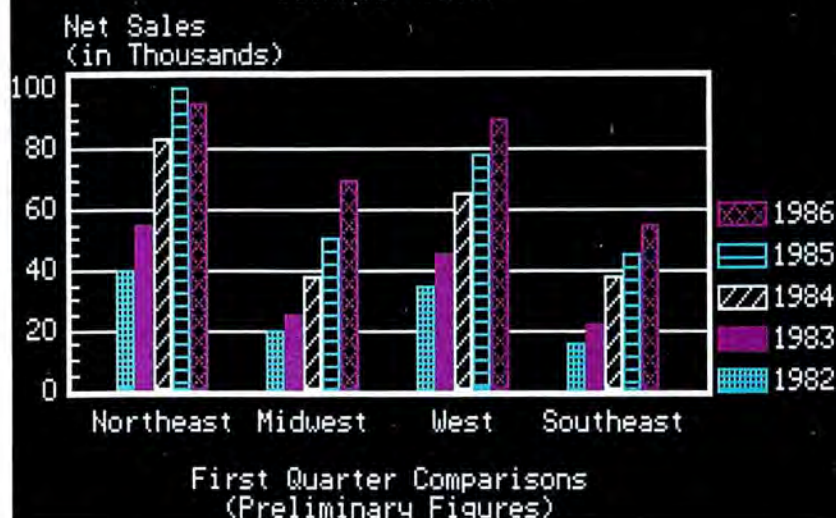
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Screen 3: Graph-in-the-Box creates graphs at the touch of a key. With a few more commands, you can produce images like this for display or printing.

data pairs, a far cry from the capacity of 1-2-3 or SuperCalc 3. The program doesn't offer the clustered and overlapped columns, high-low bars, floating legends, 3-D effects, multiple fonts, and variable type sizes found in more expensive programs. Nor does Graph-in-the-Box enhance graphs created by other programs, à la Graphix Partner.

Since memory-resident programs often conflict with one another in the close confines of RAM, it's heartening that Graph-in-the-Box works uncomplainingly with 1-2-3, SuperCalc 3, dBASE III, pfs:file, Symphony, WordStar, and DisplayWrite 3, as well as with SideKick, Pop-Up DeskSet, and Turbo Lightning. The pro-

gram's "hot key" can also be assigned to another <Alt>- or <Ctrl>-key combination.

Like my pesky jack-in-the-box, Graph-in-the-Box presents its audience with the nettling question: Do I want this thing around all the time? I wouldn't load it every time I turn my computer on, but for quickly analyzing a ream of data or creating compelling graphics, Graph-in-the-Box is an enticing option. —Richard Jantz

Graph-in-the-Box
 New England Software
 Greenwich Office Park 3
 Greenwich, CT 06830
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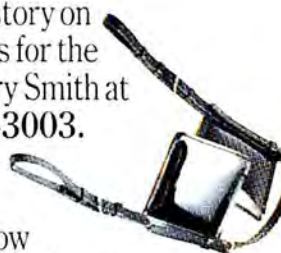
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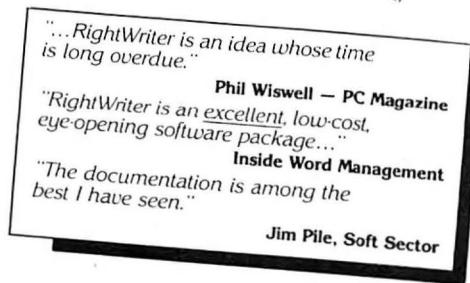
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Scorecast

Another football weekend was coming to a bad end. I aimlessly fumbled through stacks of sports pages and football journals, and asked myself, How could I lose so much after such diligent study? Sure, my methods weren't exactly scientific, but I'd scrutinized each team's record and pertinent statistics to the point of alienating my wife and friends. With my left hand on a considerably lightened wallet, I raised my right and pledged Never Again.

Naturally, it was after this impassioned resolution that I discovered *Scorecast*, a pro football data base and forecasting program from Tradewind Software. Whether you're an erstwhile bettor, a football aficionado, or on a first-name basis with your local bookie, *Sportscast* is worth more than 500 inspired hunches.

Scorecast is a fun, easy, and quick way to analyze thousands of team statistics and project realistic final scores. Once you enter the current year and understand how to select functions, you can put the user manual away and peruse the program's 17 statistical categories by simply following the menus. The necessary weekly stats can be taken from a newspaper and entered directly, or better still, downloaded from Tradewind via GENie, General Electric's on-line information service. The data is free; only GENie's access charge (a

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Screen 4: Stats in a flash:

Scorecast can take the measure
of two teams by any yardstick.

reasonable \$5 per hour in non-prime time) applies. The *San Francisco Chronicle's* massive (and expensive) Computer Sports World data base is also available over Telenet to Scorecast owners for a mere \$19.95 membership fee.

The Scorecast adept can analyze every competitive angle, from offense versus defense and home field advantage to common opponents and performance in past contests. Points per game, points per yard, yards allowed by defense, punts, fumbles, and other vital particulars can be considered as well. Like any able stock analysis program, Scorecast can quickly distill these factors into a variety of bar charts that graphically demonstrate how two teams stack up (see Screen 4). Conferences and divisions can likewise be compared.

Of course, if you're a betting gal or guy, being on the right side of the point spread is what counts. With analytical prowess Scorecast will take the stats on both contenders and predict the winner, the final score, and most important, the point spread. But combining Scorecast's educated windage with the line bookmakers put out is where the money is. I found that my hypothetical bets paid off when the spread predicted by Scorecast agreed with or was better (i.e., larger) than that offered by the pros in Las Vegas. For example, Scorecast predicted that the first 1985 meeting of the Buffalo Bills and the San Diego Chargers (held in Buffalo) would result in a 27-20 score, with the Chargers by 7. Since Scorecast's forecast more than covered the Vegas line (Chargers by 4), I chose the

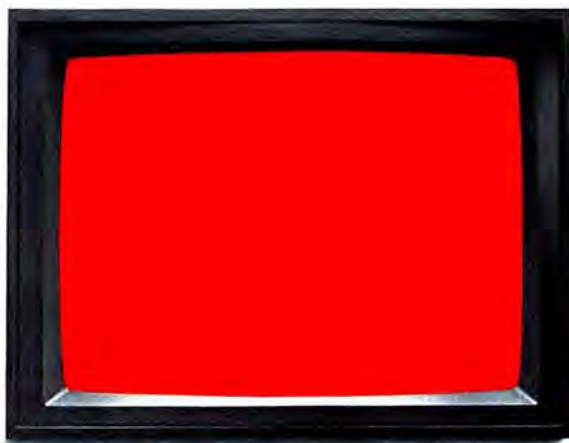
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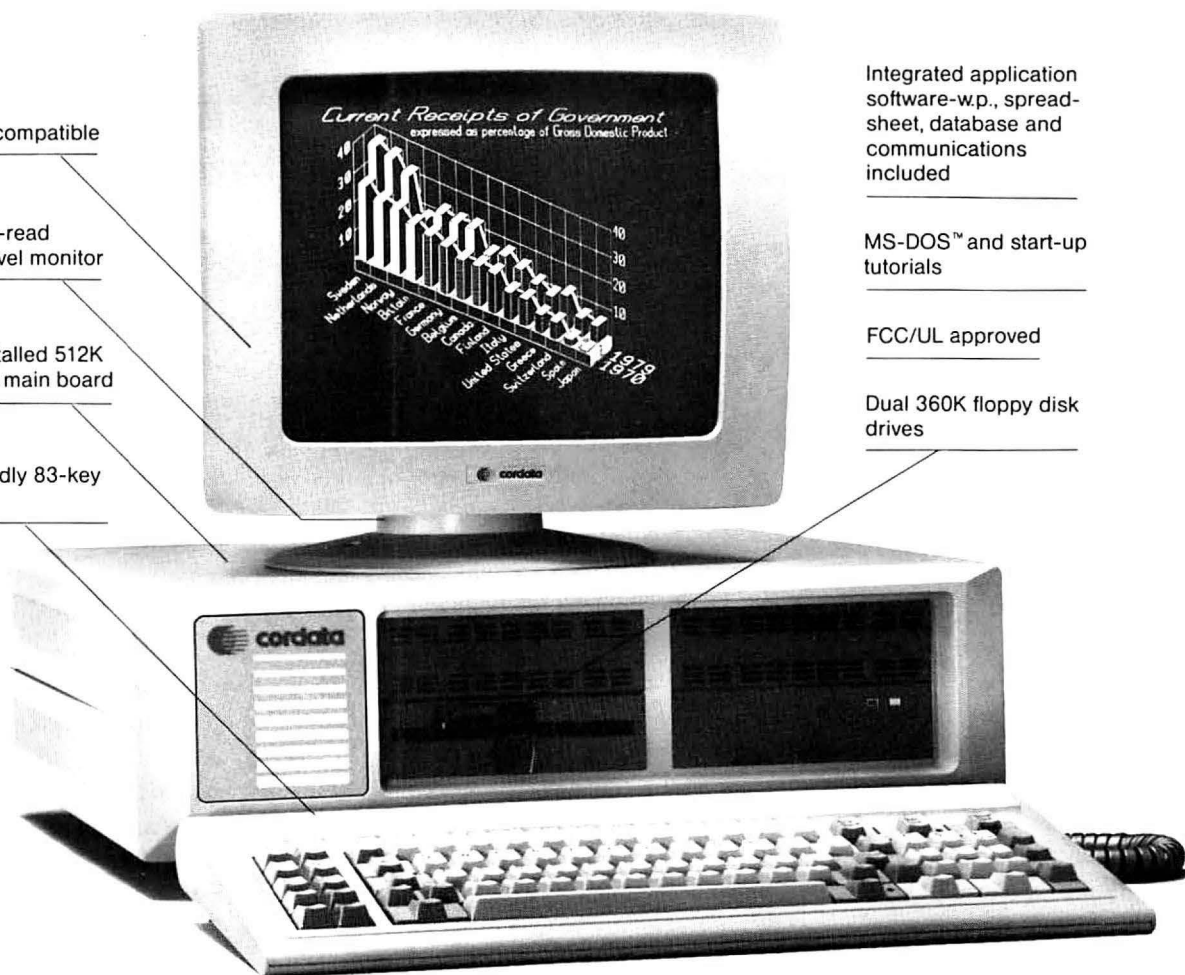
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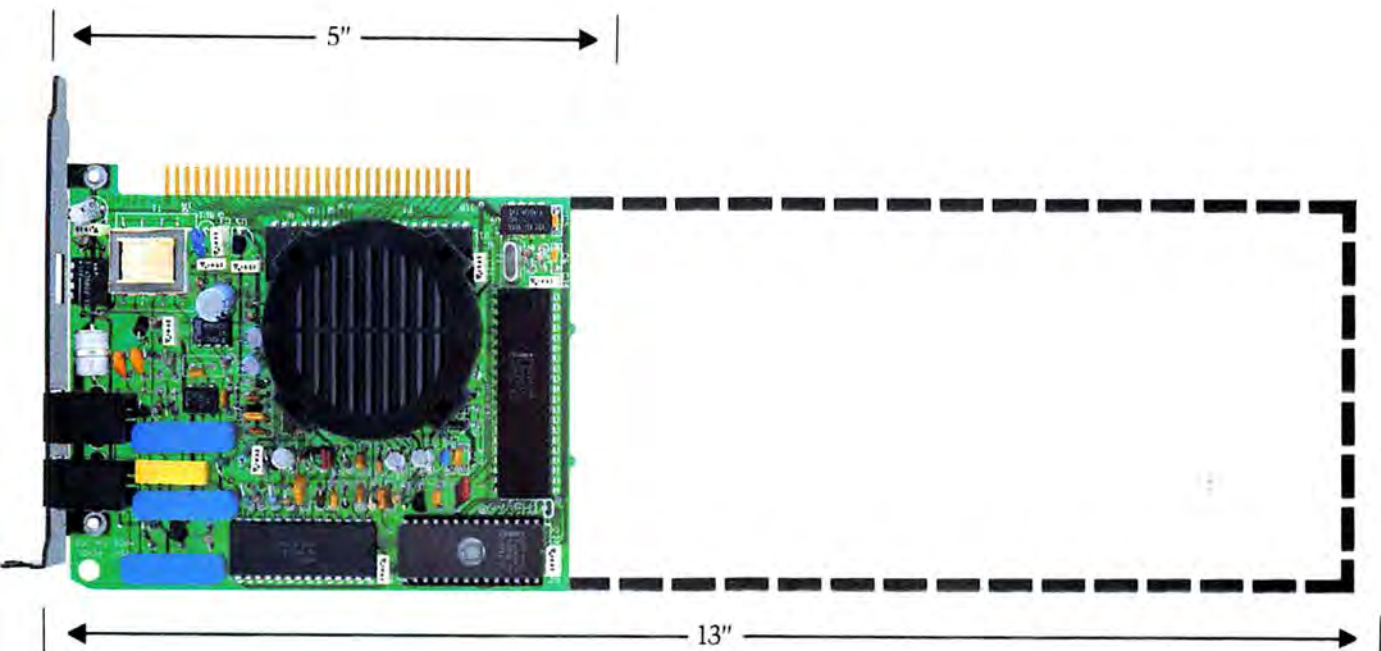
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Bill Crider and David Jenkins are Contributing Editors for *PC World*. Richard Jantz is a freelance writer in Berkeley, California, and principal author of *Creating the Best Impression: All About Business Graphics Software* (Hayden Book Company, Hasbrouck Heights, New Jersey, 1986). Patrick Marshall edits the Opinion Page of the Oakland Tribune. John Faulkner is a freelance writer living in San Francisco. ●

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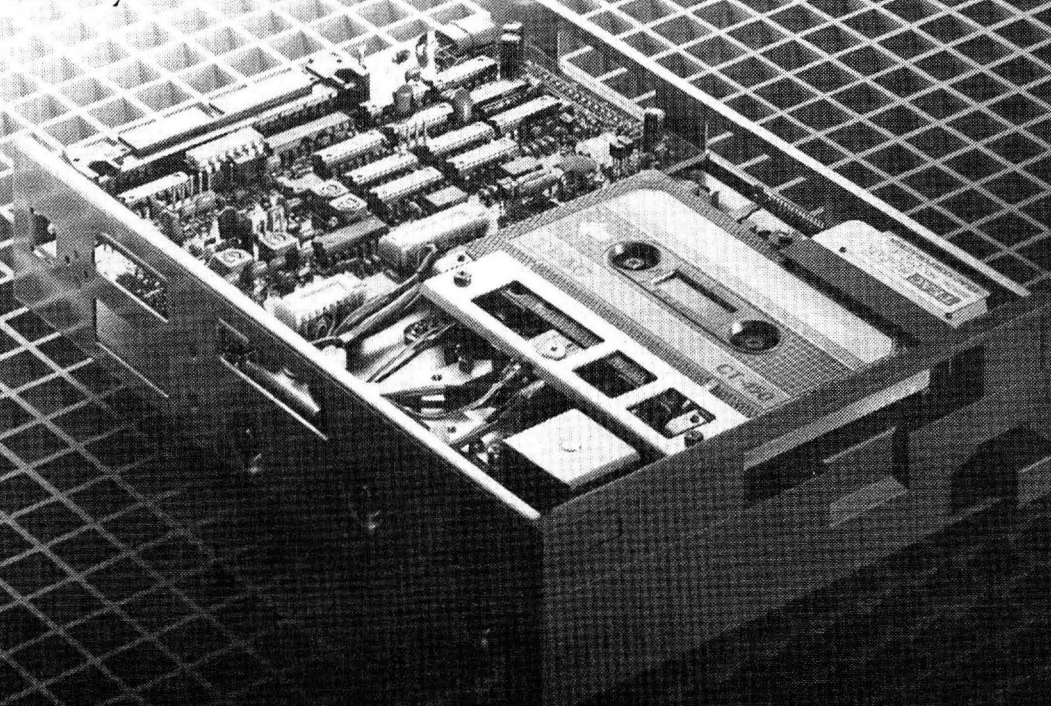
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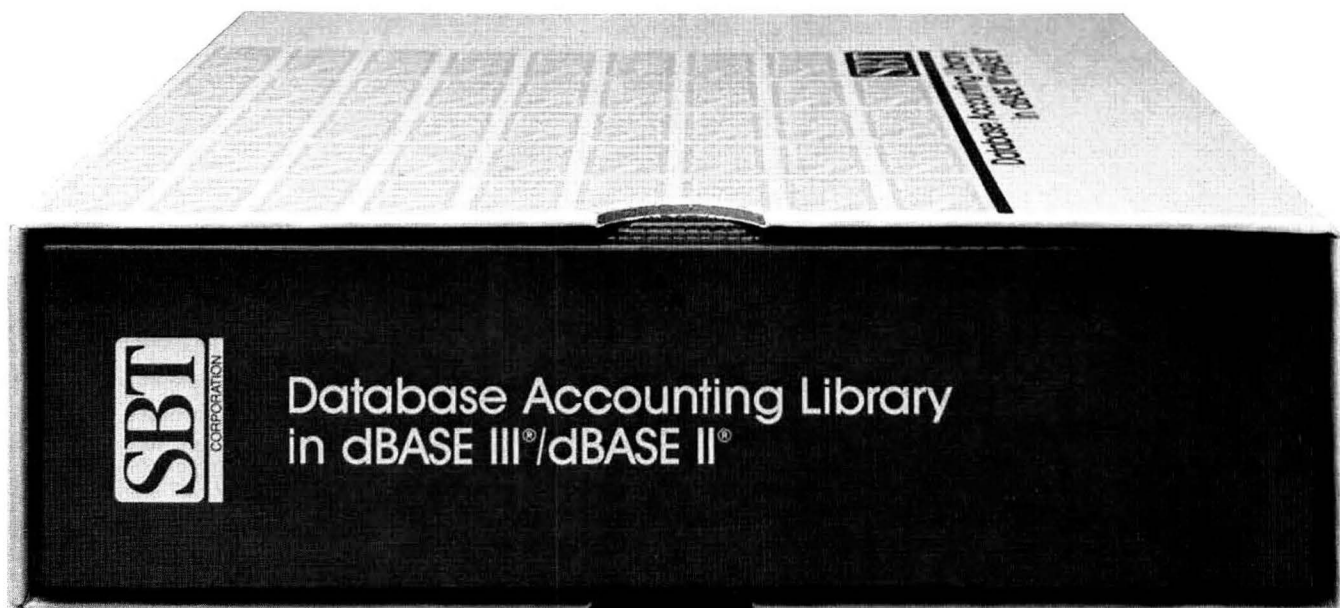
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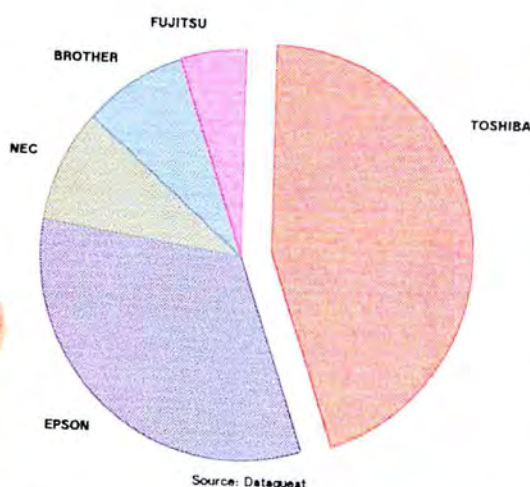
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In Touch with Tomorrow

TOSHIBA

Toshiba America, Inc., Information Systems Division

Circle 732 on reader service card

From the Hardware Shelf

PC World offers first impressions of recent hardware releases

From departmental to kneetop computing, compatibles vie for supremacy. In a lighter vein, a printer and a modem parade their distinctive engineering, while a slotless board provides switchable turbo power.

Edited by Eric Knorr

Sperry PC/IT

Like the big fish that got eaten by a bigger fish, which in turn was devoured by an even larger fish, Univac was swallowed some years ago by Sperry, which fell victim to an unfriendly takeover by Burroughs this spring. Yes, it's tough out there in shark-infested corporate waters, but whatever the repercussions of new management, industry watchers agree that the immediate effect on Sperry's dependable family of computers will be minimal.

Building on the solid reputation of its PC compatible, Sperry's PC/IT is an AT compatible that outdoes IBM's machine in several respects. For storing just about anything, the IT harbors a monster 44.6MB hard disk that zips along with an average access time of 30 milliseconds—close to 25 percent faster than the AT's hard drive.

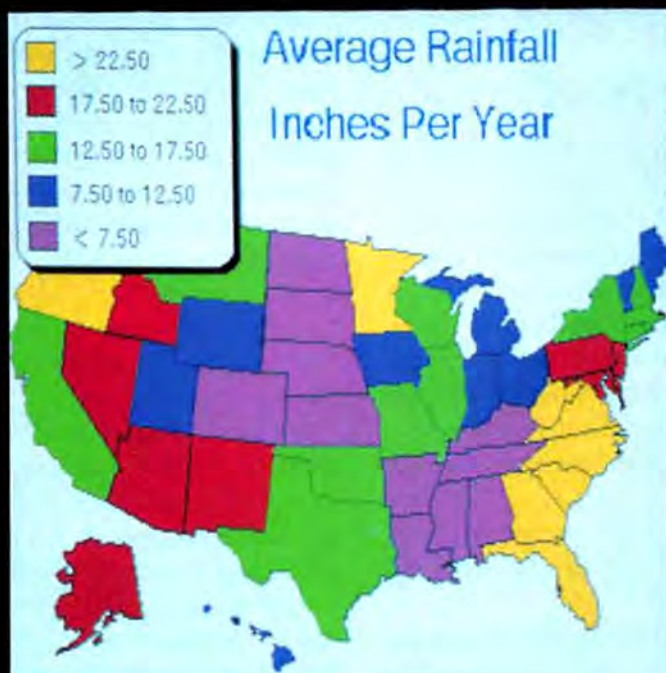
And to adjust your system to speed-sensitive software and hardware, the machine's 80286 CPU has three selectable clock rates: 6MHz, 7.16MHz, and 8MHz. Couple this flexibility with 512K of conventional user memory plus 512K of extended RAM on the motherboard and eight free expansion slots (out of ten), and you have a system powerful enough to spoil the hungriest user.

In fact, with its massive expandability, this \$6834 configuration is clearly a PC-compatible stab at departmental computing. With the addition of two optional boards, the system can support eight terminals, compared to the AT's two. Santa Cruz Operation's version of Xenix is being sold with the machine to support this multiuser configuration. For less extravagant

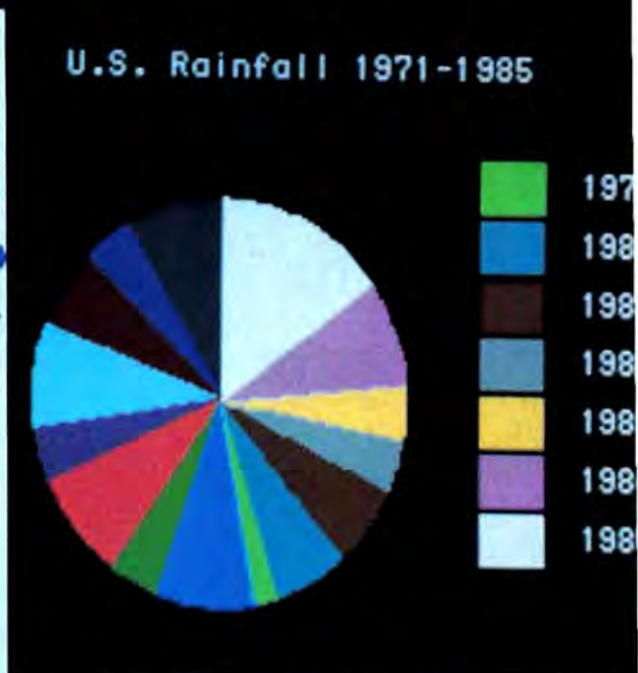
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The Sperry IT's eight free slots and 194W power supply make it a likely host for multiuser environments.





EGA Mode



Plantronics Mode

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Introducing The Paradise AutoSwitch™ EGA Card.

You've decided you want an EGA Video Card because it offers the best quality text with high resolution color graphics. The problem is that older versions of popular software, like Lotus 1A, (and some current versions too) won't work with the EGA standard. That's a problem because in the course of your workday you'll need to use software written for different video modes.

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EGA works with every popular PC video mode. And is smart enough to switch to the right mode every time you change programs. Automatically.

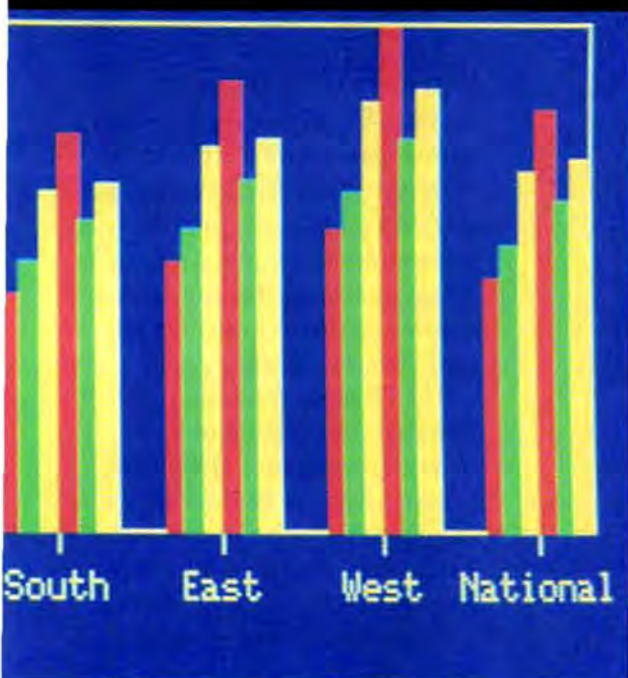
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The Paradise AutoSwitch EGA changes video modes automatically to work with your software. No Mode commands. No special software to run. On RGB monitors it "autoswitches" between EGA, CGA (IBM Color Graphics) and Plantronics modes; on monochrome

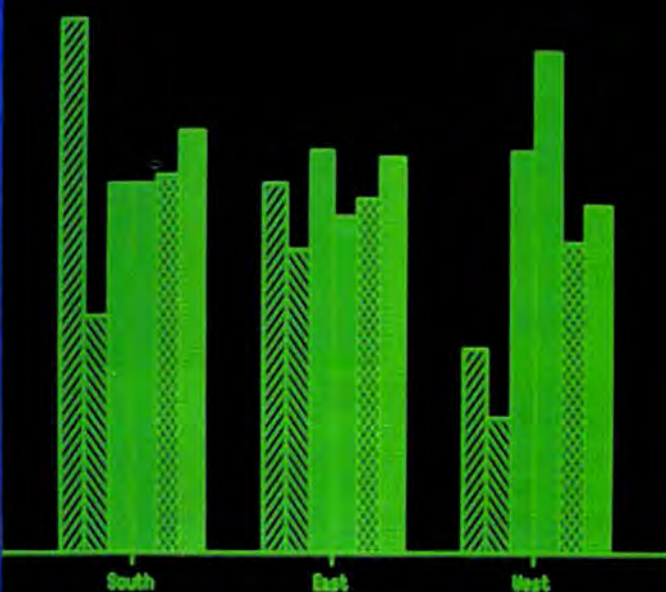
monitors between EGA, MDA (IBM Mono Text) and Hercules modes. The Paradise AutoSwitch EGA runs any PC software you want. Immediately. Automatically. That's something ordinary EGA Cards can't do.

Runs all EGA, CGA, MDA and Hercules Software with true hardware level compatibility.

True hardware compatibility makes the Paradise AutoSwitch EGA Card different from other EGA Cards. No other EGA Card offers the



CGA Mode



Hercules Mode

And That Automatically Runs Every Mode.

6845 CRT controller included in the IBM Monochrome, IBM Color and Hercules Cards. The Paradise-designed PEGA video controller chip has the equivalent of a 6845 inside. That means when the Paradise AutoSwitch EGA runs EGA software, it's an EGA card; when it runs IBM Color Graphics (CGA) software, it's a CGA card; when it runs Hercules software, it's a Hercules card. No "batch files," special software or complicated installation. No incompatibility hassles. EGA with true 6845 hardware compatibility.

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Circle 665 on reader service card



needs, a \$4340 single-user incarnation comes with 512K and no hard disk. Both renditions include a 1.2MB floppy drive, a 12-inch monochrome monitor, a socket for an 80287 coprocessor, and an expansion board containing one serial and two parallel ports.

The IT accommodates a high-powered combination of four mass storage devices. Two half-height drives can be externally mounted, and you can secure two hard disks internally for a whopping 90.4MB total. A 60MB internal tape backup unit is available as an option. The power supply weighs in at a hulking 194 watts, enough to support the maximum configuration.

One of the IT's most striking aspects is its size. At 22½ by 16 by 7 inches, the IT would be an imposing presence even on Mr. Big's desk. Sperry makes the machine's girth less onerous by offering an optional floor stand, which enables you to turn the unit on its side and banish it to under the desk.

Sperry offers a choice of three Key Tronic keyboard layouts: a PC or AT configuration or an enhanced AT design that lines the function keys along the top of the board. Personally, I found all three keyboards flat and unresponsive to the touch. I substituted a PC AT keyboard, which has functioned flawlessly.

Instead of settling for the standard monochrome display, you

(continues)

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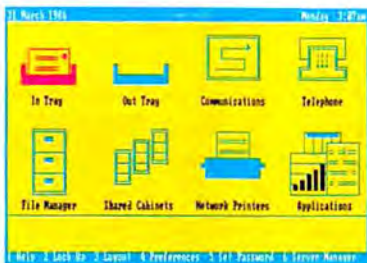
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Circle 672 on reader service card

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No matter what local area network hardware you choose—your next choice should be Tapestry network operating software from Torus Systems. Here are 6 reasons why.

1 IBM chose Tapestry, for its overseas market, and it quickly became the hottest LAN system in Europe.



This is the friendly screen that caught Big Blue's eye.

2 It's the world's easiest-to-use networking software—much simpler than Novell, 3Com, or IBM because Tapestry is managed with icons. To use it, you just point to graphic symbols: the "in-tray" to get mail, the "cabinet" to access files, and so on.

You even use icons to configure the system, so almost anyone can set up a Tapestry network—and keep it running smoothly.

3 Tapestry is the most complete LAN software money can buy.

The basic system gives you:

- **Advanced electronic mail**
Compose memos with the Torus text editor. Send them to any person or group on the network, just by pointing to names. Track the mail you've sent. Get messages instantly.
- **Cost-effective sharing of hard disks, printers and modems**

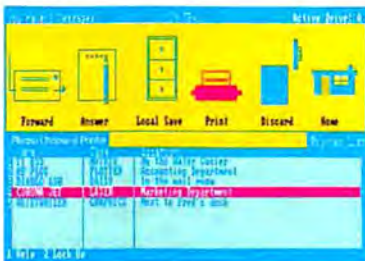
You can have up to 100 Tapestry workstation/servers and access any one of them by touching the right icon. Since all Tapestry servers are undedicated, each station is free for business as usual. You don't have to invest in specialized hardware, or sacrifice your valuable PCs.

• **Advanced communications capabilities**

Need information from the company mainframe or an outside service? Just point to the desired Service icon. Torus offers a family of network gateways* that automatically make the connection and speed your information through.

• **And there's more!**

Tapestry also provides central storage of all your applications so they too can be accessed with icons. Automatic file locking so you can safely run single-user applications not originally designed for networks. File Manager icons that let you manipulate files without using DOS commands. And a Telephone Manager that places your calls and maintains a personal electronic rolodex.



What good is a network if your people don't know how to use it? Tapestry's screens are so easy to understand, anyone can net great results without special skills or training.

4 Tapestry supports all the standards, like IBM Token-Ring, PC Network and 3Com hardware. Like PC-DOS 3.1 and NETBIOS. So you can choose the LAN hardware that's best for you, and you won't have to worry if your software will run.**

5 Tapestry is proven and reliable. Thousands of Tapestry stations have been installed in both large and small companies in the U.S. and around the world. Customers include: Proctor & Gamble, EDS, the White House, the IRS, Prime Computer, TRW, NBC News, Shell Oil, Exxon and Citicorp.

6 With this coupon you get a **FREE Network Manager**

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Notes: *ASYNC is standard, while VT100, 3270 SNA, and Remote Access are purchased separately. **Tested applications include: dBase III Plus, MultiMate Advantage, Open Systems Accounting, Displaywrite 3, WordPerfect, MS Word, Lotus 1-2-3, AutoCAD.

†6 Station Pack—\$1495, 24 Station Pack—\$3995.

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Circle 498 on reader service card

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Circle 614 on reader service card

can further personalize your IT by choosing a CGA-compatible monitor and video board or an enhanced resolution, EGA-compatible adapter and display. Although the monitors add pleasing tilt-and-swivel ergonomics, the displays themselves appear virtually identical to their IBM counterparts. Note, however, that going the EGA route jacks up the system's price by about \$850.

The IT passed its compatibility tests with flying colors, IBM AT *Diagnostics* included. *SuperKey* and *SideKick* beeped their sound prompts at the appropriate intervals, and a full battery of software worked flawlessly, including *Jet*, *WordStar*, *dBASE II*, and *Framework*, as well as DOS 2.00, 3.00, and 3.10. The one annoyance was the slight screen flicker any keystroke produced with 1-2-3 release 1A. I switched keyboards, but the problem persisted.

In the end, the stickiest point for the IT could be its pricing. The unit is manufactured by Mitsubishi, the same Japanese conglomerate that makes a nearly identical machine, the MH, for Leading Edge. Aside from the MH's smaller 20MB hard disk, the only apparent difference between the machines is their pricing—the Leading Edge entry asks only \$3995 for a unit with 1MB of memory, a 20MB hard disk, an AT-compatible keyboard, and a monochrome monitor and adapter.

Despite the Burroughs takeover, Sperry has far more marketing muscle and a better reputation than Leading Edge, which is still involved in a protracted legal battle with Mitsubishi. Competition

aside, the Sperry IT's multiuser emphasis may be the hook it needs to mix it up in the AT-compatibles competition. With its massive expandability and power, the IT is built to throw its weight around.

—Bill Taborchek

Sperry PC/IT
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215/542-4213
List price: 512K RAM, 1.2MB floppy disk drive, and monochrome monitor and adapter \$4340; 1MB RAM, 44.6MB hard disk, 1.2MB floppy disk drive, and monochrome monitor and adapter \$6834; CGA-compatible monitor and adapter \$680; EGA-compatible monitor and adapter \$849

Toshiba T1100

Some analysts predict that within ten years laptops will be the only remaining single-user PCs, permanently freeing working stiffs from desk-bound travail. If the current glut is any indication, the change-over has already begun: So far this year, major manufacturers have released more new laptops than desktop PCs. Toshiba's contribution to this booming market is the T1100 Portable Personal Computer, a \$2000 9-pound PC compatible with a footprint about a foot square.

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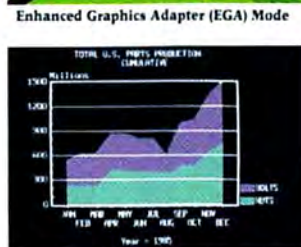
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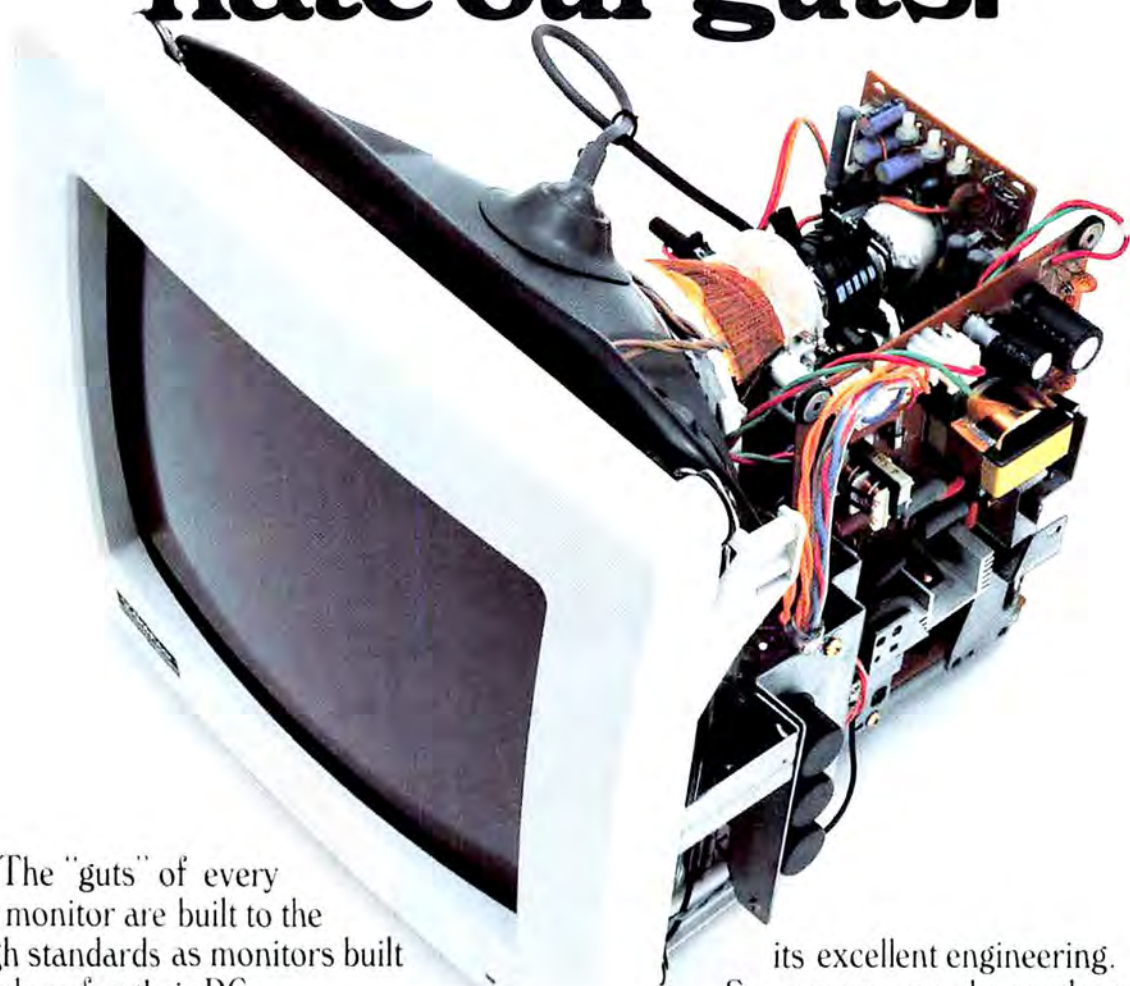
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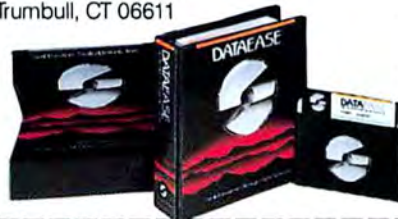
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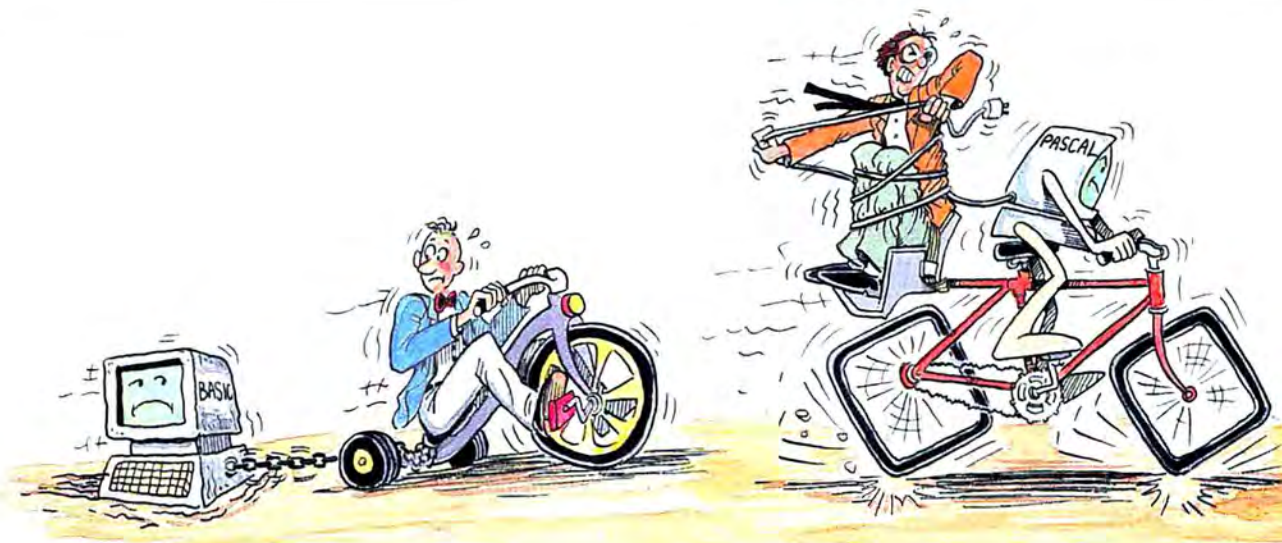
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The T1100's low-profile design is reminiscent of an Apple IIc chassis. Offering a 9-by-4-inch, 80-column-by-25-line LCD display that's quite readable, the machine is in the same ballpark with the PC Convertible. A bit lighter than its counterparts, the T1100 is powered by a rechargeable internal battery that runs for about 8 hours. A single 720K 3½-inch disk drive is complemented by external 3½-inch and 5¼-inch drives, which are sold separately.

The T1100 has no expansion slots; its factory-installed 512K of CMOS RAM is all the memory you get. A 4.77MHz 80C88 microprocessor, the most common CPU for laptops, is the heart of the



Toshiba's T1100 laptop is lighter and smaller than most of its counterparts, but the LCD display earns only a fair-to-middling rating.



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Best of all, the APL*PLUS System interfaces well with software packages you're already using—like databases, spreadsheets, and graphics packages. The APL*PLUS System also makes it easy to link those packages that aren't

machine. A parallel port and a port for an external drive, plus one for an RGB and one for a composite monitor, are built into the rear of the chassis.

LCD (liquid crystal display) technology is the weak link in most laptops, and the T1100 is no exception. Although the screen's clarity bests that of the PC Convertible, the new Data General One's LCD easily outstrips the T1100's display—especially in poor lighting conditions. The aspect ratio for graphics is altered by the rectangular screen, but the 640-by-200-pixel resolution produces a

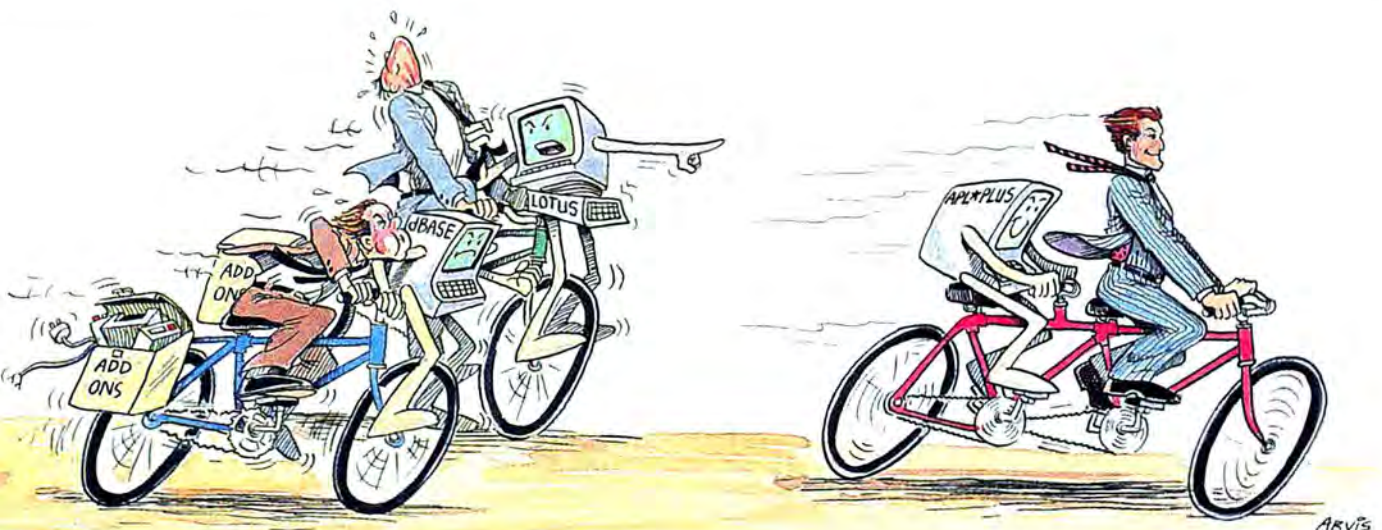
reasonably sharp image. To adjust for different lighting angles, the display tilts back a full 180 degrees.

The keyboard has a strikingly symmetrical layout that offers enlarged <Enter>, <Shift>, <Backspace>, and <CapsLock> keys. The touch is nice and light, but the keys may feel a bit wobbly to some. The function keys sit in two parallel rows on the left above the letter keys, and the adjacent numeric keypad has a similar layout. This awkward space-saving design is to be expected in a laptop, but Toshiba's decision to group the numeric keys by odd and even numbers is a strange touch.

Although a low-battery light signals the approach of zero power, the machine lacks a way to check actual battery level, nor does it display a warning to save your work. An AC adapter recharges the battery slightly faster than it runs down—a 4-hour charge, for example, lasts for about 4½ hours. The machine charges only when it's turned off, however, which may cramp your working style.

Toshiba's little wonder demonstrated its PC compatibility by running *SideKick*, *WordStar*, *SuperCalc 3*, *1-2-3*, *EasyWriter*,

(continues)



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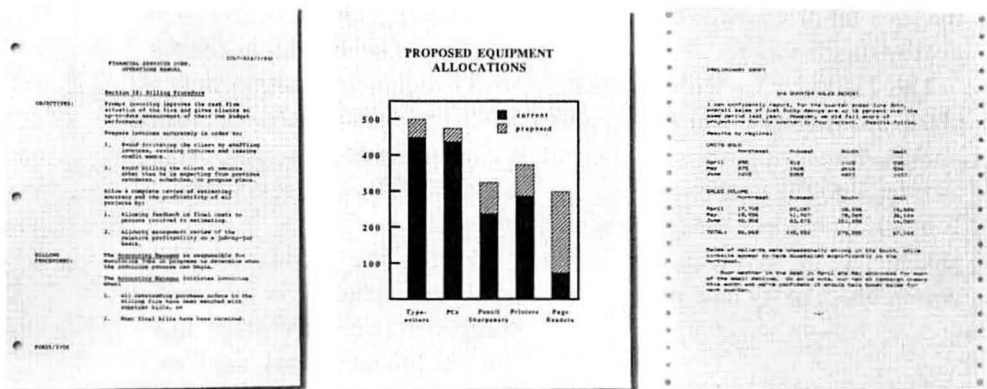
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and *NFL Challenge*. For accessing PC programs or data not available on 3½-inch disks, the optional PC Floppy Link package provides a PC expansion board and cable that enables the T1100 to take over one of your PC's floppy drives. The adjacent connector accommodates the 5¼-inch external disk drive, which can be configured as the start-up drive with the flip of a nearby toggle switch.

The T1100 comes with a stylish black carrying case that has handy pockets for storing disks, the AC adapter, and the user manual. When fully loaded, the case has a tendency to nudge the power switch on—a nasty flaw that

makes you wonder why you keep forgetting to turn off the machine.

Several of the T1100's limitations have reportedly been remedied in the new Plus version. According to Toshiba, the T1100 Plus comes with two 3½-inch disk drives, an 80C86 running at 7.16MHz, and 640K RAM. The company has also added an expansion slot for either a PC-compatible I/O bus or an add-on chassis with five more expansion slots. A \$249 expansion board containing a clock/calendar, a serial port, and a 300/1200-bps modem is also offered.

By itself, the T1100 is a middle-of-the-road challenger in a highly competitive arena. With its substantial enhancements, the Plus

will likely be a front-runner, depending on how aggressively Toshiba prices it. Habitual upgrades are the norm, but nowhere are they more frequent than in the laptop market. —Tony Brown

T1100

Toshiba America, Inc.
Information Systems Division
2441 Michelle Dr.
Tustin, CA 92680
714/730-5000

List price: 512K RAM, one 3½-inch 720K disk drive \$1999, 5¼-inch external floppy disk drive \$529, 3½-inch external drive \$499, PC Floppy Link \$99

(continues)

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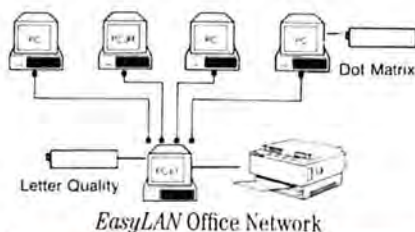
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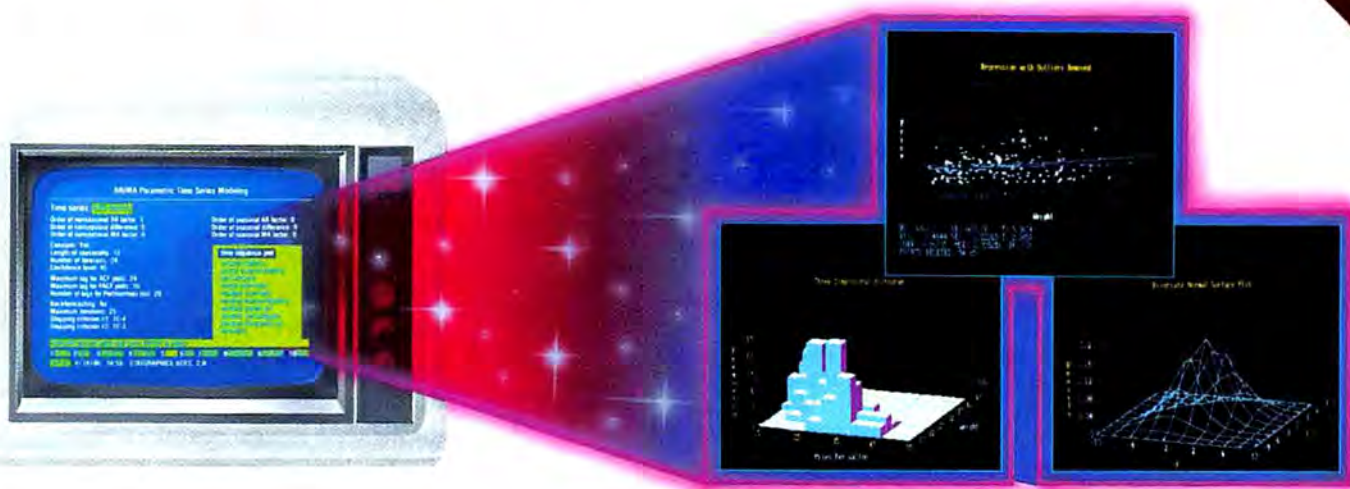
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From the Hardware Shelf



Mannesmann Tally MT-290

Conventional wisdom has it that German engineering is synonymous with quality. For massive German conglomerate Mannesmann Tally, this reputation extends from the company's line of dot matrix printers all the way to the world's largest seamless pipe, used in the Soviet trans-Siberian gas pipeline. If Mannesmann Tally's new MT-290 printer is any indication, the company name should command the same respect among PC users that it won from pipelayers in the Urals.

A programmable, thoughtfully designed 9-pin dot matrix printer, the MT-290 offers both a fleet 200-characters-per-second (cps) draft mode and a respectable 50-cps near letter quality (NLQ) mode. The MT-290 accepts standard IBM and Epson command codes, comes with nine built-in fonts, and prints graphics with up to 240 by 144 dots per inch. Options include a variety of font cartridges, plus automatic front-feed and dual-tray sheet feeders.

A 9-pin printhead may seem a bit eccentric given the proliferation of 24-pin printers, but thanks to Mannesmann Tally's proprietary technology, the MT-290's NLQ output is on a par with that produced by similarly priced 24-pin NLQ machines from Epson and Toshiba. Mannesmann Tally also claims that the MT-290's 9-pin head is more durable than the 24-pin variety.

(continues)

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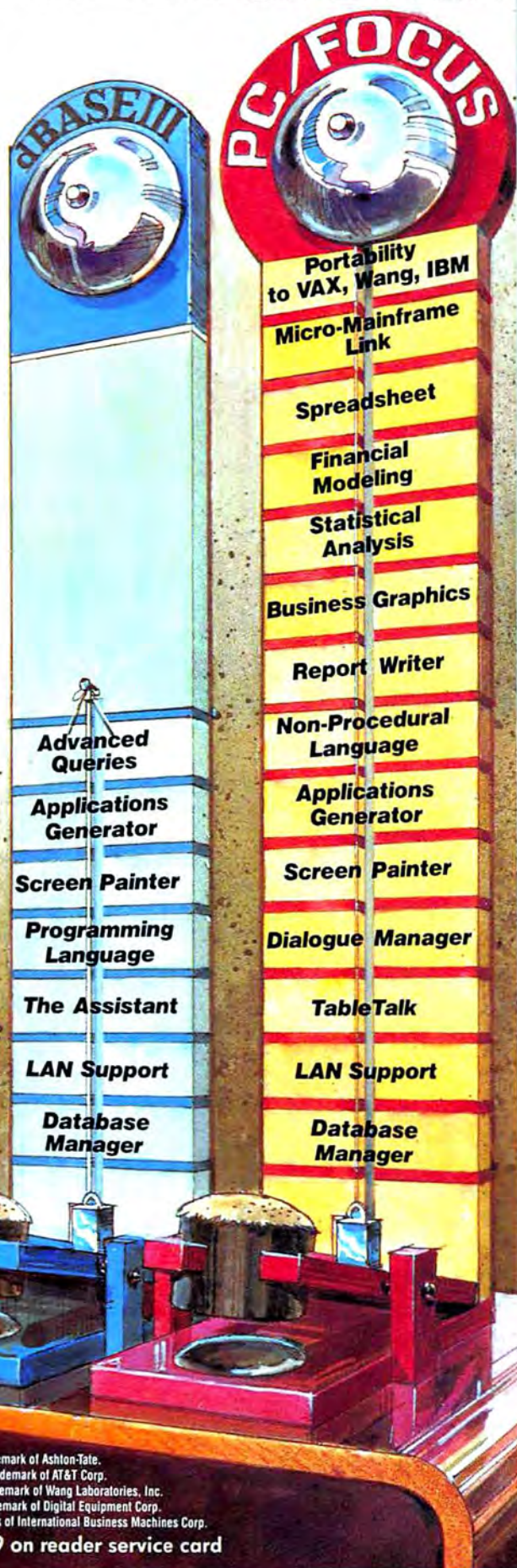
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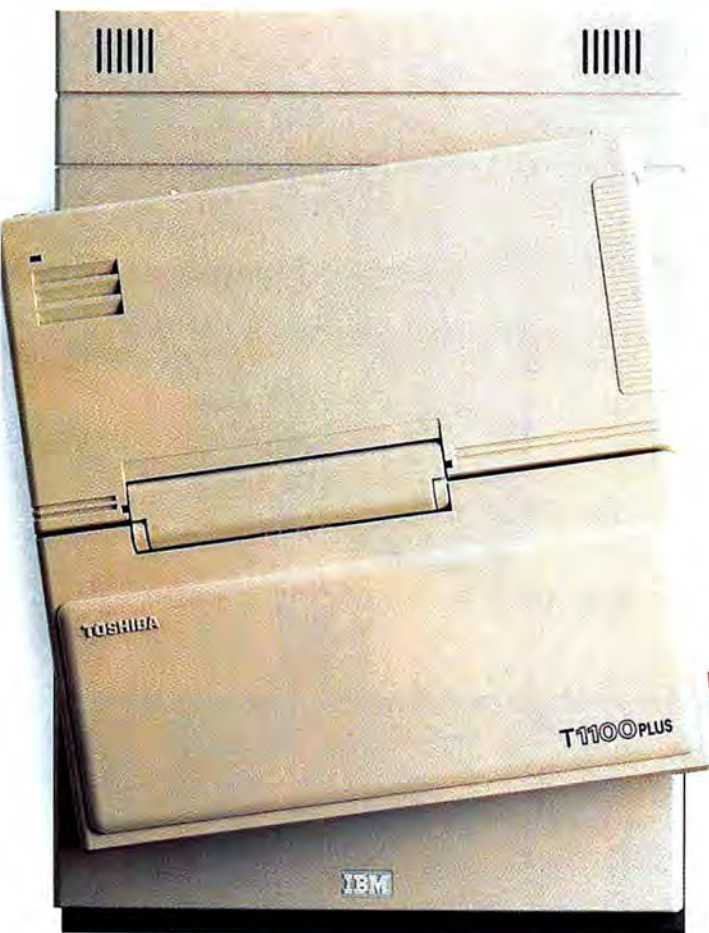
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But our portable PC is not only smaller than the IBM, it's lighter. And more powerful. Our 80C86 microprocessor lets you zip through work at up to twice the speed. And our maximum memory capacity is 640K of RAM. Theirs is only 512K.

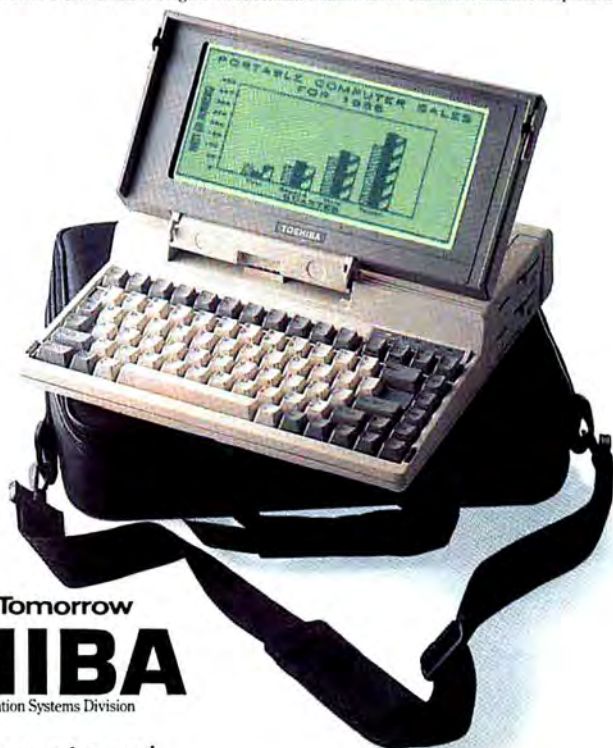
The T1100 PLUS has other things the IBM doesn't. Like serial, parallel and CRT ports that are built-in standards. Not add-on extras. And a high resolution LCD display screen that tilts to many convenient viewing angles. Not just a few.

Of course, the Toshiba T1100 PLUS does have a few things in common with the IBM portable. Like complete IBM compatibility. And two built-in 720K 3.5" disk drives. It's just that it has these things in a smaller, lighter, faster, more portable, more affordable package.

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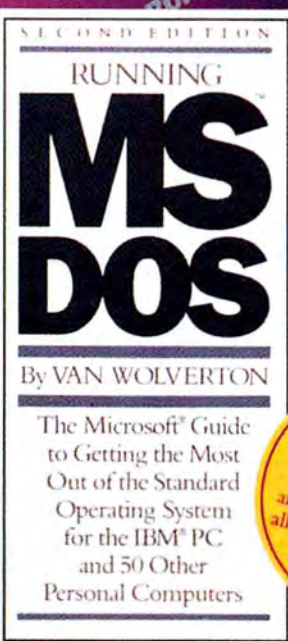


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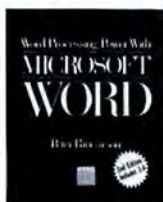


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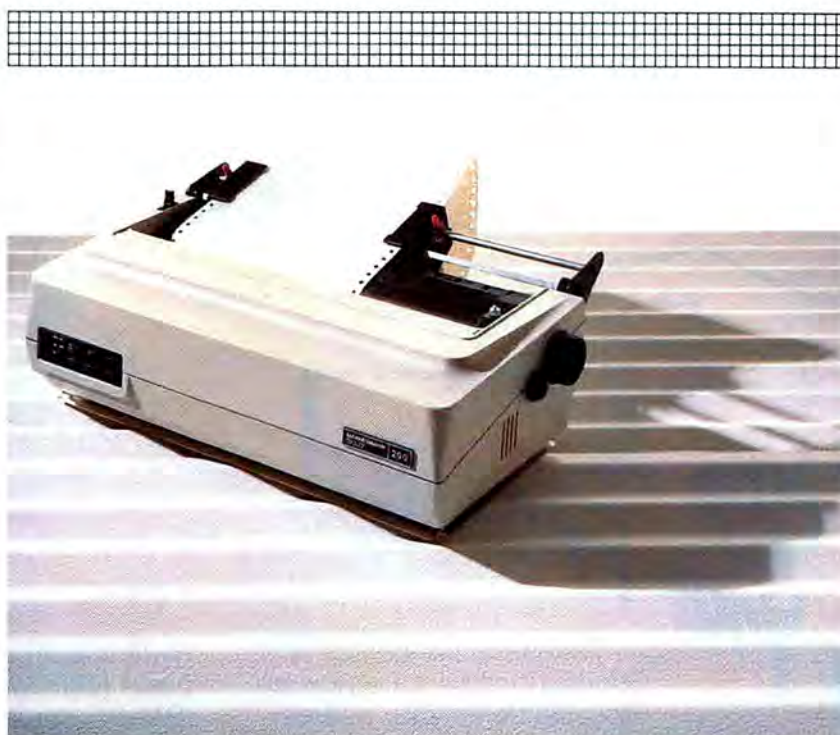


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A rugged, hefty machine, Mannesmann Tally's MT-290 offers a 200-cps draft mode and 50-cps NLQ output.

The MT-290's solid construction, quiet operation, and relatively high price make comparisons with certain expensive German automobiles difficult to resist. Besides looking sleek, the MT-290 is just a tad over 12 inches deep—somewhat smaller than comparable printers. It also has a certain reassuring heft: The stripped-down version weighs a stout 23 pounds.

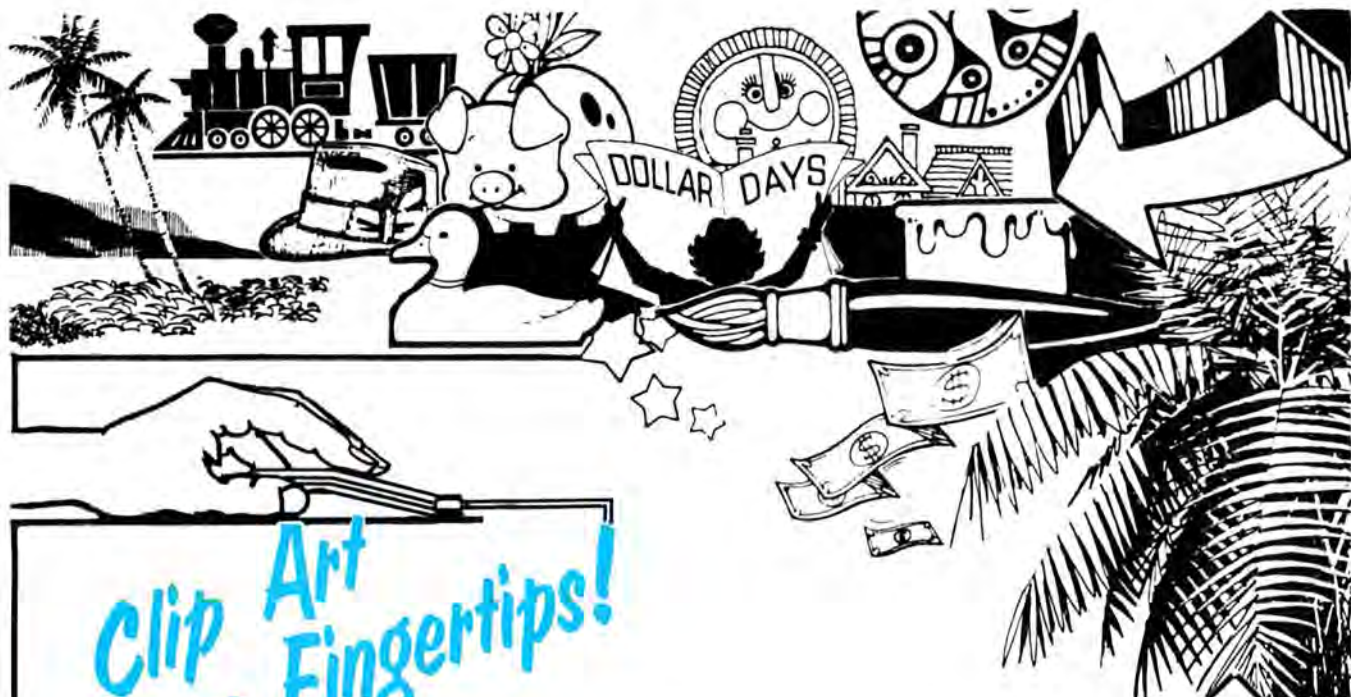
But in the final analysis, the MT-290's most appealing feature is its programmable configuration firmware, accessible through six buttons on the printer's face. Supplanting annoying DIP switches, these buttons allow you to select the printer's built-in fonts, form and line lengths, horizontal and vertical spacing, graphics features, and foreign language character

sets. When you take the printer off line, pressing and holding the No button produces a handy listing that shows all current configuration settings.

With a little bit of work, you'll soon find the appropriate settings for large spreadsheets, proposals to the board, and missives to those pen pals in Sweden. The optional font cartridges (\$49 each) are easily accessible, plugging in just under the cover near the print ribbon. The font selection includes Gothic, Italic, Modern, OCR, Teletype, and an interesting pseudocursive called Helen.

The optional automatic front feed screws onto the printer's top and can be pushed out of the way

(continues)



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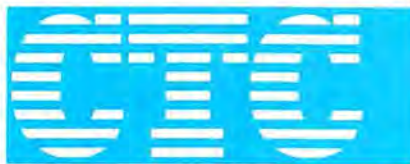
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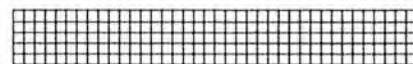


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board is out of the question. Before you settle for poky processing, take a gander at MicroSpeed's Fast88, a \$149 PC accelerator that requires no expansion slot and provides a few bonus features to boot.

The Fast88's design departs significantly from the usual 8086- and 80286-based accelerator boards. For starters, MicroSpeed chose a switchable 8088-2 CPU (or optional NEC V20) that can run at the standard 8088's 4.77MHz or at 6.1MHz, 6.7MHz, or 7.4MHz. In addition to replacing the CPU, you need to find the 8284A clock chip on your PC's motherboard, pop it out, and insert the plug and ribbon cable that link your system to the Fast88 circuit board. To avoid taking a slot, this tiny board comes with a universal mounting bracket that screws onto the inside rear panel of PCs, XTs, and most of the other compatibles.

The Fast88 relies on a mouselike external device that connects to the internal board with a standard telephone cord. This little box has two switches: one for the clock rate and one for resetting your system. The clock switch has one position dedicated to the 4.77MHz setting; the other position activates one of the three accelerated clock rates, depending on where you position a jumper on the Fast88 circuit board.

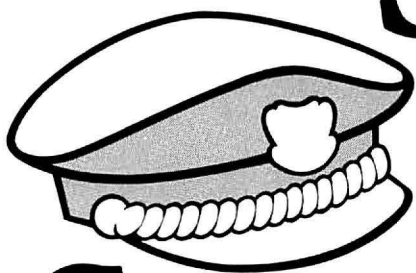
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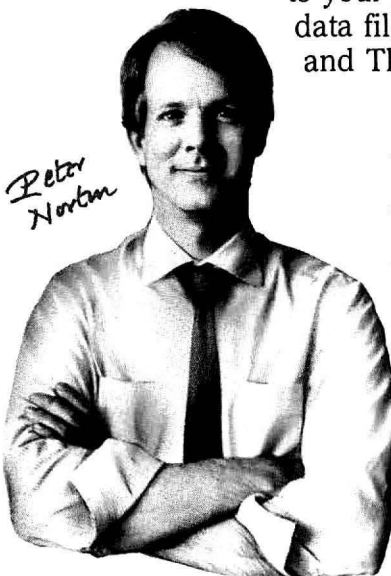
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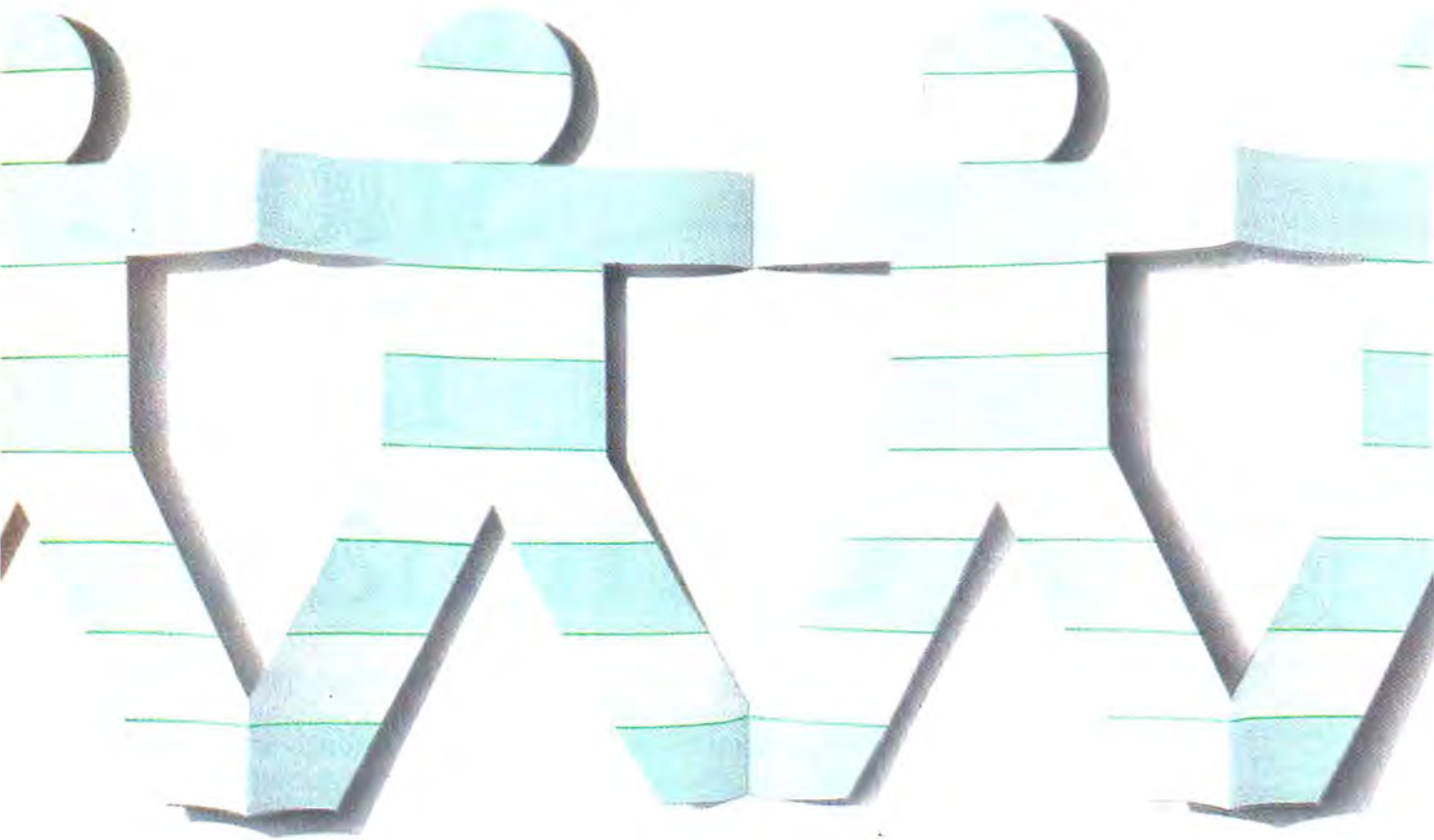
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futile, pressing the reset button re-starts your system without the tedium of a memory check. Those who are nervous about hitting the reset button accidentally can disable it by removing a jumper on the board.

For some users, installing Fast88 may be tough going. The documentation shows where the 8284A is located in PCs and XTs, but you may have to go hunting to install Fast88 in a clone. To complicate matters, some clone makers solder this chip in place. Although the manual describes how to remove a soldered clock chip and replace it with the supplied socket, such board-level work is better left to a technician.

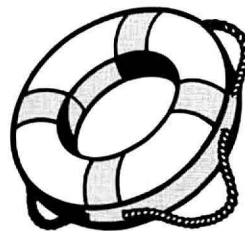
Fast88 may not be as elegant as an expansion board accelerator, but the overall result is quite effective. The variety of speed settings is ideal for sensitive software, and the price is far below most of Fast88's slot-bound counterparts. Even though the Fast88 won't win the speed sweepstakes, MicroSpeed has discovered a unique way to jockey its product into PCs without upsetting a stableful of expansion boards. —Robert Nusbaum

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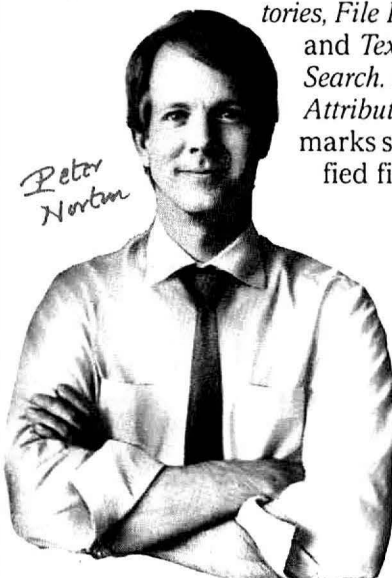
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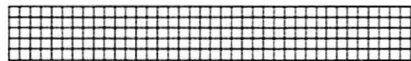
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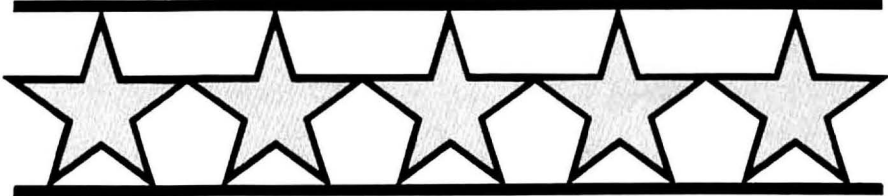
Reliable no-frills hardware—the salt of the earth. Best known for its space-saving Half Card modem, Ven-Tel regularly turns out well-engineered communications products that capitalize on proven technology. With the competitively priced 2400 Plus, Ven-Tel now has a hardy 2400-bps stand-alone entry to round out its sensible line.

The 2400 Plus obediently responds to the standard Hayes AT command set and offers the same array of line-detection and data-transfer indicator lights as the Hayes Smartmodem 2400. Closer inspection, however, reveals two deviations from the norm: the lack of a speaker volume control and the presence of a mysterious black button next to the indicator lights. As it turns out, pushing this button either kills a communications session in progress or begins one by dialing a phone number that you've recorded with Ven-Tel's proprietary addition to the AT command set.

Unlike many other stand-alone modems, the 2400 Plus provides quick access to its internal DIP switches. Instead of being screwed on, the wraparound steel case snaps cleanly onto the base and pops off without violent maneuvers. This accessibility, combined with explicit documentation, makes the 2400 Plus easier to reconfigure than many of its competitors. However, you may never have to open its hood—I tried

(continues)

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Circle 619 on reader service card

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DATA STORAGE AND RETRIEVAL: Why have a file of disks and a file of paper? Eliminate one with Softstrip data strips. File the data strip with the document. Better still, print the strip right on the document. Then put it in a file or binder.

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DATA HANDLING

SEPTEMBER CASE HISTORY



Nick Turner, editor of *Dr. Dobbs Journal*, has been making his own data strips to back up and store articles, listings and other important materials. Turner notes that the STRIPPER™ software "creates compact, machine readable archives that are immune to dust, dirt and magnetic fields". Strips that Turner prints on his printer are filed in a loose leaf binder, along with the appropriate article. This permits him to pull the strip from the binder and read it back into his computer quickly using the reader. The method saves

disk file space, since once an article has been printed, maintaining it on a disk for revision isn't required.

The STRIPPER system has solved another problem for the busy editor, inter-machine file compatibility. Using the Softstrip® System, Turner can transfer files between his PC-clone and his Macintosh "with a minimum of fuss".

"It's about time we had a way to store files on paper in machine readable form," Turner comments. Mr. Turner's comments are his own and do not reflect the opinion of the publication.

APPLICATION NOTES

On the other side of this ad we said you can move data between different programs — on paper.

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Circle 293 on reader service card

From the Hardware Shelf

Microsoft Access, PC-Talk III, SmartCom II, and SoftKlone's Mirror without having to touch a DIP switch.

The modem is driven by the same Rockwell chipset that drives the Hayes Smartmodem 2400 and the Novation Professional 2400. All my calls and data transfers to CompuServe, The Source, and other PCs—including all automatic log-on procedures—went off without a hitch. Should problems arise, the unit also includes proprietary commands to perform a battery of self-diagnostic tests.

Although the 2400 Plus has most of the features expected of a thoroughly modern modem, it lacks exceptional extras. If you have only a single phone line, for example, you may lament the absence of easy voice/data switching. AT commands will do the job, but a push-button option like the one offered by the Novation Professional 2400 would be more practical.

The 2400 Plus detects conventional phone line signals, including carrier, busy signal, dial tone, and ring. Because the modem's speaker volume is low (and unalterable), I found myself yearning for a voice detection facility as I strained to determine whether the operator was saying that the number I'd dialed had been disconnected or changed. Thankfully, the modem does detect a second dial tone—a must when using alternate carriers such as MCI or Sprint that force you to dial ump-teen numbers in two stages.

Like several of its 2400-bps peers, the 2400 Plus provides a choice of three synchronous communications modes that should

satisfy corporate users looking for a link to company mainframes. And because the modem uses the Rockwell chipset, it should provide average (or better) performance over dial-up phone lines. Nevertheless, considering the idiosyncrasies of certain post-divestiture lines, the 2400 Plus would be better off with an error-correction protocol—such as MNP or X.PC—in ROM.

The 2400 Plus's ease of use, consistent performance, and full Hayes compatibility add up to a pragmatic approach to high-speed data transfer. Although it shies away from true innovation, the 2400 Plus is a competitively priced, durable unit with every right to a piece of desktop turf.
—Art Wilcox

2400 Plus
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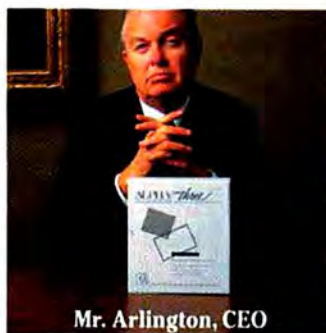
Bill Taborchek is a New York-based consultant and writer. Tony Brown is a freelance writer based in San Francisco. Paul Meyers is an independent television producer who specializes in science and technology. Robert Nusbaum is a freelance writer and programmer in Grand Rapids, Michigan. Art Wilcox is a Contributing Editor for PC World. ●



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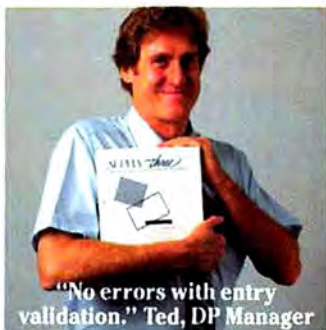
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Cindy
Mr. Arlington's secretary



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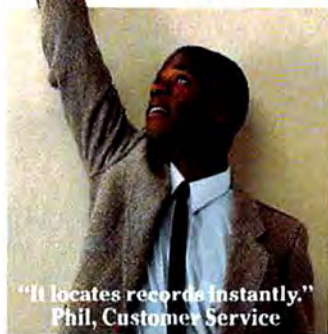
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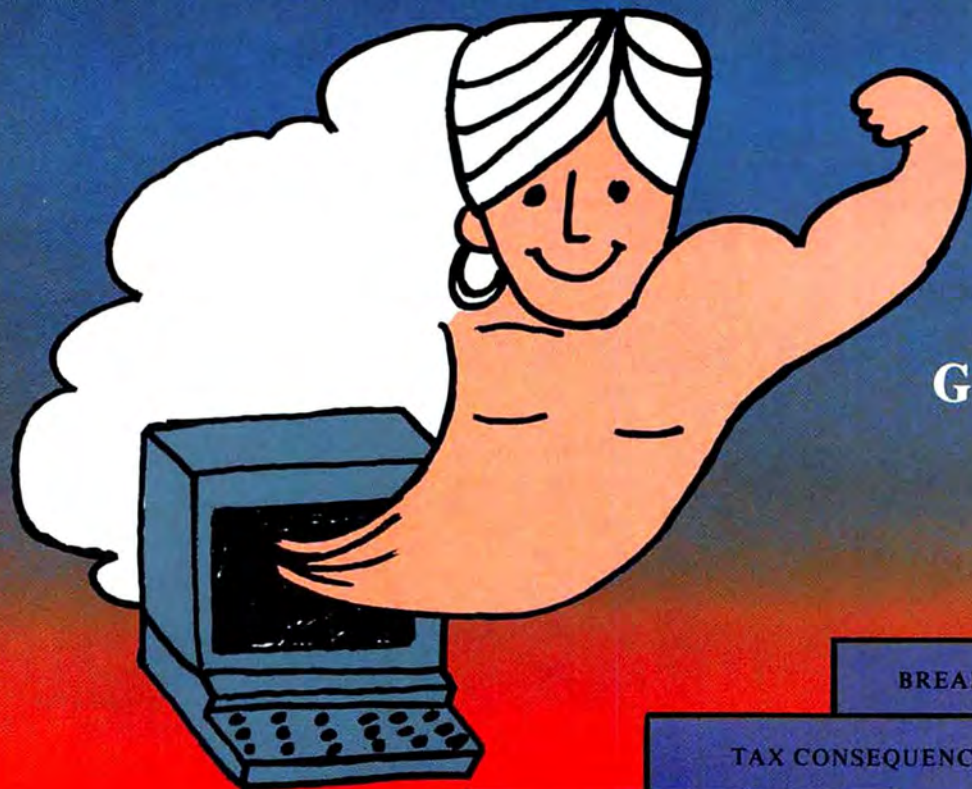


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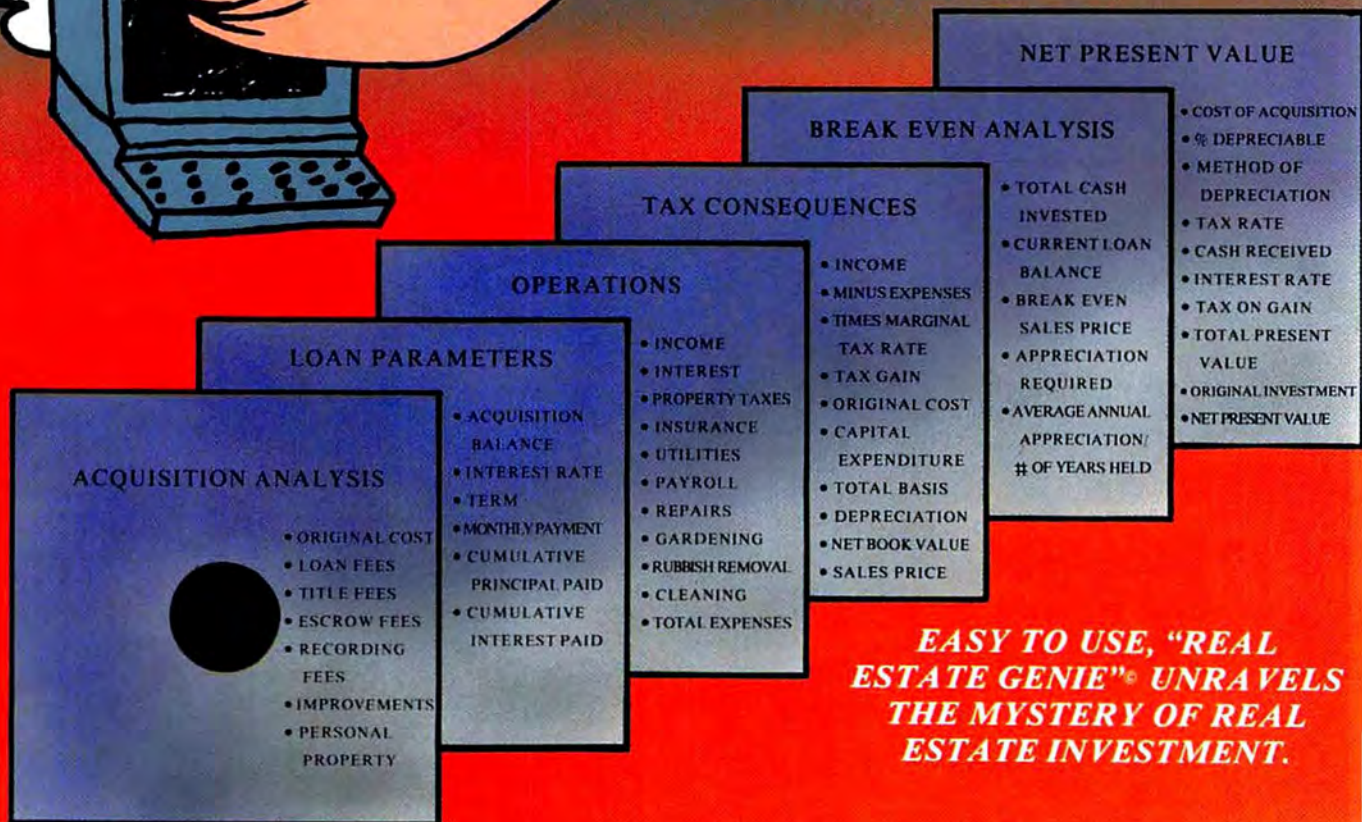
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Programmers at Work

Susan Lammers

Programming begins when a technologist enters into a private dialogue with a machine and ends when a thousand, or a million, users accomplish a task that is perhaps impossible to perform in any other way.

What follows is a look into the minds and personalities behind some of the very best of this era's software. Rather than interrogating programmers about clandestine projects or tumult within the software industry, we've attempted to pursue timeless matters that tend to be overlooked in the often frenetic personal computer business.



Gary A. Kildall



C. Wayne Ratliff



Bob Frankston



Robert Carr

We wanted to uncover the magic and the mystery that surround the development of an operating system or an application program: Where did the idea for the program come from? How difficult was it to bring to fruition? What does it feel like to develop a major program? Is programming an art or a science, a craft or a skill? What does it take to be a successful programmer?

This common set of questions supplies a framework—a way to highlight similarities and differences in approaches to programming and to allow the nuances and the philosophies of each programmer to shine through. Even so, certain themes recur: simplicity, balance, conciseness, elegance. These seem qualities befitting poetry, not programs for power users.

The order of the presentation roughly reflects the history of the industry. Gary Kildall developed CP/M, the first operating system for the personal computer. Next is C. Wayne Ratliff, creator of *dBASE*, a program that has endured as the data management market leader through changes in computer architecture and changes in fashion. Bob Frankston codeveloped *VisiCalc*, the pioneering spreadsheet that some say was the first application to really put personal computers to work. Robert Carr developed *Framework*, Ashton-Tate's breakthrough integrated package.

In the sidebar, we hear from John Page, co-founder of Software Publishing and creator of *pfs:file*, and Dan Bricklin, the other half of the *VisiCalc* development team—two men who helped bring computing to the masses and gave the rest of us the opportunity to be programmers.

Gary Kildall, developer of CP/M and founder of KnowledgeSet

Lammers: How would you characterize your particular style of programming?

Kildall: I follow very definite procedures, though they may not work for other people. I start by drawing the data structures; before I start writing code, I think about them and about what the program has to go through.

Programs are like mechanical devices; the way one piece of code works with another is similar to the way one gear meshes with another, so building code is a little like building a transmission. Once the data structures are developed, I start writing code in small chunks that I improve and monitor along the way. Checking them as I go assures me that the changes I make are localized; any problems are discovered immediately. This process of iterative improvement requires speed, so for me at least, it's very important to have fast edit, execute, and debug cycles.

Lammers: Do you use comments when you write code?

Kildall: Rarely, except at the beginning of procedures, and then I comment only on the data structure. I don't comment on the code itself because I feel that properly written code is self-documented. Once I get the algorithms down, I start writing code directly on the machine. I don't even write code on a piece of paper before it goes into the computer; that step just doesn't seem necessary. The actual coding process has always been a little scary for me because I don't know if I'm writing the right code and don't know what I'll write next.

Sometimes I realize the code's not exactly right, but I also sense intuitively that it will relate to something else—it will become right even if I don't know exactly how I'm writing it. The magical part is that at some point the whole thing comes together, and bam, you've got it. When the code coalesces, I'm certain the program will work, and I have no doubt it's been done in the best possible way.

Lammers: Is writing code always an unknown and difficult process?

Kildall: No. When I code without the pressure of a deadline, it's very relaxing. Sometimes when I'm scheduled for a long plane ride, I'll take a portable along and code just for fun. It sounds strange, but it just comes out of my brain. Once I've started, I don't have to think about it.

Lammers: Is programming something you can practice as you would the piano?

Kildall: You can practice in a sense. One theorist has the notion that kids learn to be inventive by tinkering with gears and other mechanical gadgets.

'Sometimes when I'm scheduled for a long plane ride, I'll take a portable along and code just for fun. It sounds strange, but it just comes out of my brain.' —Gary Kildall

That was certainly true of my childhood. My father was a great craftsman. I used to watch him by the hour, then try to imitate him with my own hammer and nails.

Data structures, which are the foundations of programs, are mechanical by nature, like the things I played with as a kid. So in that sense, I practiced programming. The big difference is that building something out of wood or steel takes hours of labor; if you don't do it right, you have to rebuild. Programs can be altered instantly.

Lammers: Do you find anything aesthetically pleasing in your work?

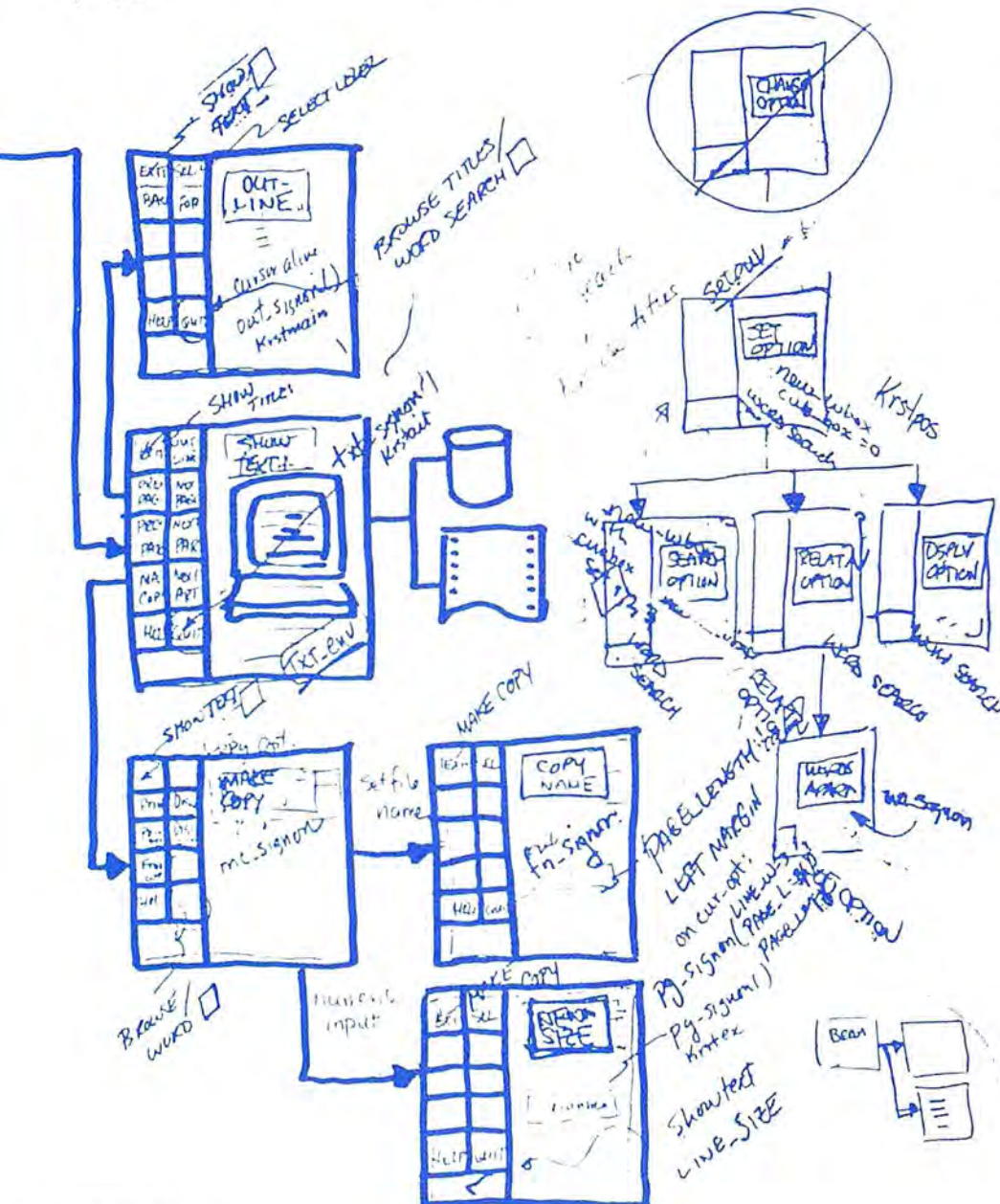
Kildall: Absolutely. When a program is clean and neat, nicely structured and consistent, it can be beautiful. I guess I wouldn't compare a program to the Mona Lisa, but a good program does have a simplicity and elegance that's quite handsome. Stylistic distinctions of different programs are intriguing, very much like the differences art critics might see between Leonardo's work and a Van Gogh. I like the LISP programming language because it's so pleasing. There's a concise form of LISP called the M expressions. When you write an algorithm using M expressions, it's so beautiful you could frame it and hang it on the wall.

Lammers: Do you consider programming an art or a science?

Kildall: There certainly is some art in it, but a lot of programming is invention and engineering. It's much like a carpenter who has a mental picture of a cabinet he's trying to build. He has to wrestle with the design and the construction to get it into a physical form. That's very much what I do in programming. Experimental science means you hypothesize, try things, and compare results, and in that way programming is science. You may have a notion of how a retrieval system should work, but not until you run it with sufficient data can you see the mechanism operating and get some statistics. I also think programming is very much a religious experience for a lot of people.

Lammers: What do you mean religious?

Kildall: If you talk about programming with a group of programmers who all use the same language, they can become almost evangelistic about it. They form a tight-knit community, hold to certain beliefs, and follow certain rules in their programming. It's like a church with a programming language for a Bible. FORTH is a good example; it's a programming language that is probably close to being a religious experience for many people. When FORTH first came out, its disciples claimed any algorithm could be done ten times faster. If you argued that



Gary Kildall made this sketch during development of the Knowledge Retrieval System to provide a graphic picture of the menu tree design.

point or any other, you found yourself talking to a brick wall and you definitely weren't allowed in the church. Now I don't mean to be derogatory about the people who use that language. It's a very supportive group and a very effective language, but the discussions were not based on reason. They were based on belief. But I'm not putting myself in a special category either—I can preach about the wonders of LISP all day.

C. Wayne Ratliff, creator of dBASE, the perennial data management standard

Lammers: Earlier in your career, you experimented with natural language; were these experiments the foundation for dBASE?

Ratliff: dBASE started, oddly enough, from football games. I was in a football pool where you picked the winner and a point spread. I believed I could win if I applied myself devoutly to the mathematical process, and that meant gathering all the statistics on weekend games from Monday morning's newspaper. About four or five weeks into the season, I had an entire room completely layered with newspaper. Trying to pick a winner by going from paper to paper was a horrible process—clearly too much to handle without a computer. Well, one thing led to another, and within a week, I'd totally forgotten about football. I had decided that the world needed a natural-language data base manager, and so I bought an IMSAI 8080 kit and put it together. I also bought loads of books on natural language and artificial intelligence.

Although I was actively engaged in experiments concerned with natural language, I hadn't fully researched the data base component. I decided to use the data base manager as a foundation for natural language development. Natural language by itself is a big "so what?"—it must act on something. I thought about the data management program I had written for Viking [the NASA project] and was essentially going to duplicate it on the IMSAI. By chance, I ran across a program called JPL Display and Information Systems. It was easy to understand, and very simple, very clean. I immediately thought it would be easy to implement on a microcomputer.

I made a few advances in the user interface and improved the performance, but the big change was moving it from a teletype orientation to full screen. The commands I added dealt with the user interface almost exclusively, but I never caught up on all the enhancements it needed. As I understand today's perception of dBASE, the program isn't very user-friendly. In retrospect, if I had followed my heart instead of advice, dBASE would be much closer to perfection today.

Lammers: Even so, what do you think has made dBASE so successful?

Ratliff: A tremendous amount of luck, but dBASE was also the right program in the right place at the right time, and that's not totally luck—that's design. The fact that it's a language as well as a data base manager has been enormously important. dBASE caught people's imaginations because it's so open-ended.

All my life, I've programmed as a toolmaker. When I compare myself, even ten years ago, to other programmers, I realize I was trying to generalize to a

'dBASE started, oddly enough, from football games. I was in a football pool where you picked the winner and a point spread.'
—Wayne Ratliff

great extent; others were trying to write programs that would solve a specific problem. These programs would frequently be delivered much sooner than mine, but mine would have a longer lifetime. Each time user needs changed, other people's programs had to be rewritten; if the need went away, their programs died. I always wrote in such a way that the program could solve a family of problems.

dBASE was different from programs like BASIC, C, FORTRAN, and COBOL in that a lot of the dirty work was already done. The program—not the user—does the data manipulation, so the user can concentrate on what he or she is doing. This spares the user from messing with the dirty details of opening, reading, and closing files and managing space allocation.

Lammers: So you had the user in mind during the design of dBASE?

Ratliff: Absolutely. Intuitively, I ask, What do users want? How are they going to use this? What good is it to them? A lot of programmers think only about how something can be coded. They've never sold or marketed anything.

Lammers: In that respect, would you advise programmers to be less technology-driven and more considerate of users and the market?

Ratliff: Yes. That's how dBASE got started. I was thinking of how I wanted to use it.

Lammers: What is it about programming that satisfies you?

Ratliff: I like the high-tech aspect of being able to create something and have it appear on the screen. If you write a program well, it's very elegant; it sings, it's well built. I enjoy it from an engineering point of view, just like a well-built car, a well-built bridge, a well-built building. Everything about it seems in balance, tuned.

Two of Wayne Ratliff's subroutines written in C that illustrate the same programming style he used in dBASE III.

```
PAGE 1 TRIMMERS.C 10/23/85 9:9

/*=====*/
/*
strcpy - copy string until a specified character is found (or entire
string is copied)

returns a pointer to 'chr' in from string (or terminator)
*/

char *strcpy(from, to, chr)
char *from;
char *to;
char chr;
{
    char c;

    while (c = *to = *from) {
        if (c == chr) {
            *to = '\0';
            return (from);
        }
        to++;
        from++;
    }
    return (from);
}
/*=====*/
/*
strtrim - trim off blank characters (and CR, LF) from right side of line
*/

strtrim(line)
char *line;
{
    int i;
    char *p;

    i = strlen(line);
    p = line + i - 1;          /* RHE of line */
    while (i--) {
        if (*p == ' ' || *p == '\t' || *p == '\n' || *p == '\r')
            *p = '\0';
        else
            break;
        p--;
    }
    return;
}
```


Lammers: Would you elaborate on this feeling for balance and elegance?

Ratliff: Balance takes many forms. The code should be crisp and concise. You should be able to explain any module in one sentence, and statements should be in alphabetical order, if possible. Indentations shouldn't go off the edge of the paper at any point. The program shouldn't have one huge "if" and a tiny "else." Balance should be everywhere.

'Balance takes many forms. The code should be crisp and concise. You should be able to explain any module in one sentence.' —Wayne Ratliff

Lammers: When you write code, does it come out balanced the first time or do you make a lot of changes?

Ratliff: I do a lot of changing. There's an analogy between writing code and sculpting a clay figure. You start with a lump of clay and then scrape away, add more clay, then scrape again. Every now and then you decide a leg doesn't look right, so you tear it off and put a new one on. That's a lot of interaction.

The ideal program module should be a page long. If it grows beyond a page, I have to decide what I'm trying to accomplish—how many separate things am I working on? Should they be broken into separate modules? Part of the elegance, and the balance, is that at a certain level, in this layer-cake hierarchy of a program, all the modules should be about the same weight and the same size, perform the same duty, and have the same functionality.

Lammers: How does balance help a program?

Ratliff: The program becomes maintainable. When you have good balance, it's as though you've discovered some basic underlying principle and implemented it.

Lammers: Do you write a lot of comments in your programs?

Ratliff: Actually, no. I've been criticized by some for not writing many comments. I figure there

are two types of comments: One explains the obvious, and that's worse than worthless; the other explains truly involved, convoluted code, which I always try to avoid. I'm almost of the opinion that the more comments you need, the worse your program is. The program itself should be the commentary.

Lammers: What qualities distinguish an outstanding programmer?

Ratliff: There's a spectrum of programming. At one end is the programmer who's working 100 percent for the user; at the other is the programmer who's dissecting some mathematical problem and couldn't care less about the user. Curiously enough, game writers are the most in tune with the user. The mathematics of the game probably irritates the game programmer, whereas, at the other end of the scale, the programmer writing a better square root algorithm regards deciding where to place an image on the screen as an irritant. I like to place myself about three-quarters of the way toward the game writer, toward the user-interface side.

Bob Frankston, codeveloper of VisiCalc and chief scientist at Lotus Development

Lammers: Is programming an art, a science, a tool, or a trade?

Frankston: It's all those things. When we formed a company to develop *VisiCalc*, we named it Software Arts. A better question would be, What is art versus engineering?

Lammers: How would you describe the difference?

Frankston: They're not that different. In engineering, it's easy to see when you're wrong because something collapses. But good engineering is no different from good art. How understandable is it? How maintainable is it? Is it simple? Is it unnecessarily complicated? How do you perceive it? In that sense, art and engineering are similar. In pure art, there's less operational testing, so it's easier to get away with things. Engineering is more practical, in that your creation has to work. But does it work only once and then fall apart? Does fixing bugs generate still more bugs? The better the engineer, the more aesthetically pleasing the machine is and the better the chances that it'll work.

Lammers: What do you find to be most aesthetically pleasing about a computer program?

Frankston: I don't have just one test; it's a combination of elements. Is the program understandable? Is it elegant? Does it show a basic understanding and an elaboration of an ideal, rather than being just disparate pieces piled together? Is it easy to develop and easy to modify?

'If you cannot explain a program to yourself, the chance of the computer getting it right is pretty small.'
—Bob Frankston

Lammers: What does it take to become a great programmer?

Frankston: A good programmer must have two attributes: an accidental mental correspondence to the needs of the disciplines, combined with an ability not to be stupid. That's a rare combination, but it's not at all mystical.

A lot of good programming can be taught. A good programmer needs an aesthetic sense, combined with a guilt complex and a keen awareness of when to violate that aesthetic sense. The guilt complex forces him to work harder to improve the program and to bring it in line with the aesthetic sense.

Lammers: If you would compare programming to an art form, would you compare it to writing, sculpting, painting, or composing music?

Frankston: In music, and in various forms of art, we try to operate within rules, but you have to know when to break the rules and when to follow them, just as in programming. In art, you also ask yourself how people will perceive your work—you're trying to create a perceptual impression. When you communicate, whether in writing or in a program, what you say must be understood by the recipients. If you cannot explain a program to yourself, the chance of the computer getting it right is pretty small.

Lammers: What work strategies do you use when you're programming?

Frankston: It's important for me to have a general sense of where I'm going on a project. I tend to mull over the ideas for a while, then develop a framework from which to proceed. Next, I build a working skeleton, which provides me with instant gratification and also lets me test approaches and rework them if necessary. You could say the program's organic; I grow it.

One of the problems with computers right now is that you can get something to work in BASIC, and then you assume you understand, when the fact is you've just started. In programming, I find a lot of understanding comes from psychology and from how people deal with the world. Ultimately, you're trying to understand how processes work in general. The program is only one small piece. You need to have curiosity.

Robert Carr, creator of Framework and chairman of Forefront Corporation

Lammers: Did you always intend to be a programmer?

Carr: At Stanford I was torn between my first love, the humanities, and my more practical side, which leaned toward engineering. I still toy with the idea of being a fiction writer. Writing English and software are far more than just acts of capturing something in code or on paper. Both processes help evolve your thinking tremendously; you take ideas two or three steps further.

Lammers: Where did you learn the programming techniques you use?

Carr: From experience and introspection. I tend to reduce things to a fairly simple framework, if you'll excuse the term, and then expand the framework to the real world. And I'm forgiving; I don't expect the framework to fit perfectly the first time. I'm horrible at math but I might have been happy as a physicist, because I believe physicists do what I do: reduce physical reality to a relatively small number of theorems and rules that can be used to interpret and predict physical reality.

Lammers: Do you think adherence to these techniques makes a good programmer or program?

Carr: Yes. The key to the craft of computer science—and I call it a craft because it certainly isn't a

The User's Place in Programming

Lammers: What were your major design considerations in making *pfs:file* different from other programs on the market at the time?

John Page: What I thought was missing was an application that ordinary people could use, much as they do a telephone or a car. The goal was a program as easy to learn as an appliance. It was an interesting design trade-off because it meant pursuing maximum intelligibility rather than maximum performance and functionality. That's a bit like the phone system, which isn't very sophisticated on the outside. You dial the number, the phone rings, and you talk to people. But to make that happen, a great deal of complex technology must be marshalled behind the scenes. Designing *pfs:file* worked in the same way: simple on the outside, backed by sophisticated technology.

In designing *pfs:file*, I stumbled over an odd software design principle: Complicated programs are far easier to write than straightforward programs—the exact opposite of what you'd expect. It's easy to write complicated programs because you reflect the complexity back onto the user; you force the user to make all the hard decisions. With a very simple program, however, the designer has to figure out the answers alone.

But here's the real grabber—the programs that are more difficult to use make a selling point of that difficulty. They turn complexity into a feature: The user of a complex system can specify exactly where the columns go, while *pfs:file* puts them where it wants. The truth is that almost anybody who uses the more complex

program changes the report five times before it looks just right. Or they put up with a rotten-looking report. The design problem becomes an issue of control versus productivity: You can have high productivity or a great deal of control. That's the trade-off programmers and users find themselves making all the time.

Lammers: Do you think small software operations will survive? Or will the software industry be dominated by a handful of huge companies?

Dan Bricklin: Today, people are writing their own programs. Any spreadsheet user is; it's just that the language is different now. Bob Frankston likes to tell a story about the telephone company. Back in the 1920s, people said telephone usage was growing so fast that by 1950 everybody in the country would have to be an operator. By 1950 people said that prediction had been wrong. Actually, it was right, because everybody *was* an operator—they just had dial telephones. The technology had made it easy enough to be an operator.

It's the same with programming. We're just making the users do more of the programming themselves, but they don't know it. Using style sheets with *Microsoft Word* is doing programming, as is using spreadsheets. There's an inherent cottage-industry component to programming. We constantly improve the available tools—the operating systems, the environments, the languages. Consequently, the user can always do much more than was previously possible. —S. L.

science yet—is to find rules. The best programmers are usually aware of several universal rules that characterize classical computer science.

Lammers: You referred to programming as a craft. Why do you consider it a craft rather than an art or a science?

Carr: It's really a combination of both art and science. Certainly some very scientific, well-grounded principles are tremendously important for software development, but good software goes beyond that. Looking at the sketch of the decision-tree that led to the design of *Framework*, you'll see I spent a lot of time thinking, scribbling—a lot of subconscious activity. That's where the art is. In art, you can't explicate how the end result was achieved. The best software comes from the realm of intuition.

Lammers: Intuition aside, have you developed some concrete rules in program design?

Carr: First, the granularity of anything you do is very important. This rule occurs repeatedly in the universe. In investments, it's expressed by the rule of diversification. For software, users must be able to break their work, and the program, into separate pieces rather than dealing with a single, giant entity.

Granularity runs into another one of my rules, homogeneity. Architecture should be homogeneous; it should not have a lot of exceptions or special cases. If you design a system to deal efficiently with memory objects that are megabytes in size as well as with byte-size objects, you'll end up with tremendous complexity.


It's better to deal with either one or the other; that's what I call homogeneity. Another global rule deals with recursion, one of the three or so brilliant levers computer science has introduced into software. The most powerful software usually applies recursion internally and often provides recursive capabilities to users.

Memory management is the most important aspect of a program's internal architecture. The rule here is never copy the same data twice. With some programs, identical data appears repeatedly, sprinkled throughout buffers in memory. This is an evil for several reasons: It bloats your memory requirements with redundant data and temporary buffers. Worse, it inflates development costs because the program takes more time to develop and debug. When

you shove data from one buffer to another, you lose flexibility and functionality; you can only do one thing to the data when it's in that particular buffer. By contrast, when you have one representation of the data and one place for it, you gain a great deal of flexibility.

Lammers: What rules or guidelines do you follow in the design of a user interface?

Carr: It's vital to achieve what I call transparency. Users should be able to forget that there is a program between them and their information. As they get acclimated to the software, their attention should be directed to the task at hand, not to the



'The best programs have an external architecture that mirrors their internal architecture.' —Robert Carr

command sequence they need. Transparency is created by the consistency and the predictability of commands and their actions.

Lammers: How did you translate simplicity and clarity into the user interface of Framework and still retain a richness of functionality and performance?

Carr: We developed a menu scheme with restraint and discipline. We all know that sensual pleasures taken to excess are a curse rather than a blessing; it's the same with menus. They require great discipline. Design in every arena from architecture to furniture has settled on some principles in which minimalism is a real benefit and virtue.

Menus are the best way to present the user with a choice of commands. But some menu systems branch so much that they become monstrosities. Even some of the less monstrous systems are felt by users to be complex and extremely difficult to learn, largely because they have such extensive menus.

Lammers: Did you sacrifice functionality to achieve this simplicity?

Carr: *Framework* has an overriding, overlapping set of multiple functionalities in a single command. I came up with ten or so operations—such as copy, move, delete, create, and find—that are fundamental to all applications. To provide functionality in

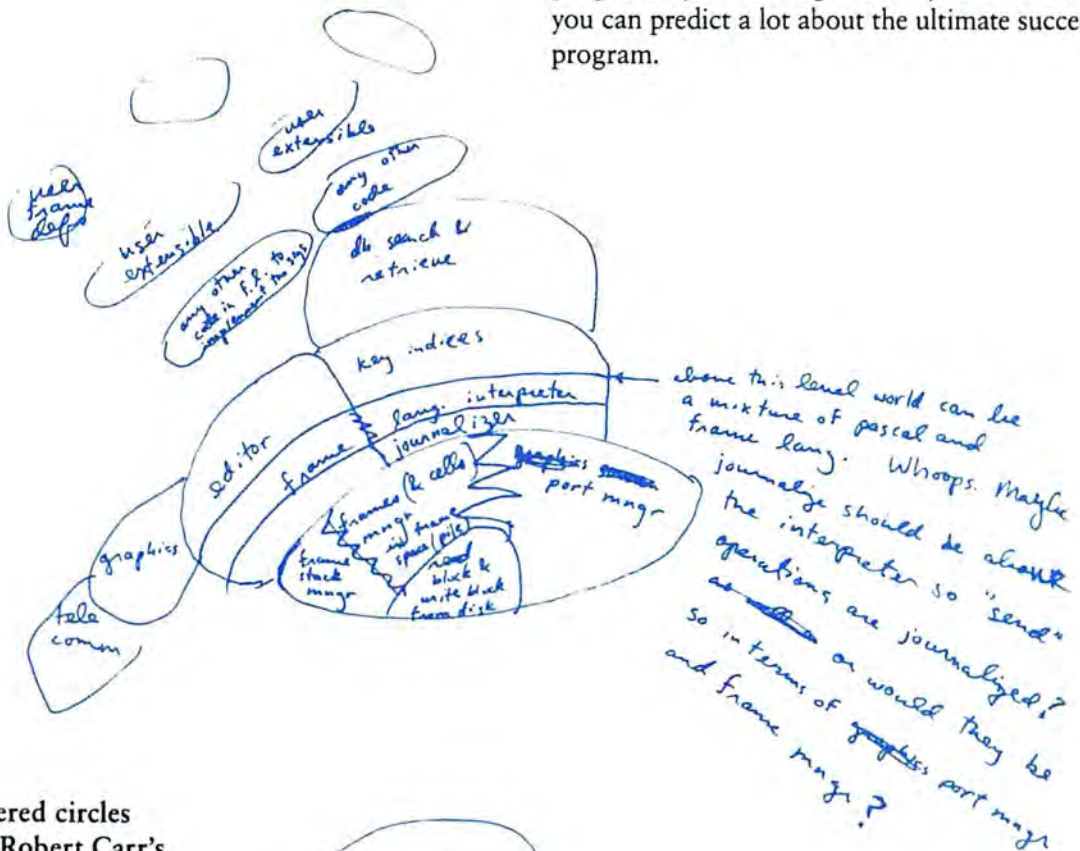
the different areas, I had to steal a terrific design notion that Xerox originated: All commands should act on data the user has already selected or highlighted. This is called the *object-verb design* as opposed to *verb-object design*. With a verb-object design, you'd press the copy command and the software would then prompt you, 'What do you want to copy?' You'd highlight some text and the program would ask, 'Where do you want to copy it to?' And you'd go there. This design puts the user in a reactive mode, which is successful to a certain degree, especially in guiding neophyte users. On the other hand, our object-verb commands are often the equivalent of ten verb-object commands.

Lammers: Are such fields as psychology or graphic design helpful in software design?

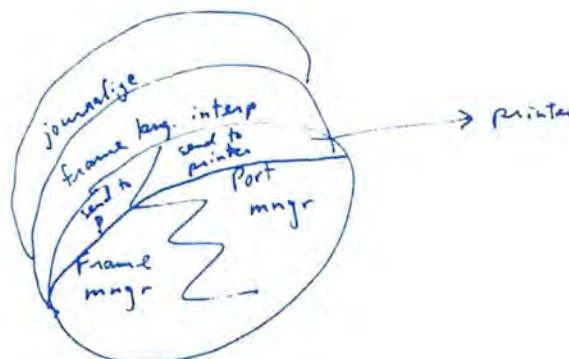
Carr: One useful area is linguistics. We need to see what it has to offer software design. Today's products use cryptic presentations, icons, or words on a command menu to present concepts, information, or signposts to the user. We need to study the science of signposts, whatever that is.

Lammers: You often refer to internal and external architecture. Would you elaborate?

Carr: The external user interface of any product has an architecture, or structure; it has its little routes and byways. The program's internal structure can also be described as an architecture. These two architectures are the most important qualities of any program. By examining how they relate to each other, you can predict a lot about the ultimate success of a program.



These layered circles represent Robert Carr's "very early groping towards structure" during development of Framework.



The best programs have an external architecture that mirrors their internal architecture. Spreadsheets are the best example. They're usually implemented as a grid of cells in memory; the user also deals with a grid of cells, so the two architectures mirror each other perfectly. Spreadsheets can be very efficient, fast, and fluid because of these traits, and it's no wonder they've been successful in the marketplace. But what happens when you try to implement a word processor on top of a spreadsheet, where internally you have one architecture, but externally you're trying to provide a very different structure, a long, scrolling roll of text? You wind up with relatively poor performance and a bulky user interface.

Lammers: Do you think you'll always be in programming?

Carr: No, I hope I can make a major change to something else. Programming can be addictive. And with an idea as innovative as *Framework*, from day one I had to sell, sell, sell. Not overt salesmanship, but I had to present the idea, clearly and concisely, again and again. One of the reasons we succeeded with the product was our ability to combine a compelling presentation of the concept with the underlying technological innovation. ●

Susan Lammers is editor in chief of Microsoft Press.

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Gary A. Kildall developed CP/M (Control Program for Microcomputers), the first personal computer operating system, in 1973, shortly after receiving his Ph.D. in computer science. As chairman of Digital Research (DRI), Kildall also designed the Dr. Logo programming language for the PC and developed PL/I, one of the first high-level languages for personal computers. In 1984 Kildall formed Activenture Corporation (now KnowledgeSet) to develop CD ROM products. He remains both DRI chairman and president of KnowledgeSet.

From 1969 to 1982, C. Wayne Ratliff held a series of engineering and managerial positions at Martin Marietta. As a member of the NASA Viking Flight Team during the 1976 Mars landing, Ratliff wrote the data management system for the Viking lander support software. In 1978, he developed Vulcan, which he marketed himself until Ashton-Tate took over the marketing in

1980. Ratliff renamed the product dBASE II. In mid-1983, Ashton-Tate purchased the dBASE II technology and copyright from Ratliff, and he joined Ashton-Tate as vice president of new technology. Ratliff was project manager for dBASE III, as well as designer and lead programmer.

Bob Frankston earned bachelor's degrees in mathematics and in EECS (electrical engineering and computer science) from MIT. In 1974 he received two more MIT degrees, this time an engineering B.S. and a masters in EECS. At MIT, Frankston met Dan Bricklin, who had conceived of the electronic spreadsheet while at the Harvard Business School. Bricklin depended on Frankston to create a workable version of the program. The two formed Software Arts and worked together until they completed the

product, VisiCalc, in 1979. In the spring of 1985, Software Arts dissolved after a protracted legal battle with VisiCorp over marketing rights to VisiCalc, and Frankston joined Lotus Development as chief scientist of the information services division.

As chief scientist at Ashton-Tate, Robert Carr is responsible for directing research in new products and technologies. A pioneer in the field of integrated software, Carr is the designer and principal developer of Framework and its successor, Framework II. Carr cofounded Forefront Corporation to complete the development of Framework, and the company was subsequently acquired by Ashton-Tate. Carr had previously served as programming consultant on Context MBA, an early integrated package, and worked at Xerox PARC. He holds a master's degree in computer science from Stanford University.

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Smartmodem 300	\$139.
Smartmodem 1200	389.
Smartmodem 1200B (w/Smartcom II)	349.
Smartmodem 1200B (no software)	319.
Smartmodem 2400	589.
Smartmodem 2400B (w/Smartcom II)	529.
Smartcom II 2.1 (software)	89.
Hercules ... 2 years	
Hercules Color Card (parallel port)	159.
Hercules Graphics Card (parallel port)	189.
Intel ... chips: 1 year; boards: 5 years	
Above Board PC 64k (upgrades to 2 Meg)	call
Above Board AT 128k (upgrades to 2 Meg)	call
Above Board PS 64k C/S/P (upgrades to 1.5 Meg)	call
Above Board PS AT S/P (upgrades to 1.5 Meg or higher w/piggyback)	call
8087-2 (for IBM-PC & XT)	129.
8087-2 (works on 8 Mhz computers)	177.
80287 (for 6 or 8 Mhz IBM-PC AT)	225.
80287-8 (for 10 Mhz & faster IBM-PC AT)	269.
Kensington Microware ... 1 year	
Masterpiece	94.
Masterpiece Plus	129.
Printer/portable computer stand	17.
key tronic ... 90 days	
5150 keyboard	115.
5151 keyboard (deluxe)	169.
Kraft ... 1 year	
Joystick	29.
New! 3 Button Joystick	35.
Mouse Systems ... 3 years	
PC Mouse with PC Paint+	special
PC Mouse with Ready and PC Paint+	149.
NEC ... 90 days	
Multisync monitor (EGA compatible)	549.
NSI Logic ... 3 years	
EPIC (video adapter, EGA compatible)	279.
Orchid Technologies ... 1 to 2 years	
Conquest Multifunction Board 0k upgrades to 2Mb, fully supports LOTUS/INTEL expanded memory specification (EMS)	264.
PC Net Board	319.
Eccell Multifunction Board for the AT	399.
Tiny Turbo 286	459.
PC Turbo 286e w/1 Meg	749.
Turbo EGA	call
EGA	359.
Paradise Systems ... 1 year	
Color/Mono Card	149.
Five Pack w/384k	159.
Auto Switch EGA	359.
Princeton Graphics ... 1 year	
MAX-12E Amber monochrome monitor	179.
HX-12 RGB monitor (690 x 240)	449.
HX-12E (EGA compatible)	539.
Quadram ... 1 to 2 years	
Expanded Quadboard	
0k (upgrades to 384k)	129.
384k (fully populated)	179.
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QuadEGA+ (half-card)	369.
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Lotus 1-2-3	WordStar 2000
Symphony	Turbo Pascal
Framework	WordPerfect
dBase III	each \$12.

Toshiba ... 90 days
All Toshiba printers listed are 24 pin dot matrix.

- * P321 serial/parallel printer (80 col.) 519.
- * P351 serial/parallel printer (136 col.) 1089.

Toshiba T1100 PLUS Laptop Computer .. call
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Video 7 ... 2 years
VEGA (half-card) 369.

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- 10 Meg cartridge 51.
- Bernoulli Box 40 Meg w/PC2 card 2449.
- PC2B (Bootable) Card 229.
- 20 Meg cartridge 69.
- Bernoulli Box Care Kit. 79.

Mountain Computer ... 1 year

- Drive Card 20 Meg. call
- Drive Card 30 Meg. call

PC Connection ... 1 year

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Seagate ... 1 year

- 20 Meg Internal Hard Drive (w/controller and cables) 409.
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TEAC ... 1 year

- FD-55BV Drive (5 1/4" half-height) 109.

Toshiba ... 90 days

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Smarter Than the Sum of Its Parts



Imagine a high-end pfs:series ... no, scratch that; an easy-to-use Symphony ... no, scratch that; a combination dBASE III, 1-2-3, DisplayWrite 2, Chart-Master, Crosstalk, and SideKick ... no, scratch that; imagine a system designer's dream ... yeah, that's the ticket; you've got a picture of the Smart System from Innovative Software.

Ken Milburn

Integrated software is old news by now, and in some circles it's a sore subject. Many users have been vexed by the limitations of packages that try to cram a software spectrum into a 640K PC. In attempting to tightly integrate applications, some packages are needlessly complex. Others, trying to be user-friendly, offer stripped-down applications that can't compete with stand-alone programs.

Still, integrated packages are attractive because they make it easy to incorporate data from one application into another without any rekeying. Since the user interface remains the same from one kind of task to another, you don't have to adjust to a new set of commands every time you switch applications.

Innovative Software's *Smart System* consists of three full-featured stand-alone programs that are integrated in a looser fashion than packages like Sym-

phony or *Framework*. Unlike some integrated packages, *Smart* does not allow you to transfer a file via modem while you compose a report in the word processor, and although it provides a windowing system that lets you display up to 50 files within a single application, it does not let you visually compare files from different applications. But thanks to a built-in programming language, *Smart* can mimic some capabilities of integrated packages, such as easy transfer of data between modules. More important, *Smart* is the only integrated package with a powerful, programmable data base manager.

The Best of Their Genre?

You can buy the *Smart Word Processor*, the *Smart Spreadsheet*, or the *Smart Database Manager* separately if you wish. Innovative Software earns about half its sales on stand-alone versions of the spreadsheet and data base manager, which are among the best of their genre. The *Smart Database Manager*, clearly the centerpiece of the trio, rivals *dBASE III Plus* in sophistication, and the spreadsheet matches up closely with 1-2-3. In fact, if graphics is your game, the *Smart Spreadsheet* wins hands down. The *Smart Word Processor*, on the other hand, suffers as a stand-alone, partly because it is designed with integration in mind. However, you can buy all the programs bundled as the *Smart System* for less than the cost of the spreadsheet and data base manager together.

Even if you buy one of the *Smart* programs separately, you'll receive a somewhat integrated package. Each module comes bundled with a full-featured

Table 1: Data base performance: Smart Database Manager versus dBASE III and dBASE III Plus (times shown in minutes:seconds)¹

Test	Smart	Smart "Compiled"	dBASE III version 1.1	dBASE III Plus
Adding records				
100	0:25	0:21	0:17	0:19
1000	5:10	4:48	3:03	3:28
10,000	56:20	54:39	48:20	52:53
Indexing				
100 (1 index/2 indexes)	0:03/0:03	0:03/0:03	0:03/0:03	0:02/0:02
1000 (1 index/2 indexes)	0:11/0:12	0:09/0:14	0:29/0:40	0:09/0:10
10,000 (1 index/2 indexes)	2:11/2:35	1:58/2:08	5:40/6:29	1:51/2:17
Sorting				
100 (1 field/2 fields)	0:02/0:02	0:04/0:04	0:04/0:04	0:03/0:03
1000 (1 field/2 fields)	0:24/0:31	0:28/0:30	1:13/1:14	0:32/0:33
10,000 (1 field/2 fields)	8:11/8:45	7:36/7:58	16:41/17:45	8:50/9:10
Locating the last record				
100 (1 field/2 fields)	0:01/0:01	0:01/0:01	0:01/0:01	0:01/0:01
1000 (1 field/2 fields)	0:08/0:08	0:08/0:08	0:07/0:12	0:07/0:09
10,000 (1 field/2 fields)	1:24/1:16	1:24/1:16	1:07/2:03	1:06/1:38
Counting				
1000 variables: x	0:12	0:10	0:15	0:17
1000 variables: counter	0:12	0:10	0:18	0:20
Substring search				
100	0:01	²	²	²
1000	0:09	0:08	0:06	0:07
10,000	1:22	1:17	1:08	1:14
Replace all				
100	0:02	0:02	0:04	0:01
1000	0:26	0:24	0:21	0:21
10,000	7:31	7:04	6:08	6:08
Simultaneous replace				
1000 each (1 user)	2:21	2:19	n/a	2:15
1000 each (3 users)	5:33	5:24	n/a	5:15
1000 each (6 users)	8:12	7:58	n/a	7:40

¹These tests were performed by the Lambda Group, a computer consulting company in San Francisco, using PC's Limited AT computers with 6MHz clocks, 1MB of RAM, 40MB Seagate voice-coil drives, and Gateway Communications G-Net Key Cards at the workstations and file server. The Novell Advanced/86 V2.0 operating system was used at the file server.

²Less than .5 second

communications program, two calculators, a pop-up notepad, a personal appointment and task scheduler, and a complete programming language.

With the release of version 3.1 of the *Smart System*, Innovative Software has added a number of features, including access to DOS, an enhanced spelling checker with automatic hyphenation, and DCA file format compatibility. Other improvements include support for the IBM Enhanced Graphics Adapter, the Lotus/Intel/Microsoft Expanded Memory Specification (EMS), and math coprocessors. All programs use virtual memory, which causes part of a disk to automatically supplement RAM whenever RAM becomes full. In addition, Innovative claims that the multiuser version of *Smart* is the only integrated series (and the only spreadsheet) that will work on local area networks with full file- and record-locking (see the sidebar "Networking With Smart"). To ice the cake, Innovative Software has made a fast program even faster (see Table 1 and Figure 1).

Transfer or Get Off the Bus

The *Smart* documentation is professional and well organized. Installation is straightforward, and the program is not copy protected. Printed and disk-based tutorials guide the new user, and a toll-free help line is available. Once you're in the program, pop-up help screens go to work, and menus can be expanded to display more features as you gain mastery.

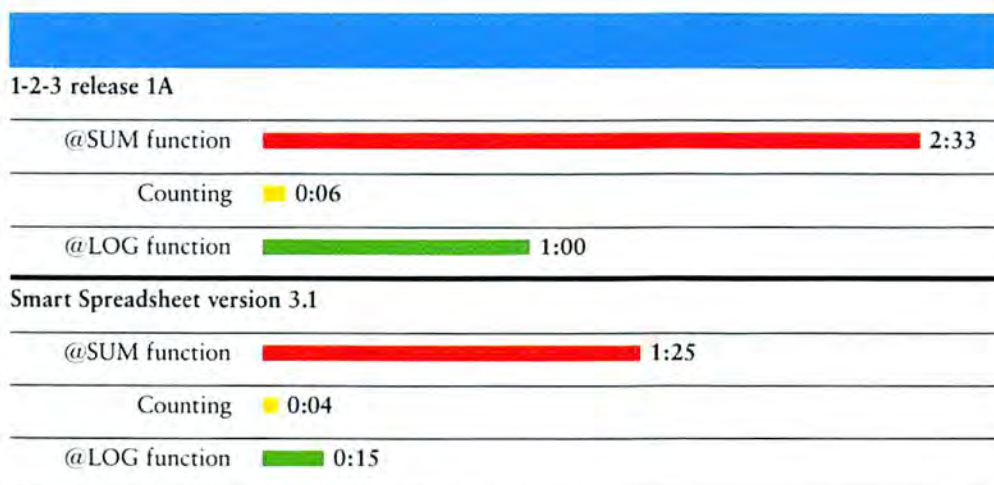


Figure 1: Timing tests of Smart Spreadsheet version 3.1 versus 1-2-3 release 1A (times shown in minutes:seconds)¹

¹ All tests performed on a 52-column-by-40-row grid

To execute a command, you can select it from a menu or use a keystroke combination. Most of the commands occur in more than one application; even when they're different, they are couched in a familiar-looking environment. The opening screen shows a chart of the applications you've already installed. The last four lines of the screen are reserved for horizontal menus, a status line, and a prompt line (see Screen 1).

The *Smart* programs excel at moving information between applications. All the modules use three transfer commands: Send, Write, and Read. Send transfers data to another *Smart* module, Write spits it out to files formatted for other popular programs, and Read accepts files from external programs. You can exchange files between *Smart* and any application that uses ASCII, Lotus, SYLK, DIF, and DCA formats.

Smart includes powerful functions to assist data transfers. For example, you can Transpose the sequence of data fields (items) as you're Reading or Writing them. In other words, you can have records reformatted automatically as they pour into or out of the system. You can ship selected groups of data from one file to specified locations in any of the other *Smart* applications' files. You can even instruct the destination program to start executing a *Smart* program the instant the data is received.

Networking With Smart

While slowly gaining ground on programmable integrated packages such as *Framework* and *Symphony*, Innovative Software harbors no illusions that the *Smart System* can overtake its well-entrenched competitors overnight. However, betting on the growth of local area networks (LANs), the company is hoping to stake out the future with its multiuser versions of *Smart*.

Innovative is actively pursuing LAN clients and corporate fence sitters with a multiuser system it claims is the only integrated package with systemwide file- and record-locking. *Smart* is available in multiuser versions for LANs and for use with the UNIX operating system (the UNIX version is also being marketed by AT&T). The LAN variation works on current versions of PC-compatible networks that meet DOS 3.10 specifications or that run under Novell's *Netware*. DOS 3.10 network standards are met by most of the popular LANs, including 3-Com, IBM's PC Network, and networks from Orchid Technology and Corvus.

In our tests, *Smart's* multiuser version performed fast and flawlessly on a Novell network running *Netware/86* (see Table 1). However, in each situation, the LAN performance of the software will be dependent on several variables: the efficiency of the network operating system, the type of

cabling used, the performance of the hardware nodes, and whether or not the central file server is dedicated.

Once installed, the multiuser *Smart* is almost identical in operation to the stand-alone versions. The only difference is in the way the system prevents users from simultaneously posting information to the same file (or data base record) and thus scrambling data. The network administrator determines various users' access to files and assigns each user a password.

Individuals can also password-protect their own files. If files aren't password-protected, any number of users can examine the same file at the same time, as long as they don't attempt to make changes and then save the file under its original name. A second user can call up the same document, but only the first user can save a revision under the same name as the original. The system tells subsequent users to give the file a new name before saving or quitting. Data base records are an exception: Multiple users can make simultaneous changes within a single file, but individual forms (records) are accessible to only one user at a time. —K. M.

Any number of files within a given application can be Linked so that data entered into one file is simultaneously entered into the proper location in all the others. Or you can use the Lookup command to find the data in another file and have it automatically posted to the current file.

■ Ultimate Programmability

Although most integrated software can be programmed to some degree, *Smart* carries programmability to its outer limits. You can program throughout the system, even in the accessory applications, and a macro capability can play back prestored keystrokes. A variety of formula operators perform calculations on math, text, time, and dates. *Smart* also includes a valuable library of over 106 prefabricated formulas, called "functions," which can perform in over 14 task categories. Each program module also adds unique functions. The Smart Programming Language ties the various functions together.

If you're not inclined toward programming, *Smart*'s Remember mode can write the programs for you by tracking your actions through any *Smart* application until you toggle the mode off. All you have to do is give the code a name and store it for later re-playing. Because the commands are the same as those used in executing the program, even a beginner can edit the generated code. You can play back your program one step at a time for debugging. *Smart* programs can be called up automatically when you load any *Smart* application.

Routines written in the programming language work on only one application at a time; however, you

can Jump from a program written for any given module to one written for any other. Using the built-in screen editor, you can create your own input screens and custom menus for any of the applications. Input screens are easy to construct, but menu creation is a more complex process.

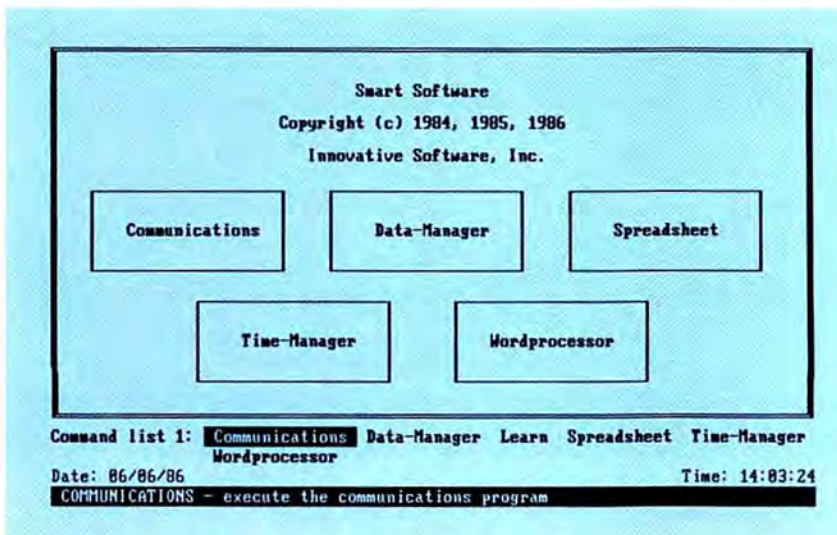
■ Canned Formulas and Higher Math

Smart places few limitations on the complexity of a formula. You can enter up to 1000 characters in a single worksheet cell. *Smart Data Manager* and calculator formulas can contain twice that many.

The numeric operators available for formulas include those for statistical and trigonometric manipulations. Text operators, which can be used in conjunction with logical and relational operators, let you compare, locate, verify, and concatenate alphanumeric strings. Date and Time formulas calculate the time elapsed between two dates or times, identify the day of the week of a particular date, and add or subtract increments of time.

■ The Smart Database Manager

The *Smart Database Manager* has already attracted a cult following among some ex-dBASE programmers. No other integrated software offers such a sophisticated data manager, and with the programming language on hand, application developers can have a field day. By letting Remember generate most of the code and then writing the fancier routines manually, a designer can quickly assemble a customized application.



Screen 1: The Smart System's main menu, with all applications installed. Unlike integrated packages that load several applications into memory simultaneously, *Smart* consists of a series of stand-alone modules that share a common command interface and can be tied together by *Smart*'s programming language.

Creating a new file begins with a simple columnar work screen. You type in a descriptive field name (up to 16 characters), a field type (Alpha, Date, Inverted Name, Numeric, Phone, Social Security, Time, or Counter), and a field length. Numeric fields have options for decimal precision and running totals.

Counter and Lookup fields automatically enter the data for you as the cursor passes by. Pressing <F2> enters today's date into any date field, while <F9> reenters the data from the last record. You can select key fields from a list that pops up on screen.

Defining a data entry screen is the next step in building a data base. *Smart* creates a default entry screen, which consists of a list of your field names. Making fancier custom screens is a matter of using the cursor to choose screen locations for each field. You can then enter titles, descriptive text, or entry prompts that differ from the original field names (see Screen 2).

You can attach as many as 10 entry screens to a single data file, and each screen can stretch up to 15 pages. You can specify mandatory entry of certain fields on a screen or designate a field as "read only" unless it's accessed by a certain password. It's also possible to trap some kinds of entry errors by requiring that entered data fall within a designated range.

To begin entering information into your data base, pick Load from the command menu (or press <Alt>-L). A list of available files pops up between

the work space and the command menu. (*Smart* performs this service any time you have to remember the name of a file, procedure, screen, query, or data range.) Choose the file you want, and a list of screen names pops up. Pick the screen and start entering your data.

Building Your Masterpiece

A summary of the *Smart Database Manager's* capacities provides some idea of the program's flexibility. As many as 14 files can be open and interacting with one another at the same time; each file holds 1 million records of up to 255 fields each. Fields can be calculated with all the power and complexity provided by the *Smart System's* functions and formulas.

Three relational commands control interaction between separate data files. Lookup retrieves information from another file based on the active file's data. For instance, all name and address fields can automatically be entered into an order form from a vendor file as soon as the vendor number is entered. The Transactions command moves, adds, or subtracts the contents of fields in one file into fields in another. This capability can, for example, post account balances from an invoice file to a general ledger file. Relate creates a new file from the contents of any two others.

Smart offers great flexibility in finding, organizing, and viewing information. You can quickly locate

Screen 2: The Smart Database Manager with four files open. Window 1 shows a user-designed input screen. Window 4 shows the default screen created automatically when a new file is opened.

Window 1

File # 394
Date Entered 00/00/00

PEOPLE

Pre-title Mr. First name Eric M.I. Last name Brown
Salutation Eric Business Title Assoc. Editor
Business Type Computer Mag.
Company PC WORLD Phone (415)861-3861
Address 1 Home/Alt Phone (000) 000-0000
Address 2 555 De Haro Street

Window 2

Name George Masters
Phone (608) 999-6543

Window 3

Customer No. 23 Sold To Name F
Company Name Carrington Lawn and Garde
Billing Address 84 South 14th Street
Carrington

Window 4

Inventory Code 110
Department LAWN/GARDEN
Main Category Power Equipment

Command list 1: Autohelp Browse Create Delete Enter F10 Goto Help
Print Query Report Scroll Update

File: PEOPLE3 Window: 1 Page: 1 Rec: 266 (266) Act: N
F10 - find records containing specified data

a few screens with the Find command, Browse the entire data base in columnar format by selected fields, or Scroll through the data base at variable speeds, screen by screen, or column by column.

Using the Query command, you can create subsets of data bases according to complex criteria. Queries are formulas incorporating any applicable *Smart* functions and operators, including Where and Replace. Where lets you speed up a Query by prescreening files and testing only those records that qualify. Replace lets you update multiple files simultaneously.

You can enter impromptu Queries and also save them to disk; they can be recalled later by the usual point-and-pick method. Other Query options count the occurrences of identical entries in a file or report on which records contain the least or most (or both) entries within a specified range in any specified fields. You can predefine routines for Lookup, Query, Relations, Report, Sort, Summary, and Transactions and select them from a submenu that appears when you use these commands.

Putting You on Report

Sophisticated data management capabilities aren't of much use unless you can produce meaningful printed summaries. That's why the caliber of the report generator makes or breaks a data base manager. Innovative Software includes two report generators in both the *Smart Database Manager* and the *Smart Spreadsheet*. The Print command prints the field names as column headers—good enough for “quick and dirty” tabular reports. More powerful is

the Report command, which lets you put any field from any file anywhere on a page. You can define page length, width, page numbering, headers and footers, and number of lines and characters per inch. Descriptive text can be centered or justified left or right, and you can copy, move, and delete items. Mailing label output is a predefined option, and tabular reports can have breaks for group totals and sub-totals. Using Report, you can even print a table report from one data base on the same page as a custom report from another.

It's hard to find fault with the *Smart Database Manager*. A note field would be useful for entering paragraphs of text, but otherwise the features are ample, and the documentation, performance, and error-handling are excellent.

The Smart Spreadsheet

The *Smart Spreadsheet* has earned a reputation as one of the fastest around (see Figure 1). A spreadsheet's maximum dimensions are 999 rows by 9999 columns, but those figures actually understate the amount of work space available. The program can use up to 8MB of EMS memory if available; otherwise it shuffles data to and from disk. The program also implements sparse matrix technology, which avoids wasting space with empty cells.

Spreadsheets can be handled most effectively if they're broken into smaller chunks and linked to-

LIABILITIES AND EQUITY		
Current Liabilities:		
Accounts Payable	7,188	5,288
Accrued Expenses	1,688	1,788
Accrued Taxes	588	488
Total Current Liab.	\$9,288	\$7,388
Mortgage Bonds Payable	16,188	16,888
Total Liabilities	\$25,388	\$23,388
Stockholders Equity:		
Preferred stock (\$188 par)	1,688	1,688
STATEMENT OF CHANGES IN FINANC		
for the Year Ended: December 3		
Sources		
Working capital provided by		
Issuance of long-term debt		
Issuance of additional capi		
Total Sources		
Command list 2: Border Columns Font Graphics Lock Paint Rownumbers		
Sort Titles Unlock		
Worksheet: BALANCE Loc: r26c1 FN: 8 Font: Standard		
BORDER - remove/restore current window border (toggle)		

Screen 3: The Smart Spreadsheet with three active files. The disparate appearance of the spreadsheets is due to the fact that borders, column numbers, and row numbers can be toggled on or off.

gether. You can link and window up to 50 spreadsheets that can take full advantage of *Smart*'s relational commands, programmability, and file transfer talents (see Screen 3). Consolidating spreadsheets into a master report is no problem—even if they were created in 1-2-3. Because any function preceded by an @ sign is calculated the way 1-2-3 would calculate it, *Smart* executes most 1-2-3 formulas directly.

The *Smart Spreadsheet* incorporates features such as sorting, protected cells, justification, named ranges, filling a row or column with incremental numbers, and multiple linear regression. *Smart* is one of the few spreadsheets that provide linear algebraic functions; matrix commands provide the abilities to generate eigenvalues and eigenvectors and to invert matrices using the Gauss-Jordan method.

Even though the *Smart Spreadsheet* integrates with the *Smart Word Processor*, you can create a decent-looking report without leaving your spreadsheet. The Report command lets you specify where you want to place ranges, repeated row and column titles, and headers and footers.

■ A Graphic Surprise

The *Smart Spreadsheet* boasts the most sophisticated built-in business graphics you can find in a spreadsheet program. You can create 78 different types and subtypes of charts, including several 3-D

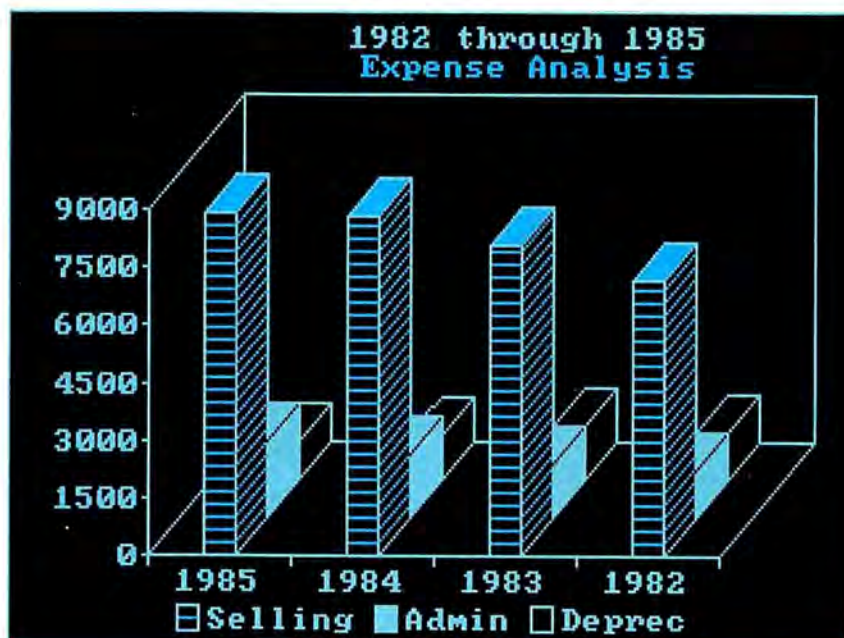
varieties (see Screen 4). You can also incorporate 16 colors, 14 fill patterns, and six type styles in three sizes for each. A built-in slide-show feature lets you string together a series of graphs. For high-quality output, *Smart* supports a variety of pen plotters as well as the Hewlett-Packard LaserJet. Charts can be sent directly to the *Smart Word Processor*.

■ The Smart Word Processor

As a stand-alone, the *Smart Word Processor* can't compete with the heavyweights, but interfaced with the other modules, it grows in stature. Not only can it assemble the output of the other modules, it can draw upon the powerful functions of the *Smart System*. For example, using the Macro function you can easily redefine the keyboard to suit your preferences. You can import graphics from the spreadsheet and have the text automatically wrap around them. Mailing lists from the data manager can be merged with word processed letters. *Smart*'s formulas and functions can be called up for in-text math, and its windowing capability lets you edit multiple documents simultaneously (see Screen 5).

The *Smart Word Processor* can't create multiple columns, process outlines, automatically number lines, or generate tables of contents, but the features it has are well implemented. The *Smart Word Processor*'s advanced capabilities include footnoting, headers and footers, alphabetized lists, automatic hyphen-

Screen 4: A three-dimensional stacked bar chart created directly from a *Smart Spreadsheet* range. You can create 78 different chart types and even tie them together in a slide show.



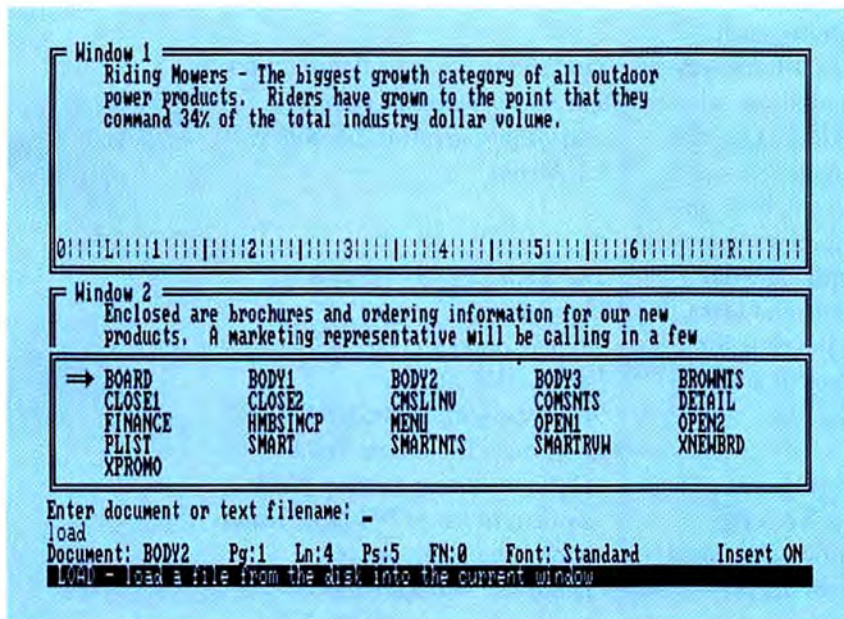
ation, and 11 built-in printer fonts. A font editor is accessible from the main system menu. If you have a graphics system, you can modify the existing fonts by editing the dots on a grid. You'll probably want to do this if you have a laser printer, as the existing fonts are rather crude.

The RAM-resident *Smart Spelling Checker* would benefit from a larger dictionary, but it does its work quickly and its design is solid. Sound-alikes pop up for each misspelling; selecting one of them automatically corrects the word. The program also informs you of incorrectly placed hyphens. You can spell-check by block, word, sentence, line, paragraph, document, or remainder of file. And you can delete, copy, or move your prose by the same increments.

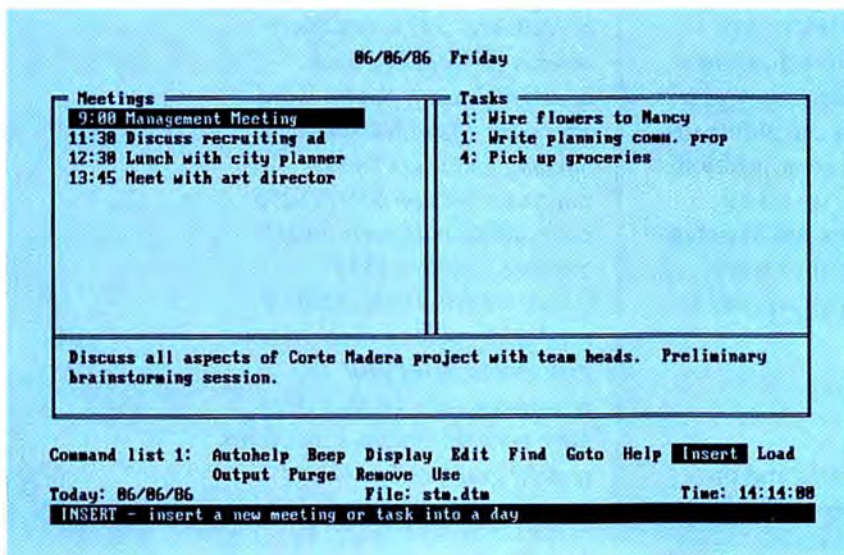
Despite its relative sophistication, the plethora of commands, menus, and prompts throughout the *Smart* System may frustrate experienced word processing people. On the other hand, people with little word processing experience will welcome these features.

Extra Communicated

Smart Communications, a full-featured modem program worthy of stand-alone status, comes with every *Smart* application. Since it's every bit as programmable as the rest of the system, you can make up



Screen 5: The Smart Word Processor with frequently used boilerplate paragraphs displayed in separate windows. Note the pop-up window at the bottom of the screen that refers you to other paragraphs listed in the directory.



Screen 6: Smart's Time Manager. You can attach a note to each task or appointment. Smart also includes a programming language, two calculators, a line editor, and a full-fledged communications program.

auto-dial directories and create script files for automatic system log-ons. Its ability to work in unattended mode lets you download stock market reports, news headlines, and electronic mail while you're away from the office.

You can capture incoming information to a file, a buffer, a printer, or any combination of the three. Once you've captured text, it can be sent directly to any *Smart* application. The Format option enables columnar text to be automatically translated into spreadsheet or data base format. You can also exchange programs and spreadsheets with other computers using the XMODEM error-checking protocol.

■ Desktop Accessories

In addition to Smart Communications, each *Smart* package includes a Time Manager, a RAM-resident calculator (the F-calculator), a stand-alone calculator (the G-calculator), and a Text-Editor. Like the communications module, the Time Manager runs as a separate application. It functions as a handy little appointment book and list manager that displays your appointments by the day, week, or month. The day screen automatically inserts appointments and tasks in the proper sequence when you enter the time for an appointment or give a priority number to a task. You can attach a three-line note to either (see Screen 6).

The two calculators serve slightly different purposes. The G-Calculator, accessible only from the main menu, contains ten memory locations. A limited number of functions can be used in algebraic, formulaic, or Reverse Polish Notation (also known as RPN or postfix) calculator modes. The RAM-resident F-Calculator pops up from within any *Smart* program; it calculates formulas of up to 1900 characters containing any of the *Smart System* functions. Upon exiting to the application program, you can automatically enter the calculated result at the cursor position.

The RAM-resident Text-Editor is useful for writing program code and making short ASCII notes. This simple line editor has no word wrap or word processing features, but you can find, replace, and insert lines.

■ A System Designer's Dream

The *Smart System* has more features and options than a Russian novel has characters and subplots—certainly more than have been described here. Suffice it to say that *Smart* may well be the system de-

signer's dream tool. *Smart* has been around for several years, and Innovative Software has been in the software business since CP/M was king, but the company hasn't let its software remain mired in the past. This product displays both experience and innovation. The data manager and spreadsheet are top of the line, and although the word processor can't compete with the heavyweights, it offers more than enough features for most users.

When you buy the *Smart System*, you get much more than three stand-alone applications. You get more than a variety of graphics, communications, and productivity goodies. With the *Smart System*, you acquire the potential for truly integrating the full range of your office tasks. ●

Ken Milburn is a freelance writer and microcomputer systems consultant based in Mill Valley, California.

*The Smart System version 3.1
Innovative Software
9875 Widmer Rd.
Lenexa, KA 66215
913/492-3800, 800/GET-SMART
List Price: The Smart System
\$895, multiuser version (three workstations) \$1795 (\$595 each additional user); Smart Database Manager \$495, multiuser version \$995 (\$295 each additional user); Smart Spreadsheet \$495, multiuser version \$995 (\$295 each additional user); Smart Word Processor (includes Smart Spelling Checker) \$495, multiuser version \$995 (\$295 each additional user); Smart Spelling Checker \$139
Requirements: 256K (320K if used with spelling checker), two disk drives (hard disk recommended), DOS 2.00 or later version; graphics and fonts require graphics board and monitor*

Fast and BASIC



BASIC is no lumbering giant. You can accelerate this most popular of computer languages with a series of commonsense—if often overlooked—programming procedures.

Greg Perry

||||| You won't start an argument by contending that BASIC has become the computer language of the masses. You might get a few takers, however, if you insist that it made it on its merits, with no help from firmware.

If you held your ground, you'd best your opposition. BASIC represents an unusually successful attempt to be many things to many people. It's comprehensive yet accessible, boasting features that even some mainframe languages lack. Although BASIC has its inelegant, unstructured side, it's none-


```

5 REM *** Program to print the
6 REM *** numbers 1 through 10
10 I=1
15 REM --- Print the number
20 PRINT I
30 IF I>=10 THEN 60
40 I=I+1
50 GOTO 15
60 END

```

Listing 1: A BASIC compiler reads and translates an entire program, identifying REMarks once and then ignoring them. An interpreter, however, reads and translates one program line at a time, so a REMark in a loop such as line 15 is interpreted repeatedly.

```

5 REM *** Interpreting REMarks slows
6 REM *** down BASIC programs
10 DEFINT I
20 FOR I=1 TO 100
25 REM --- This REMark takes up time
26 REM --- So does this one
27 REM arkable, isn't it?
30 PRINT I
35 REM --- We are almost done
36 REM --- with the REMarks
40 NEXT I
50 END

```

Listing 2: Interpreting the REMarks in this program slows the printing of the numbers 1 through 100.

theless easy to use. It relies on straightforward English statements—such as PRINT and INPUT—but is capable of complex operations, including creating and updating both sequential and random access data files.

Like most BASIC users, you probably tend to write programs as fast as you can—but you may well be bypassing ways to write the fastest programs possible.

BASIC veterans and fledgling programmers alike can profit from techniques that build programs for speed.

Computers cannot, of course, understand BASIC or any other high-level language directly. Their lexicon is limited to machine language instructions, encoded as 1s and 0s. Fortunately, because

human beings make the machines (and the rules), there's no compulsion to convey commands as strange, symbolic representations of bits and bytes. Thus, high-level languages use instructions that mere mortals can read and save as ASCII files. A single instruction in a high-level language represents a series of elemental machine tasks. Interpreters and compilers enter the scene as agents that translate our instructions into commands the computer understands.

Inside the Interpreter
Interpreted BASIC is a language of immediate gratification. Commands execute without compilation or linkages, and programs, once loaded, execute immediately. That's the case because interpreted BASIC programs are translated as they run. An interpreter reads a line of code, translates it to machine instructions, and executes those instructions. It then reads, translates, and executes the next logical line in the program, even if it has processed that line before (for example, in a loop of instructions). A compiler, on the other hand, reads and translates a BASIC program as an entity, writing to disk an entirely new file called an *object code file*. The object code file is then linked to other compiled program modules with a special program called a *linker*. Even if you have no other compiled program modules, you must use the linker to create a third disk file, the executable (.EXE) file.

While the compilation process is time-consuming, it generates code that executes in a flash; interpretive code, by contrast, is ready to run and can be edited easily and quickly, but executes slowly.

REMarkably Slow

Most BASICs (including the PC's) are interpreted rather than compiled. While interpreted BASIC programs may be compiled, compilers are generally used only by professional programmers. Interpreters have become a hit with novice programmers because interpreted BASIC programs are easy to tinker with and rerun.

Interpreters and compilers enter the scene as agents that translate our instructions into commands the computer understands.

That interactive environment is conducive to understanding and experimentation. The trade-off is execution speed: A compiled program is several orders of magnitude faster than an interpreted one.

If Listing 1 were to be compiled, for example, the entire program would be read and (except the REMarks in lines 5 and 15) translated into object code and stored on disk. (The compiler acknowledges the REMark lines only once and doesn't bother to compile any such lines of code.) The object code would then be linked to produce an .EXE file.

In contrast, if the program were run through an interpreter, each line would be individually translated and executed. Even REMarks are first identified and then ignored every time program execution loops through a REMark line. The program in Listing 2 requires some 500 interpretations of the REM statements within its loop. It's no wonder that inter-

preted BASIC incurs major speed penalties. But once you appreciate the strengths and limitations of interpreters, it's possible to optimize interpreted BASIC programs (see Figure 1 for a summary of recommendations).

Obviously, eradicating all REM statements speeds program execution. Good documentation, however, is vital to your ability to un-

derstand and modify a program. So in lieu of banishing REMs completely, you can just purge them from a run-time version of your handiwork. Documentation should be written *as* the program is developed, not afterward, and a thoroughly REMarked-up version of the program will serve as a permanent reference. In a nutshell: When writing a BASIC program, use REMarks liberally; once the program is written and debugged, copy it (giving it a different name) and eliminate the REMs.

Declaration of Dependence

Our quest for efficiency also entails declaring all variables as integer, single-precision, double-precision, or string variables by means of DEF statements at the start of the program. For integer routines, failure to declare a variable's type has the unhappy consequence of causing numeric variables to default to single-precision

variables. In such a situation, every time a FOR...NEXT loop is interpreted, for example, the index variable (such as the variable I in FOR I = 1 TO 10) would be carried out to six decimal places—a needless squandering of processing time.

Some programmers prefer to declare a variable's type explicitly when it's used, rather than relying on the global declaration of a DEF statement. You could, for instance, declare I as an integer by following it with the percent symbol at every occurrence in the program. Although this approach beats letting the variable default to single precision, you're still asking the computer to spend clock ticks interpreting I%. Program execution

Figure 1: BASIC programming tips to live by

- ✓ Delete REM statements from your code.
- ✓ Declare all variables with a DEFtype statement before the variables are used.
- ✓ Keep variable names short.
- ✓ Use variables instead of numeric or string constants.
- ✓ Place DATA statements at the beginning of a program.
- ✓ Put frequently called subroutines near the beginning of a program.
- ✓ Use the colon to combine as many statements per program line as you can.
- ✓ Eliminate all unnecessary spaces.
- ✓ Don't use extraneous words in statements.


```

5 REM *** Interpreting numeric constants
6 REM *** slows down BASIC programs
10 DEFINT I
20 FOR I=1 TO 100
30 PRINT 3.14159*I
40 NEXT I
50 END

5 REM *** Using a variable in place of a
6 REM *** constant speeds up BASIC programs
10 DEFINT I
20 PI=3.14159
30 FOR I=1 TO 100
40 PRINT PI*I
50 NEXT I
60 END

```

Listings 3a and 3b: Interpreting numeric constants such as 3.14159 in line 30 of Listing 3a (top) slows down execution. Replacing a numeric constant with a variable such as PI in line 40 of Listing 3b (bottom) speeds up execution.

is quicker if you declare I as an integer-precision variable with the DEFINT I statement.

With string variables, even die-hard, speed-conscious BASIC programmers tend to use H\$ rather than declaring H as a string in a single DEFSTR H statement. Like the I% approach, however, H\$ exacts its price in slower execution.

Furthermore, although IBM BASIC permits variable names of up to 40 characters, the shorter the name, the more efficient the interpretation. The drawback of brevity, however, is that the code is less informative.

Each time your program uses a numeric constant, you force BASIC to add steps to its interpretive dance. By examining the ASCII representation of each digit,

sign, and decimal point, the interpreter converts the constant to the special format BASIC uses to store numeric values. Every time the interpreter encounters a numeric constant, the dance begins anew.

You can forgo these gyrations by assigning a constant to a variable and using that variable throughout the program. Once the number is converted and the assignment made, BASIC simply looks up the variable's value in an internal table—and voilà: instant recognition. For an example of this, compare Listings 3a and 3b; the latter routine shows that pi is better handled as the variable PI than as the value 3.14159.

You can squeeze similar speed improvements from your code when working with string constants. Assigning such a constant to a variable once—and henceforth using that variable in place of the constant—shortens the program and eliminates multiple interpretations.

■ Jockeying for Position

Arranging statements in a sensible order is often the soul of an efficient program. Any time you use a set of READ and DATA statements, put the DATA statements as close to the top of the program as possible. When a READ statement is executed, the interpreter searches the program from the beginning to find the next unused DATA line, even though the DATA statements may directly follow the READ statements.

Likewise, when a program reaches a GOSUB, the BASIC interpreter goes to the beginning of the program and reads line numbers until it hits the subroutine's line number. BASIC simply isn't capable of proceeding directly to the line of code called. Therefore, it's a good idea to place the most frequently used subroutines ahead of routines you use less often. In doing so, you painlessly minimize BASIC's work when a program reaches a GOSUB. Obvious as it seems, this simple procedure is usually overlooked.

Presentation of BASIC statements can also bolster program performance. You can pack several BASIC commands into a single logical line (a maximum of 255 characters) by separating them with a colon. Listing 4a, for in-

stance, shows a seven-line program; Listing 4b shows the same program shortened to just two lines. The second arrangement yields the same result as the first but does it faster, simply because its statements have been combined. With the colon carrying the load, the interpreter no longer needs to decode line numbers.

Granted, the two-line program is a bit hard to decipher (which is why your original need not be quite this compact), but it leaves the seven-line version at the starting gate. Note also that the two-liner doesn't contain a single superfluous space.

Spaces can't be eliminated entirely. You'll need them (or other delimiters) to separate BASIC commands and variable names. For instance, the interpreter does

not understand PRINT I. Nor can you jettison spaces from string constants. Assignment statements, however, should read something like $A=B+C$ instead of $A = B + C$. Wiping out spaces may seem trivial, but the interpreter treats spaces just as it does alphanumeric symbols. As a rule, the fewer spaces, the better.

■ Repeat After Me

On the whole, BASIC programmers are savvy enough to avoid inserting redundant words and commands. Most have been omitting the redundant LET statement for so long they've probably forgotten LET exists. Obviously, $LET A=B$ is slower and less compact than $A=B$, which does the same thing. On the other hand, a few less obvious BASIC statements—like OPEN—also lend

themselves to shortcuts. OPEN O,1,filename can do the work of OPEN filename FOR OUTPUT AS #1 LEN=128 in less than half the space.

This litany of tips is just the beginning of resourceful, efficient programming. Most of the code you'll be generating in this way isn't pretty and doesn't make for especially readable listings. But the only thing likely to slow you down is the edict that you keep both sleek and well-documented versions of your programs. Good luck and good programming. ●

Greg Perry is a writer and programmer based in Tulsa, Oklahoma.

```
5 REM *** This program is big and thus slow
10 CLS:PRINT "Hello."
20 PRINT
30 PRINT "Who are you";
40 INPUT N$
50 PRINT "Well, "N$", I'm pleased to meet you."
60 END

5 REM *** This program is more compact and thus faster
10 CLS:PRINT "Hello.":PRINT:PRINT "Who are you";:INPUT N$:PRINT "Well, "N$", I'm
   pleased to meet you.":END
```

Listings 4a and 4b: Using a separate line for each statement as in Listing 4a <(top) makes programs readable but slow. Statements separated by colons can be packed together in one program line of up to 255 characters to make programs faster, as in Listing 4b (bottom).

Remote Quadrille



If you have long-distance training, support, or telecommuting needs, a specialized breed of remote communications software may be the answer. Remote software such as Remote, pcANYWHERE, Carbon Copy, and CloseUp lets you operate your PC by modem and allows two distant users to collaborate on a PC project together.

Judy Getts and Michael Markowitz



||||| 'STOP! STOP! ...' '^K^Z^Q^C^Q ...'
Beep! Beep! ... '^H^T^Z^G^4^O^ ...'
'NOOO! ...' '^G^T^V^ K^V^A^T ...' Beep!
Beep! Beep! Beep! Beep! Beep! Beep! 'AaarrGGG
Grrhh! ...' '^K^V^K^V^V^V^K ...' 'HElppp!
HEEELP!' Beep! 'What are you doing to my PC?!'
Beep! Beep! ... '^K^ ...' Scroll-scroll-scroll. 'Me?!'
'^X ...' Beep! Beep! Beep! ...

(Two people trying to execute WordStar commands simultaneously on opposite sides of the country.)

The first time you stepped out onto a dance floor your palms were sweaty and your feet as maladroit as the pedal extremities of a diplodocus. You took your partner, the music rolled, and before you knew it, both of you were apologizing for bumping kneecaps.

Using remote communications software to get in sync with a far-flung PC can be as awkward as learning to dance. Remote congruence requires not only prior agreement on rudiments like stop bit and parity, but often more global orchestration. You need to establish what programs to run once the PCs are connected and who is going to press what when. Call it the quadrille of communications. Transferring files, by comparison, is but a two-step.

In the past year a host of packages labeled *remote* have entered the PC communications market.

This review examines four non-copy-protected remote programs: Microstuf's *Remote* version 1.30, Dynamic Microprocessor Associates' *pcANYWHERE* version 1.30, Meridian Technology's *Carbon Copy* version 2.14, and Norton-Lambert's *CloseUp* version 1.10. The capabilities they provide are as divergent as the appellation remote is vague (see Table 1 for a comparison of features). Some of

Buying a remote program may be just the excuse you've been looking for to pick up a high-speed modem.

these programs are best suited for calling up your PC from a distant modem and fetching files, others for working on a spreadsheet with a remote PC user. A few even allow you to toggle the phone line between voice and data as you work.

Remote packages are a breed in themselves; they won't download program listings from your favorite bulletin board or send E-mail on its way. The one capability they share is allowing one PC to access the operating system of another—from a distance. A PC user calling in to a system running remote software can run programs, execute DOS commands, transfer files, and do just about anything he or she could do while sitting in front of the distant PC. Both keyboards compete for input privileges on the PC.

Remote programs basically fall into two camps. In the traditional approach used by *Remote*, the program resides on the remote PC (the one being accessed), and any PC or terminal can call in. The other strategy, adopted by *Carbon Copy* and *CloseUp*, requires programs at both ends: a small memory-resident program on the remote (accessed) side and a more powerful program on the local (calling) side. You can configure *pcANYWHERE* to run under either method. With all four packages reviewed here, the user of the remote PC can never access the DOS of the local PC.

One further warning: All of these programs are difficult to learn to use effectively, and they're plagued with bugs. But then, the genre is young. It wasn't long ago that remote communications on a PC was esoteric stuff.

Remote Applications

Whether you really need remote software depends on your application. Several general-purpose communications programs, such as Norton-Lambert's *Lync* and Microstuf's *Crosstalk XVI*, include some remote capabilities, albeit primitive ones. While these programs will suffice for occasionally calling an unattended PC to transfer a file, they lack collaborative features, such as a copilot mode that enables users at both ends to confer while working on an application.

If you require remote access day in and day out, nothing short of a 100 percent remote package will do. Not only can you access your company's scattered PCs to update data bases or connect with your office PC while you're on the road or at home, you can also collaborate with another PC user on an application program. Remote software is the only practical solution for long-distance technical support and tutoring or giving a long-distance PC slide show or software demo.



















Before we dance the remote quadrille, take heed: For the most part, running programs remotely or collaborating on an application is slow going; refreshing entire screens from a distance takes more time than sending files. We tested these packages with 1200-bps Hayes-compatible modems, but all four programs support 2400- and 9600-bps modems, which should boost performance considerably. Buying a remote program may be just the excuse you've been looking for to pick up a high-speed modem.

Remote

'HElp, hElp, help!' A lone, distant telecommunicator was calling our Remote system. The cries were affecting, no less so for being typed directly after the DOS prompt. All the while we sat watch by the screen of our PC and chuckled. 'Eel?p!' the intruder cried again, and the cursor leapt to and fro on the screen like Tinkerbelle. Apparently our caller had just discovered the special keyboard sequences. 'Hit the deck!' we typed back. But it was too late....

Microstuf's *Remote* is the granddaddy of remote software, having been around since the heyday of CP/M. Like an old hooper on the road to retirement, the program lacks pizzazz, but nevertheless it has some endearing qualities.

Table 1: Feature comparison of four remote communications packages

	Remote	pcANYWHERE	Carbon Copy	CloseUp
Packages needed	1 copy at remote PC, some type of terminal emulation at local station	1 copy at remote PC, 1 at local PC or some type of terminal emulation	2 copies: 1 at local PC, 1 at remote PC	1 copy of Support version at local PC, 1 copy of Customer version at remote PC
Machines that can access package	Any terminal or computer with terminal emulation	Any terminal or computer with terminal emulation	IBM PC with Hayes-compatible modem	IBM PC with Hayes-compatible modem
Error-checking protocols	XMODEM and proprietary	XMODEM	Proprietary	Proprietary
Error-checking of keystrokes				
Screen-capture function				
Session-capture function				
Supports graphics				
Supports color				
Switches from data to voice				
Pop-up chat window				
Password protection				
Electronic mail feature				
Modems supported	Any asynchronous	Hayes compatible only	Hayes compatible only	Hayes compatible only
Highest speed supported	9600 bps	19,200 bps	56,000 bps	9600 bps

You can access a PC running *Remote* from any terminal or computer equipped with a communications program that includes some form of terminal emulation (almost all do). Of the other three programs, only *pcANYWHERE* can make this claim, but its terminal emulation mode does not operate as well as *Remote*'s. And because *Remote* provides the highest level of security of the packages reviewed, you can confidently leave it running on your unattended PC.

On the downside, *Remote* is the only program reviewed that lacks a copilot mode. Although two people can share the keyboard on *Remote*, the program provides no pop-up chat window or other feature to facilitate on-line collaboration. The only way to communicate or to coordinate your moves is to chat on the DOS command line or from within a

word processing program; both methods prove inefficient.

While running an application on the remote end, *Remote* is freakishly slow at updating the local screen. It paints the screen line by line. Furthermore, the poor documentation neglects to mention such essentials as *Remote*'s inability to run alongside many memory-resident programs, including Borland's *SideKick*. Nor does *Remote* support color or graphics. Finally, because the program regards the PC as a dumb terminal, the PC's 25-line display shrinks to 24 lines.

Installing *Remote* on your PC is similar to setting up an ordinary communications program to wait

for a call. You set the parameters, name the users who can access your PC, and assign passwords (see Screen 1). *Remote*'s password directory also lets you specify the type of terminal emulation for each user and what batch files (if any) to run when the caller connects.

When users dial into a PC running *Remote*, they're greeted by its DOS prompt and acquire total access to the system; they can update data bases, open spreadsheet files, and essentially do anything they wish. They can also pick up or drop off files using one of two error-checking protocols: XMODEM or Microstuf's *Crosstalk* protocol. After a caller logs off, the system resets itself to await the next call.

Remote is the only package reviewed that contains an electronic mail program. Callers can send and receive messages via a simple bulletin board message center. Another unique *Remote* feature is the log it keeps of everyone who calls the system, including time and date of log-on and any unsuccessful log-on attempts.

If you only need to transfer files or use DOS commands, *Remote* works fine. Try to use *Remote* to run programs remotely, however, and you'll encounter an exercise in futility. The remote PC is so preoccupied with transmitting and updating screen images, it hasn't time to respond to commands. Often it won't

accept commands and will beep at you; when it does acknowledge what you've typed, the delay in echoing characters to the screen is agonizing. Running programs *Remotely* is like trying to tango in knee-waders.

Most of *Remote*'s flaws are trade-offs for compatibility with a diversity of equipment. In sum, *Remote* may be the only reasonable choice for a company that needs remote access to an assortment of terminals and computers. But PC-only users who want to collaborate by modem should read on.

pcANYWHERE

'Brace yourself', he typed across the screen, 'we're about to enter the LAN. Don't hit anything, just follow me. And remember, if you get lost, log off, wait 15 seconds, then log back on.' 'Gotcha', I tapped out. My response looked confident, echoed up there on the screen, but in reality I was uneasy, nervous as a street urchin sneaking into a movie theater.

My guide typed a pathname. Another appeared, then another, each flashing up in succession. Then came the passwords; only strings of ellipses showed, like dim comet tails. After that we entered a subdirectory. I had paused to scan a couple lines of pathnames and puzzle out where we were, when horizontal bars suddenly flashed across my screen. 'We made it!' my guide announced. 'Like to try to switch into UNIX now?'

Screen 1: Setup screen for Microstuf's *Remote*. While this venerable program lacks the bells and whistles of its imitators, it's the only remote program with a built-in bulletin board function, and it supports various terminal types better than any other.

```

REMOTE V.1.3                                     (C) 1981, 82, 83, 84, 85, Microstuf, Inc.

Current REMOTE system Setup

----- Communication Parameters -----
B - Baud rate ..... 1200                      P - Parity ..... None
C - Communication port .. 1                    S - Stop bits ..... 1
T - Standard Terminal .. Dec VT50/VT52        D - Data bits ..... 8

----- System Options -----
I - Inactivity Timeout - 10                    R - Automatic Restart .. Enabled
A - Answer ring count .. 1                     L - Password limit ..... 5

X - Exit to Main Menu

Enter your Choice: T
    
```


pcANYWHERE is Dynamic Microprocessor Associates' attempt to pick up where *Remote* leaves off. Unlike *Remote*, the program features a pop-up chat window, the ability to customize the keyboard and the screen, a programmer's interface for writing

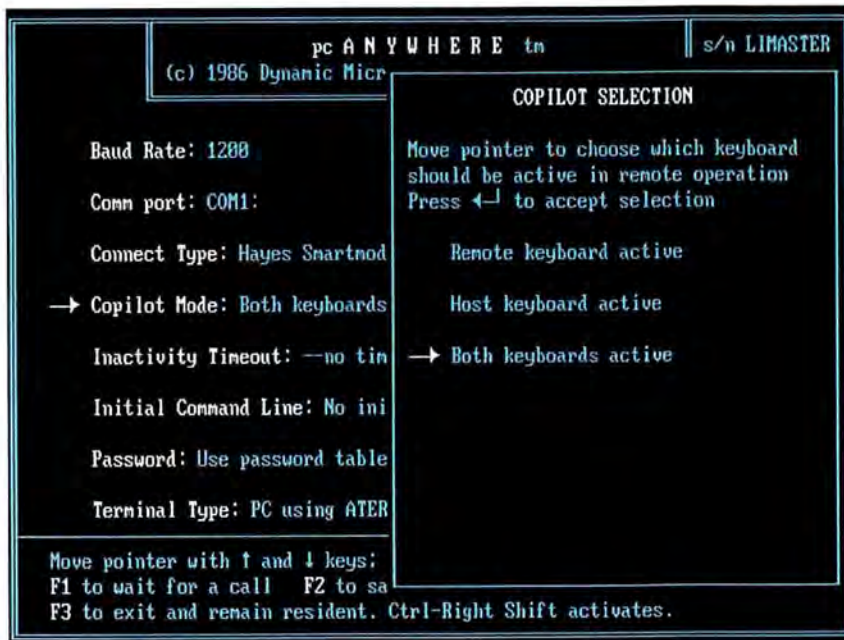
pcANYWHERE's terminal emulation is slow and crude. Depending on which terminal you're emulating, the program updates screens piecemeal.

your own front end, and excellent documentation. You can restrict callers to running only certain programs, and you can fine-tune the copilot mode to exchange control of the keyboard (see Screen 2). Like *Remote*, *pcANYWHERE* includes password protection and automatically resets to await the next call.

There are two different ways to link up to a remote PC running *pcANYWHERE*. As in *Remote*, you can log on from any terminal or computer that has terminal emulation. Or, if you're using an IBM

PC with a Hayes-compatible modem, you can improve performance by installing *pcANYWHERE* on both ends of the connection. When two *pcANYWHERE*-equipped PCs communicate, the performance is dazzling. Running programs remotely is nearly as good as running them at your own PC, with only a minimal lag in displaying characters to the screen. With the program on both sides, you load *pcANYWHERE* on the local end as a RAM-resident program. The user who runs into problems brings up *pcANYWHERE* on top of the application already running and then instructs *pcANYWHERE* to either answer or call the technical support person. After making the connection, the user pops back to the problem screen so both parties can work on it together. You can bring up the chat window by pressing <Ctrl> with the right <Shift> key at any time during an application.

pcANYWHERE isn't perfect. When a caller disconnects without logging off properly, the remote PC freezes. Furthermore, *pcANYWHERE* sometimes responds with alarming slowness to commands while off line, and once you exit the program to return to



Screen 2: Setup screen for *pcANYWHERE*, displaying a pull-down menu for fine-tuning the copilot mode. While *pcANYWHERE*'s terminal mode is slow and sticky, the program is a top performer when both sides of the connection use *pcANYWHERE*.

DOS, the program's screen and cursor attributes follow right along with you. Also, the program supports neither color nor graphics.

Call up a PC running *pcANYWHERE* with communications software other than *pcANYWHERE*, and the picture grows dimmer. *pcANYWHERE*'s terminal emulation is slow and crude. Depending on which terminal you're emulating, the program updates screens piecemeal—half a line in one corner, another at the bottom, and a smattering all across kingdom come—until you've got a crazy quilt of remnants from various screens. The debris even starts to invade the chat window. Also, as with *Remote*, your PC is stuck with a dumb terminal's 24-line screen.

The program has other bad habits in terminal emulation mode. Like *Remote*, *pcANYWHERE* locks up keyboards at either end while it's busy painting characters on the screen. After you exit the chat box and return to the DOS prompt, the program echoes characters onto the screen at a sluggish pace. If you call in to *pcANYWHERE* with a Macintosh running VT 100 emulation, you'll see the program leaving characters on the screen as it scrolls, like wounded soldiers left on the battlefield.

So skip trying to access *pcANYWHERE* with anything other than a PC running *pcANYWHERE*. Call into it with *pcANYWHERE* and you'll find the program's response time without rival.

Carbon Copy

The line typed itself slowly across the screen in the chat window. It conveyed a weary tone. 'Let's try this one more time ...' 'ok', I typed sheepishly, 'I'll press <F2>'. 'YOU DON'T PRESS ANYTHING, UNDERSTAND?' 'ok'. 'Not the <Esc> key, not <F1>, not <F7>, and certainly not <F8>!' Got it?' I nodded but couldn't bring myself to respond in type. A few seconds later a box popped onto the screen with the message 'Voice Mode Requested'. I pressed the key to accept, waited for the prompt, then picked up the phone. As I pressed another key to silence the modem, I prepared for the tirade. Finally, the voice came through loud and clear: 'How dare you help yourself to my collection of blackjack games!' What could I say? ...

Carbon Copy by Meridian Technology helped pioneer the collaborative copilot mode and next to *Remote* is currently the most prevalent of the remote programs. The program was designed for on-line collaboration and for providing technical support. That doesn't mean you can't leave it running unattended on a PC, but since the program's security features are

The remote version of Carbon Copy is memory-resident. While on line, either user can easily toggle the display on and off to reveal or hide the application below.

weak, you may be reluctant to do so. The program accepts only strict PC compatibles with Hayes-compatible modems at either end of the connection, and both must be running *Carbon Copy*.

The *Carbon Copy* disk provides three major programs: one to install *Carbon Copy*, one to run on the remote PC, and one to run on the local PC. The installation program lets you set parameters and passwords to access the remote PC. There's also a quirky dialing directory that occasionally hangs your system, but the program somehow manages to dial the numbers correctly.

The remote version of *Carbon Copy* is memory-resident; you can call it in the middle of an application by pressing <Alt> in conjunction with the right <Shift> key. A menu appears that lets you dial a PC running the local version, capture and review screen images, and switch the phone line from data to voice. The local PC's screen is identical to the remote screen, and on both systems a chat box appears at the top (see Screen 3). While on line, either user can easily toggle the display on and off to reveal or hide the application below. Because both screens and keyboards are linked, both users almost always see the same thing.

Carbon Copy's fanciest feature lets you toggle back and forth between data and voice with the <F2> key, without any noise interference creeping onto the screen of either PC when you make the switch.

Although the program usually works simply and logically, it has its flaws. Navigating the screen of an application running on the remote PC is still slow for the local user, but it's not as trying as terminal emulation via *Remote* or *pcANYWHERE*. Although *Carbon Copy* supports color and graphics, it won't run with interactive graphics. For example, it will crash if you try to access Autodesk's *AutoCAD* remotely. Another problem: The password, dialing directory, and communications parameters are all stored in the installation program, so both parties must exit to DOS and load this program to make changes.

The local user must perform file transfers and other remote DOS functions with a separate program called CCDOS. Accessing the remote PC's DOS directly would be much easier. Also, CCDOS has limited error handling. When we tried to access a drive on a remote PC that, unbeknownst to us, lacked a floppy, the screen filled with lines of capital Es. We assumed they stood for *Error*.

Despite an occasional pratfall or two, *Carbon Copy* is a capable program. It handles screens nicely, transmits graphics, and sports an excellent voice/data switch. Most importantly, its speed makes plausible the idea of working collaboratively on an application with another PC user.

CloseUp

'This pROgram'S A SCREAMer. IF ONly iT WOULDn'T CauSe MY KeYBOard to KEEp leAP-ING iN aND OUT of CapS In thE CHat WinDOW LiKE THIS!' 'I KNoW I hAveN'T tOUChEd ThE cAPs kEY oN my KEyBoaRd, HAve YoU oN YOUs?' 'nO, BUt WHenEveR YoU PRess ThE SHifT keY iT TraNsmITs TO My bOARD aS IF i hAd pREsSed thE SHifT kEY.' '<Ha-Ha-Ha!> GOod gRIeF THiS IS FrUstrAtIng!'

On a dance floor full of remote software with two left feet, *CloseUp* by Norton-Lambert may not be Fred Astaire, but at least it's been to dance class. The package was designed specifically for providing technical support to a user on a distant PC, but it's suitable for more than that.

CloseUp consists of two programs: the Support (local) version and the Customer (remote) version. The packages are sold individually, but you need one to connect to the other. Customer is a small memory-resident program that sets up the remote PC to accept incoming calls or to call the PC running the Support version. Once connected, the Support user can take control of the Customer's machine, running applications and accessing the Customer's *CloseUp* menus.

The screenshot shows the Carbon Copy (CCHelp V2.14) interface. At the top, there are two dialogue boxes. The first, 'Your Dialogue', contains the text 'How does this look Nathan?'. The second, 'Remote Operators Dialogue', contains the text 'It looks fine on this end, but you are over budget in March!'. Below these, a status box displays 'Carbon Copy (CCHelp V2.14)', 'Licensed by: Meridian Technology (714)476-2224', 'Serial# 88888864 Licensed to: PC World', and 'Data Link is Established'. A box at the bottom left shows 'Time 8:33:48' and 'Connect 8:14:48'. On the right, a menu lists functions: IF11 Terminate Data Link, IF21 Enter Voice Mode, IF31 Capture Screen Image, IF41 Review Captured Screen Image, IF51 File Transfer Package, IF71 Change Display Mode, IF81 Data Link Maintenance, IF91 Repaint Screen & Return, and IF101 Return to Application. The background is a spreadsheet with columns for Jan, Feb, and Mar, and rows for Desc., Cost, Freight In, and Warehouse.

	Jan	Feb	Mar
Carbon Copy (CCHelp V2.14)	6	12	18
Licensed by:	3,780.00	\$7,560.00	\$11,340.00
Meridian Technology (714)476-2224	\$132.38	\$264.68	\$396.98
Serial# 88888864 Licensed to:			
PC World			
Data Link is Established			
Time 8:33:48			
Connect 8:14:48			
Desc.			
Cost	\$657.00	\$3	
Freight In	\$32.00		
Warehouse	\$6.57	\$78.84	\$157.68
			\$236.52

Screen 3: A glimpse of an on-line session with Carbon Copy. A chat window is superimposed over the spreadsheet that both users are examining.

The Customer user, however, cannot access the Support machine.

The pull-down menus on either side of the connection are similar, but the Support menu is more elaborate (see Screen 4). It includes options for setting communications parameters, phoning out or awaiting a call, reassigning keys, executing DOS commands on the Support PC, capturing screens, creating pictorial play-by-play logs of an on-line session, and more. The Customer menu is a simplified version of this, the main difference being its inability to initiate file transfers or make screen captures.

During *CloseUp* sessions an application can be running in the background on the Customer PC. For

CloseUp leaves a good impression. You can save screen captures into 'slide carousels' to play back in slide-show format.

the Support user, flicking back and forth between the Support menu, the Customer menu, and the Customer's application is as easy as flipping channels on a TV.

While impressive, *CloseUp* is a recent release and not without its defects and idiosyncrasies. It won't allow you to transfer files unless their names include extensions, and the program never tells you when the PC on the other end disconnects. After you exit the Support version, the screen cursor doesn't return to its original shape. For file transfers, *CloseUp* uses Norton-Lambert's proprietary error-checking protocol, a fast protocol that uses data compression. However, on one occasion we did lose a few blocks of data. The only major problem we encountered was the program's refusal to run *AutoCAD*.

CloseUp is rich in frills. It error-checks every keystroke sent between the two PCs, so no stray characters pop up on either screen. *CloseUp* supports

color and graphics, and it does a nice job of mapping to the screen of the local PC. The program includes two separate screen-capture functions: One saves a screen as graphics; the other saves a screen as ASCII text for inclusion in word processing files. You can save screen captures into "slide carousels" to play back in slide-show format. Even in its primal form, *CloseUp* leaves a good impression.

Would You Care to Dance?

If you've read this far, you've probably concluded that the Ginger Rogers of remote programs has yet to be born. You're probably right, and you may want to wait until these programs mature. On the other hand, if you've got to go remote, you've got to go remote. Despite their problems, all these programs merit serious consideration.

CloseUp is the program you want if you need to provide tech support or work in tandem on an application with another PC user. *CloseUp* bears the heftiest price tag, but considering its wealth of features and relative lack of bugs, it's the one most worthy of its cost.

pcANYWHERE ranks second. The swiftest of the pack when it comes to working interactively in copilot mode, it's also the cheapest package. Furthermore, its ability to be fully customized puts it a cut ahead.

Carbon Copy rates a close third. It's not that much cheaper or faster than *CloseUp* and has somewhat more limited features than either *CloseUp* or *pcANYWHERE*. Although some of *Carbon Copy*'s features, such as the voice/data switch, are excellent, the segregation of its programs makes for too much extra work.

Remote is your choice if you need a plain and simple system that can be accessed by a wide variety of terminals and computers. Although its security and electronic mail features are noteworthy, *Remote* can't keep pace with its competitors beyond simple file transfer.

One final note: If you do decide to jump into the remote quadrille, go into it with patience, consider buying a high-speed modem, and above all, keep your blackjack games well hidden. You never know who's going to be snooping around your PC. ●

Judy Getts writes on telecommunications from a remote location in Wisconsin. Michael Markowitz is an associate professor of mathematical sciences at Loyola University of Chicago. Remote assistance was provided by Peter Olson, a telecommunications engineer in Watertown, Massachusetts.

Carbon Copy version 2.14
Meridian Technology
1101 Dove St. #120
Newport Beach, CA 92660
714/476-2224
List price: \$195
Requirements: 128K, one disk drive, DOS 2.00 or later version, Hayes-compatible modem

CloseUp version 1.10
Norton-Lambert Corp.
P.O. Box 4085
Santa Barbara, CA 93140
805/687-8896
List price: Support \$245, Customer \$195
Requirements: Support 192K, Customer 48K; one disk drive; DOS 2.00 or later version; Hayes-compatible modem

pcANYWHERE version 1.30
EKD Computer Sales & Supplies Corp. (authorized distributor)
764 Middle Country Rd.
Selden, NY 11784
516/736-0500
Dynamic Microprocessor Associates (manufacturer)
545 Fifth Ave.
New York, NY 10017

212/687-7115
List price: \$95
Requirements: 128K, one disk drive, DOS 2.10 or later version, Hayes-compatible modem

Remote version 1.30
Microstuf
1000 Holcomb Woods Pkwy.
Roswell, GA 30076
404/998-3998
List price: \$195
Requirements: 128K, one disk drive, DOS 2.00 or later version, asynchronous modem

C 12:32:35—E 00:27:40

Close-Up V 1.10 Norton-Lambert Corp. Support Menu Sync Mode Connect

Phone Setup Display Keys **File** Print Record Playback Transfer

	JAN	FEB				
NORTHERN	34.23	30.57				
SOUTHWEST	12.36	16.58				
CENTRAL	58.68	47.47	47.79	38.89	39.11	39.24
SOUTHERN	27.27	27.82	23.83	16.74	16.35	16.36

Save Menu Parameters
End Close-Up
Change Directory
List Directory
Execute a command

Y " JUNE
Enter Criteria
B:*.*

Want me to send you the figures I have Earl? The ones for the southwest territory are more recent than yours.
Sure.
Hold on a minute...

Up and down arrows move Chat window

Screen 4: The Support screen of CloseUp while on line. In the background sits the Customer's spreadsheet. Only the Support person sees the pull-down menu. Currently the Support person is selecting the file option to call up a directory. The chat window appears at the bottom.

Network Management: Tips and Traps

A local area network doesn't live by installation alone. This guide to network management outlines what you need to know—and do—to keep the beast contented and well cared for.

Bill O'Brien

|||| It began with your aptitude for writing batch files. You worked diligently, tricking up your AT and quietly gaining a reputation as a good person to know when the chips were down.

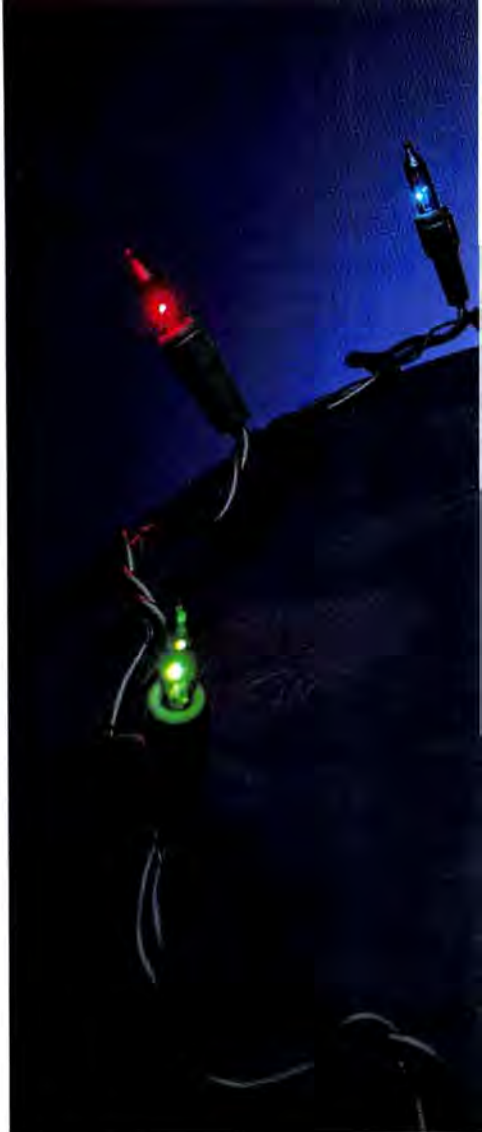
And now it's come to this. Your knack for squeezing power from your system has gotten you elected administrator of an office full of systems. You sense the Peter Principle at work.

Welcome to a growing club of skilled users drafted into the thankless ranks of network managers—a dubious reward for your ingenuity, but an increasingly vital corporate assignment, nonetheless.

Your commitments elsewhere in the organization, coupled with the modest scope of your department's LAN (local area network), ensure that these duties won't claim all your time. Still, as someone with more than a modicum of

PC experience, you have no illusions about what it will take to keep the network humming. A truly irascible LAN may demand 10 to 12 hours of babying each week, even after the usual shake-down period.

Caring for a LAN entails protecting system integrity, scheduling net operations for maximum efficiency, and maintaining a prudent watch over hardware and software to prevent downtime during critical-use periods. You'll have to orchestrate harmonious relations among DOS versions, peripherals (be they accelerator or multifunction boards, graphics adapters, printers, gateways, bridges, or what have you), RAM-





Charles Kemper

resident utilities, and full-blown multiuser application packages.

To keep the LAN from dominating your office, you need to make good work habits a collaborative routine. Fortunately, you're not alone; there's a growing body of wisdom—some of it conveyed here—to help you develop and perfect a regimen to simplify your life. In addition, a variety of network management tools are now hitting the market (see the sidebar "Help Wanted"). You'll also need an assistant capable of serving in your stead. If you've done your job correctly, he or she should even be able to resolve minor snafus.

A Conductor Through the Din

As maestro of network operations, you oversee an "average" network: 6 to 10 workstations with 20MB to 40MB of shared hard disk storage in 2 PCs, pressed into service as file and print servers, respectively; and two printers, one dot matrix, one laser. Your net may be modest in size, but it's ambitious in scope; users share peripherals and data alike.

Your learning curve is steep; you'll want to find out as much as possible as soon as possible. Management tasks should begin when the net is installed (although that's a luxury you may not have). Whether your company has retained a network installer, a sys-

tem integrator, or simply the services of a hardware vendor, be an inquiring witness. Learn all you can about the net's components and its configuration. In the course of your activities, you'll find that "the network" is a distinct entity from "the hardware," despite their interdependence.

If your net is installed by a system integrator, don't skip the obvious: Note the company name, contact person, and phone number. Get information on warranty and service contracts (see Figure 1). System integrators typically install updates of network software and back you up with on-site troubleshooting. Some kind of support arrangement with the system integrator is crucial; because that firm knows your network intimately, it's a more appropriate refuge than the manufacturer when trouble strikes.

Help Wanted

Wes Nihei

Sisyphus would have made the perfect network administrator. Like the legendary Corinthian king's rocky dilemma, a network manager's job can be an exercise in frustration.

Fortunately, off-the-shelf help for LAN czars is on the way. Networks have finally begun to catch on, and that growth is fueling a market in network utility software to help keep them running.

These utilities make the network manager's job easier by enlisting a PC to monitor LAN operations. Network management software now includes packages that help coordinate user requests, track the usage of a particular program or file, gauge the amount of storage space used by a given workstation, and keep tabs on the number of times a network is accessed remotely or sends data through a communications link.

Among the first in what's certain to be a growing genre is *Net Utilities*, from Network Enhancement Tools; this program monitors electronic mail and user activity and permits memory-resident print spooling from within an application. Novell Networkware system managers can create reports on file and volume usage, including update and creation dates, and modify user access privileges with J. A. Lomax Associates' *Network Management Report Utilities*. Pacific Software's *Network Assistant* is a menu-driven, RAM-resident program that provides LAN managers with control over network printing resources and permits customization of each workstation's menu.

Network vendors are also recognizing that managers can use a little help. Corvus Systems, Banyan Systems, and Novell all offer LAN software utilities that bestow varying degrees of network monitoring and control on LAN administrators. Micom's *Inter-*

lan utilities log specified network activities. *Tapestry* from Torus Systems enables a LAN manager to monitor and set priorities for print operations. Consumer Software's *Network Courier*, a network communications program, caters to network managers by providing functions that modify user groupings, analyze and control storage requirements, and monitor system usage. The program also reports the size and number of open files and indicates the amount of storage currently occupied.

For the accomplished manager thinking of expanding the department's network, Innovative Software's *SmartLan Test* offers a series of predetermined benchmarks that measure performance degradation as PCs are added to the network. The resulting figures help you decide whether adding a station is all that wise an idea.

The importance of network management isn't lost on IBM. With the

Token-Ring Network Manager, a network administrator can track problems to a single workstation. Workstation network adapters monitor network traffic and notify the *Network Manager* when a station fails; the LAN manager can then remotely disconnect the workstation from the ring and reconnect it when the problem is resolved. IBM's Netview, a mainframe-based program for managing SNA networks, also offers limited monitoring and control functions for the Token-Ring network. A LAN manager can send diagnostic information collected by *Network Manager* to Netview for further analysis.

As the network manager position crystallizes, software for network housekeeping will become more finely honed. In time, net management will no longer be a Sisyphean task.

Wes Nihei is the
Editorial Assistant
for PC World.

As you ferret out details on each PC's complement of expansion boards, keep a log of repair information (see Figure 2). Don't limit this record to boards; maintain

A *physical device* is simply any item of hardware—whether server, computer, or printer—on the LAN. The term *logical device* describes the way LAN users reference any

A truly irascible LAN may demand 10 to 12 hours of babying each week, even after the usual shakedown period.

historical repair data on all components and peripherals.

Once you're ensconced in the position, your day-to-day network management tasks will encompass the broad categories of documentation, resource allocation, backup strategies, and troubleshooting.

Getting It All Down

Maintaining documentation of any kind is a laborious but essential chore. The forms included with this article make documentation less onerous, helping you organize information about the LAN and structure routine tasks. Well-conceived documentation is also a boon to your sidekick, who will depend on those records in your absence. You should, of course, feel free to adapt any of these forms to your installation and to fashion additional forms as needed—particularly as your department installs multiuser applications.

Note that you'll use information in Figures 3 and 4 to track the whereabouts of each physical and logical device on the network and to draft a logical map of the LAN.

of the network's physical devices. For example, in addition to a networked PC's own physical drives A: and B:, drive D: on another networked PC may be available to the first workstation as drive C:.

Nets use addresses or aliases to distinguish the various devices. Addresses for some network interface boards are set with DIP switches; other LANs use a unique name for each network interface board. The name may describe the board's location, such as Room22; denote its use, as with the alias Accounts; or identify its user, Nicholas, for example.

You should complement the net's logical map with a physical one, beginning with the equipment itself. Label the cables entering and leaving all workstations, servers, repeaters, and transceivers. Simply write the cable's origin or destination on a label and wrap it around the cable.

Doling out passwords is a staple of network management but a thorny matter where documentation is concerned. Most LANs use passwords to grant or restrict access to specific drives or partitioned volumes; a few skip password protection altogether,

Figure 1: This system background form enables you to check on third-party support at a glance. If your company uses separate hardware and network vendors, consider adding a page to the form.



Network Documentation
System Background

Network installer: _____
 Contact: _____
 Phone: () _____
 Installation date: ____/____/____
 Warranty expiration date: ____/____/____

Service contract number: _____
 Vendor: _____
 Contact: _____
 Phone: () _____

Notes:

establishing volume access for individual users during network installation instead. Recording passwords in any form can obviously undermine their validity and must be done with an eye to security. Accordingly, you should change passwords at least once a month. Some networks offer password administration utilities that make the task easier; with other networks, assigning passwords is strictly a manual process. You'll also need to monitor and, on occasion, change user access to files and records (read/write, read-only, and so on).

Resource Allocation

In addition to serving as the network documentarian of record, you will be the arbiter of battles surrounding access to such network resources as shared disks and printers.

Figure 2: With an expansion board profile, you can maintain up-to-date records on what's in every box. You may want to modify the service history section to include return merchandise authorization numbers for equipment sent out for repair.



Network Documentation
Expansion Board Profile

Board name: _____
 Serial number: _____
 In machine (serial number): _____
 Slot number: _____
 Date purchased: ____/____/____
 Warranty expiration date: ____/____/____
 Vendor: _____
 Contact: _____
 Phone: () _____

Service contract number: _____
 Vendor: _____
 Contact: _____
 Phone: () _____

Service history

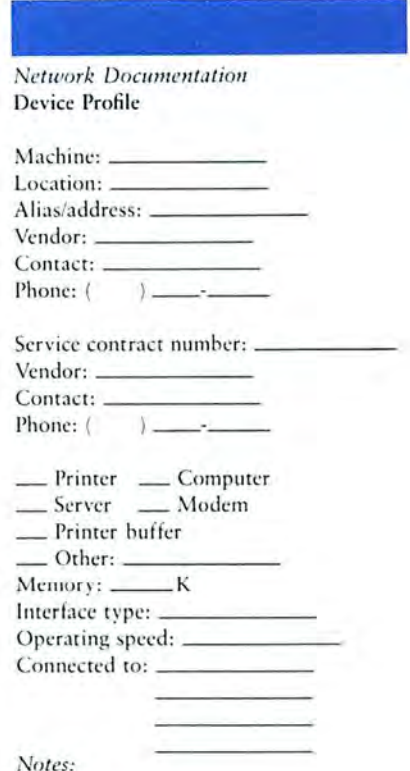
Repair:	Date out	Date in	Cost
_____	____/____/____	____/____/____	\$ _____
_____	____/____/____	____/____/____	\$ _____
_____	____/____/____	____/____/____	\$ _____
_____	____/____/____	____/____/____	\$ _____

Replacement:
 Date: ____/____/____
 By board (serial number): _____
 (Fill out new sheet for replacement board.)

Notes:

Batch files are powerful tools for organizing resources and orienting users. They can be used to simplify movement among sub-directories and to create on-screen menus that enable users to move around the LAN. As you prepare batch files for users, keep two quirks of DOS batch programming in mind. Searches of ex-

Figure 3: A general device profile supplies essential information about every item of hardware in the network. Don't forget to include alias or address information for workstations and servers.



Network Documentation
Device Profile

Machine: _____
 Location: _____
 Alias/address: _____
 Vendor: _____
 Contact: _____
 Phone: () _____

Service contract number: _____
 Vendor: _____
 Contact: _____
 Phone: () _____

___ Printer ___ Computer
 ___ Server ___ Modem
 ___ Printer buffer
 ___ Other: _____

Memory: _____ K
 Interface type: _____
 Operating speed: _____
 Connected to: _____

Notes:

tended directories set by the DOS PATH command recognize only .COM, .EXE, and .BAT files. The *IBM PC Network Program* includes the command APPEND, which does for text (and program overlay) files what PATH does for command files. In addition, current DOS versions don't permit interactive batch files. Once again, the *IBM PC Network Program* may bail you out with the command YNPROMPT, which enables batch files to branch in response to keyboard input.

Figure 4: The software profile should be a snap to complete. Use the notes section to record special file or buffer parameters needed in the net's CONFIG.SYS file, or environment characteristics that should be modified in an AUTOEXEC.BAT file.

Network Documentation
Software Profile

Software name: _____
Version: _____
Serial number: _____
Multiuser? _____
___ Data manager
___ Word processing
___ Spreadsheet
___ Telecommunications
___ Other: _____

Requirements:
System size: _____K
Number of drives: _____
Network capability:
___ File lock ___ Record lock
Purchase date: ____/____/____

Manufacturer: _____
Contact: _____
Phone: () _____-____

Vendor: _____
Contact: _____
Phone: () _____-____

Notes:

Figure 5: Augmenting the device profile, this form serves as the network's logical map, enabling you to track references among machines. If you have more than one printer, consider including a similar page for PC-printer relationships.

Network Documentation
Drive Map

Machine: _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____

Machine: _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____

Machine: _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____

Machine: _____
Drive ___ mapped as drive ___ on machine _____
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Machine: _____
Drive ___ mapped as drive ___ on machine _____
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Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____

Machine: _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____
Drive ___ mapped as drive ___ on machine _____

The Application Go-Round

Applications that hog memory, repeatedly read and write to disk, or monopolize CPU time burden the server—and degrade the network response of that server's devices.

In organizing activity on your network, try to divide such demanding activities among various servers. Use the form in Figure 4 to track relationships and the form in Figure 5 to monitor the peculiarities of each network application. Note also that other forms—particularly the hardware profile

of each workstation—will come into play as you install multiuser applications.

Managing print requests must also be factored into your application balancing act. Indeed, the LAN's print spooler—which resides on the print server—is another application, albeit a special

one. The spooler writes print requests to disk, establishing a queue and, in theory, averting conflicts. In practice, disk-intensive activities can retard spooling to disk.

If your LAN relies on a non-dedicated print server—a PC that manages printing chores but also acts as a workstation—you may want to augment the spooler with

Tools of the Trade

The quiver of tools you'll need to manage a network is modest. Naturally, you should have a complement of screwdrivers, both straight and Phillips, and pliers, including needle-nose and diagonal cutters. A volt-ohm meter or digital volt-meter will come in handy for cable testing. And a soldering iron rated at less than 40 watts, along with rosin-core solder, is useful to have around.

If your net includes diagnostic software, a shorting plug will also be necessary. You can make your own with either a PL-259 or BNC connector, depending on which is used to attach cables to the network interface board. Just solder a short length of wire between the center and shield contacts at the rear of the connector. Because this

plug will return any signals sent out, you can use it with diagnostic software to test the integrity of the interface board.

A general-purpose spares kit for your network should consist of one interface board, one floppy disk drive for every six on the system, and one bank of RAM chips for each station. The exact mix of 16K, 64K, and 256K chips depends on the kind each station uses. Keep a set of PL-259, miniplug, or BNC connectors available, as well as a spare T-connector, terminator plug, and/or junction box, as required by network hardware.

If your network is under a service contract, you may regard a spares kit as superfluous. Whether it will depend on the promptness and competence of your service firm. In addition,

some maintenance agreements allow for lower rates if you stock your own spares.

Basic supplies also belong in your tool kit. Never start the day without at least ten formatted floppy disks (more if you back up to floppies). Always have at least six ribbons and a standby box of paper on hand as well. And if you back up to tape, keep at least three preformatted tapes on hand. Unformatted tapes are generally less expensive, but formatting your own takes anywhere from 40 minutes for a DC-1000 cartridge in a Compaq 286 to 4 hours for a 100MB tape in a Corvus Bank. —B. O'B.

a print buffer. This memory device holds data (and then feeds it to the printer) as fast as the spooler can send it from disk. Set the size of the buffer according to system traffic; a 128K print buffer will, for example, hold approximately 60 pages of double-spaced text.

Storage Strategies

Network management is, in part, the art of maintaining the greatest possible amount of shared disk space. As free space decreases, network performance diminishes. If the system exhausts available disk space, the shared disk may crash, taking the LAN's precious data with it.

Impress on users that doing their own housekeeping is in everyone's best interest. It's relatively easy to store rarely used files, old mail, or outdated information locally on floppy disks rather than cluttering a network resource. When you need to remove files to free up disk space, copy the files to floppies, then make the deletions. Savvy management and common courtesy dictate that you give users as much lead time as possible when advising them of pending deletions.

Bear in mind that DOS writes data to the first available sectors from the beginning of a disk, skipping used sectors and writing data to the next free area. Over time, as deletions free up sectors and new files are created, files become fragmented across the disk, and hard disk access times increase. When this sluggishness begins to affect network performance, back up your data, reformat the server's disk, and restore data on a file-by-file basis.

Sound Insurance Policies

Backing up data ensures against loss in the event of a catastrophe and is only a nuisance until the inevitable occurs (see "Protection Money," PCW, August 1986).

Whether you do image or file-by-file backups, your regimen must be specific and your deposits frequent. Network theory favors redundancy, and you'll want to do both periodic and daily backups.

backups off-site. (In theory, daily backups are made only of newly modified files—those whose save date differs from the last file-by-file backup. Your ability to adhere to this procedure will depend on whether your system has a clock and your backup utilities support time stamp recognition.)

How meticulous should you be about backup? If you can't restore data with (in most offices) a max-

The network manager is the arbiter of battles surrounding access to such network resources as shared disks and printers.

Periodic backups of all files on the network should occur every two weeks. Use new media the first three times you back up; this tactic enables you to retain copies of data that is two, four, and six weeks old. For the fourth backup, retire the oldest data to a safe, off-site locale and introduce new media for the latest backup. Continue this process with each successive backup.

Don't attempt to save a few cents by recycling old tapes or floppies. If you reuse vintage media for new backups, you may be taking your data in your hands.

Make daily backups according to a similar procedure, but use new media for five days. Do the sixth daily backup on the oldest media and recycle all media thereafter into the backup process. Because you're also keeping periodic backups, you need not stash daily

imum loss of one day's work, you aren't managing the net with proper care. You should, of course, peg your backup strategies to the net's workload. If yours is a low-use system where in-house mail is the primary function, backups assume relatively less importance than on a LAN built for shared data and accounting tasks, where twice-daily backups may be warranted.

Looking for Trouble

Problems are endemic even in the best of networks. At the first sign of matters gone awry, clear the net of users. Begin isolating the incident by determining whether the failure is systemwide or localized. (Never neglect the obvious: If the network functioned before you flicked it off last night, check for loose or dislodged cables or plugs.)

Systemwide problems can be the easiest to diagnose. If, for example, none of the stations can access

a hard disk or a printer, check the device itself, then the PC to which the printer or disk is connected.

Although it rarely happens, a single faulty workstation can bring down all or part of the net. The simplest diagnostic technique involves removing workstations

should include a shorting plug and an ohmmeter (see the sidebar "Tools of the Trade"); they'll enable you to assess transmission quality. Disconnect the suspect cable from all hardware and touch one ohmmeter probe to the center coaxial conductor or to one wire

which reserves drives A: through E: for the PC on which it resides. If your network was created under an earlier DOS version and maps a 3.00 reserved drive as a network resource, attempts to share that drive will return a 'Device Not Ready' or 'Invalid Drive Specification' error message. Consult the LASTDRIVE command in your DOS manual for a solution. It's essential that the stations and the network use the same version of DOS—particularly if the stations will be accessing external DOS commands via the net rather than from the local disk.

LAN board replacement. Before replacing a network interface board, try toggling the DIP switches that set device addresses. Because switches are mechanical, contacts can be misaligned. If you must install a replacement board, carefully set address switches and jumpers according to network specifications.

Workstation expansion. If you've added a memory expansion or accelerator board to a network station, you should revise your documentation to reflect the potential for a clash with network requirements. If such elements as clock rate and on-board BIOS are incompatible with the net, some boards can crash the LAN; others may leave the net unscathed but keep users at the starting gate. Consequently, the network configuration program may require slight adjustment, or the board may have to be disabled during periods of network activity. In addition, several high-speed disk controllers have been known to give fits to NETBIOS-compatible LANs. Again, this is solid reason

Network management is, in part, the art of maintaining the greatest possible amount of shared disk space.

from the LAN one at a time. If the stations are connected in a daisy chain (A to B, B to C, and so on), replace each suspect unit with a coupler as you remove it, to retain cable continuity; do not exceed the recommended distance between stations. Once you have removed a station, fire up the network. If the system runs, you've found the culprit.

Having isolated the afflicted station, your next imperative is to keep downtime to a minimum by zeroing in on what's ailing the unit. With the PC segregated from the LAN, test it by attempting to start DOS. If the unit works, the likely source of the trouble is the network interface board. Before removing the board, check all connections and address switch settings. If nothing is amiss during that review, replace the board with a new one and make sure the switch settings duplicate those of its predecessor.

If all that proves inconclusive, scrutinize the cables. Checking cables is a fairly straightforward process. Your diagnostic tools

in a twisted pair. Connect the other probe to the coax shield or to the second wire of the twisted pair. (If you're using shielded twisted-pair wire, ignore the shield—just use the twisted pair.)

With the probes attached to the cable, the ohmmeter needle should not move; digital ohmmeters will give a reading of 0. If you get a higher reading, the cable has a short and should be replaced.

If the cable checks out, attach a shorting plug to one end. The ohmmeter needle should swing across the scale. If it doesn't move or fails to travel the entire scale, the cable has a complete or partial break. Replace it.

Problems, Problems

Networks fall prey to innumerable goofs and glitches, some seemingly without a perpetrator. Here's a sampling of the kinds of situations you can anticipate.

DOS versions. Implementing a new version of DOS can be problematic. Consider DOS 3.00,

to keep track of the hardware in each station.

Printer usage. On most nets, printer problems are a function more of logistics than of electronics. Consider the experience of one firm that was intent on linking its PCs to a laser printer. Once the network was in place, the company found that its biggest problem sounded almost trivial: What paper should be put in the printer? The office could obtain no consensus on color, letterhead, form, or size. Initially, employees called the printer station with instructions about what paper to load. When the print queue was long, however, the printer operator was unable to change the paper quickly enough; at other times he inadvertently inserted the wrong paper, necessitating a rerun. You can avoid this kind of maelstrom to some extent by limiting paper choices and keeping lines of communication open.

Adding stations. Tacking on a few extra stations is relatively easy with most LANs. And with the advent of network test programs, you can even determine the effect of adding stations on network throughput. If your net uses hubs, you can bring on new stations by adding or stacking hubs. In the event a second network is necessary, you can join the nets with a bridge (a means of linking compatible networks).

The law, however, doesn't handle network growth quite as nonchalantly. Increasingly, license agreements for multiuser software

specify a maximum number of users—a limit you can exceed only by paying an additional fee. Copy protection may also curb—or at least temper—your network's growth.

User education. As LAN manager, you're on the front lines of "group computing," and that means coping with users of varying sophistication. At one firm, a new secretary innocently gave the LAN a jolt. She had a bit of word processing experience but no DOS expertise. Curious about a file named COMMAND.COM, she opened it with her word processor. It looked like gibberish, so she closed it (unknowingly inserting word processing codes as she did so). Noticing that file on other networked PCs, she opened COMMAND.COM on them as well.

On most nets, printer problems are a function more of logistics than of electronics.

The next morning none of the computers would boot.

An alert manager could have averted this predicament by using the DOS command ATTRIB to make COMMAND.COM a read-only file (along with AUTO-EXEC.BAT, CONFIG.SYS, and the command files from the DOS disk). In short, use preventive maintenance whenever you can.

Network diagnostics. Some of the best assistance should be no farther than your software shelf. Your net's diagnostic software and supporting documentation can

help you isolate problems in systems components from the network software right down to the chips on the interface board. Pay attention, even to the obvious—grating noises from the server that betray a defective disk drive, the frozen fan that reveals a blown fuse. Don't even trust the power strip to which the equipment is connected; test it.

Parting Shots

When you're steeped in network theory, up to speed on your installation, and convinced that the LAN management assignment won't be so distasteful after all, give a little credit to the hardware and software maintenance contractors behind you.

Keeping open channels with vendors is in fact the final arc in

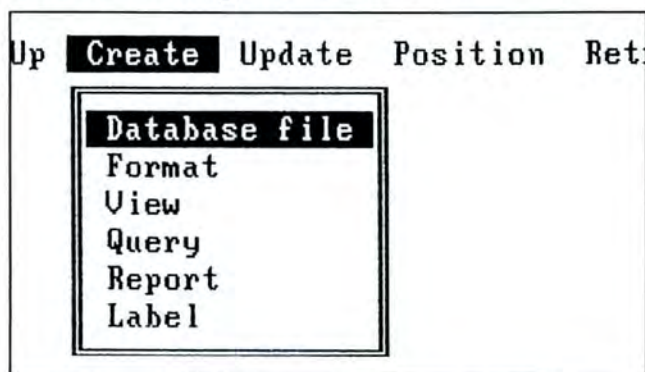
the network management learning curve. Fill your Rolodex with the names and numbers of those hardware and software suppliers who can reliably provide you with the information you need. If there's an eternal truth in the network management game, it's that class is held daily—and the learning never stops. ●

Bill O'Brien is a technology writer and computer columnist in New York City.

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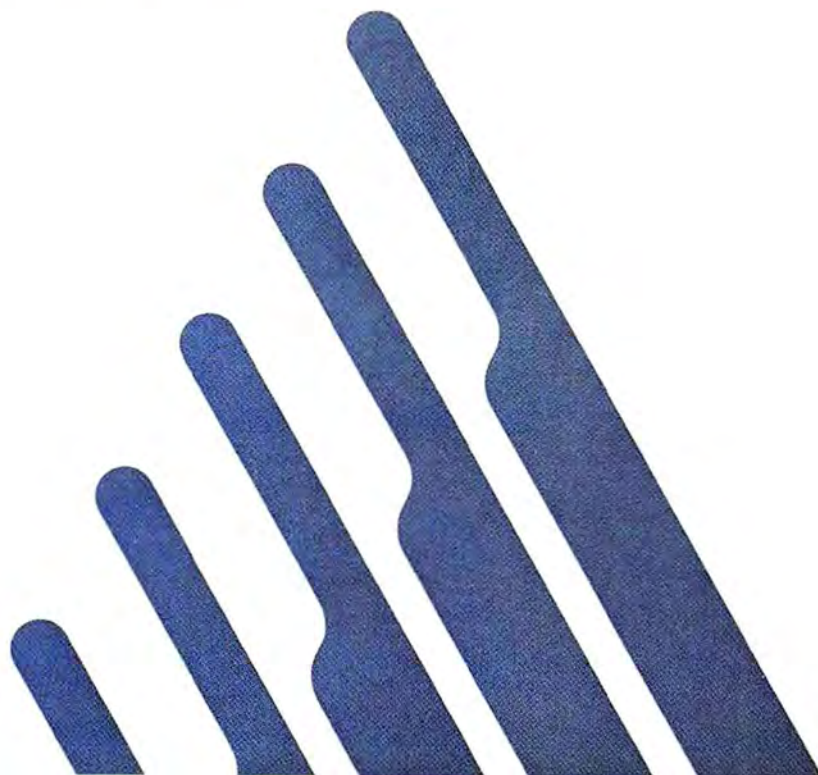
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FRED Creates a Blip Chart

What Framework can't do, its programming language can. Learn how to teach Framework new tricks and create a custom stock analysis graph with just a pinch of FRED.

William Urschel and Terry Lawhon

 The task seemed simple enough: Draw a custom chart that flags significant price changes in a stock using data downloaded from Dow Jones News/Retrieval. En route to paydirt we encountered the requisite bumps and bruises but ultimately concocted a nifty solution: a program that uses two tricks to make FRED, *Framework's* programming language, an even more powerful tool.

One word of caution: This exercise isn't for the fainthearted. You'll need solid grounding in both *Framework* and the FRED language. And to gain maximum benefit from our breakthrough, it doesn't hurt to be a Wall Street wizard of the first order.

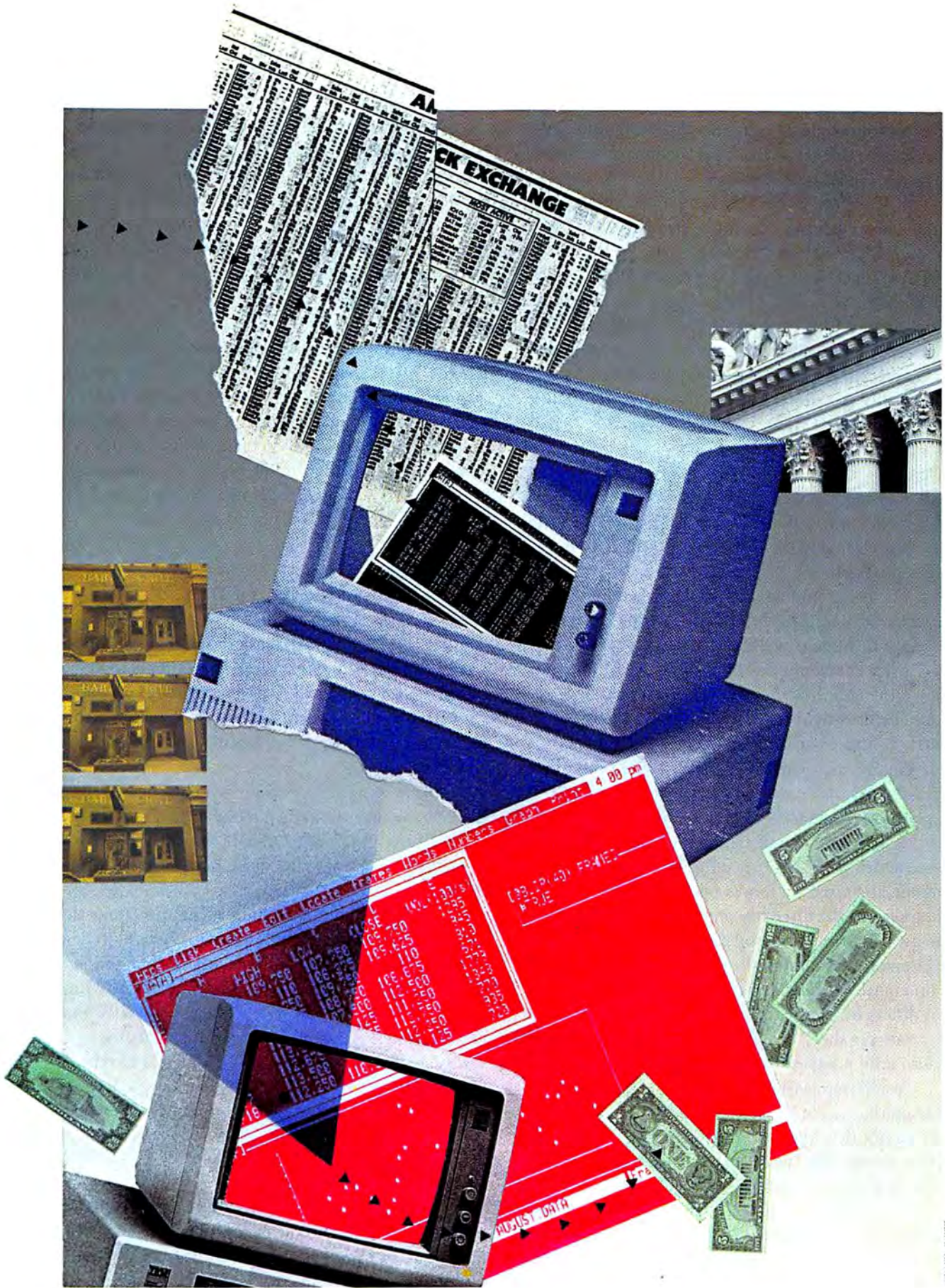
The first complication was that we wanted to view a Blip Chart (see Screen 1), which uses "pie slices" that point up and down to show significant movements in stock prices. Although *Framework* and other programs, such as *1-2-3* and *Symphony*, can generate price graphs, high/low/close graphs, *x-y* graphs, and bar, pie, and exploded pie charts, none can handle Blip Charts. This isn't surprising, because

we invented the Blip Chart on the back of a damp cocktail napkin just last Saint Patrick's Day over at McGinty's Pub. (Blip Charts will, of course, be built into all the best spreadsheets and data managers—just as soon as developers realize the utility of a graph that can be understood even after a pitcher of green beer.)

The second problem: FRED functions that operate on regions of a spreadsheet cannot take variables as parameters. Instead, FRED must be given actual spreadsheet cell names (such as D50), which makes it difficult to write a FRED program capable of handling an unpredictable amount of spreadsheet data. In our case, we wanted the Blip Chart program to work whether we fed it 50 or 300 days of stock prices.

After many a somber, if not sober, night pondering the problem at McGinty's Pub, we fell upon techniques that can be employed on a host of *Framework* applications. The Blip Chart, or any other kind of chart you might create, can be built from scratch using FRED's @DRAW function. Depending on the parameters, @DRAW can create lines, set the line color, set individual pixels on or off, draw rectangles and circles, set fill colors, and draw individual characters.

You can use a variable-string concatenation technique for any number of problems in which FRED requires references to specific spreadsheet cells, but a general solution begs for a variable. In the case of the Blip Chart, we wrote a subroutine that, on the fly, converts a variable to the string constant that identifies the last cell of a range of data (in our case,



Laura Tarrish

at the bottom of the D column). This technique, by the way, also applies to the macro languages of other programs, including *Symphony*.

BLIP, or rather the FRED code we put in the formula area “behind” the frame named BLIP (see Listing 1), demonstrates the nitty-gritty of FRED’s @DRAW function (see the *Framework Programmer’s Reference* as well). The BLIP program also demonstrates how to fool recalcitrant *Framework* functions into accepting variable amounts of data, a technique not covered in Ashton-Tate’s documentation. As a bonus, BLIP is a pretty fair example of structured programming in FRED.

A Blip Overview

Generating a Blip Chart is a three-step process that corresponds to the three code sections in our FRED program.

The program must first define where in the *Framework* spreadsheet the data is stored, then find the range of values the data spans, calculate a “significant” price change (in relation to the overall fluctuation), and determine the scale to which the chart should be drawn. Second, the program draws the chart’s x- and y-axes and the dollar scale for the y-axis. Finally (and here the fun starts), the program grabs the first day’s closing stock price and marks its place on the chart with a circle; the remaining data is checked a day at a time. If a price is less than or greater than the first price by the “significant” amount, the program moves one column to the right and indicates the direction of price movement with a downward- or upward-pointing pie slice. The slice is positioned according to the closing price. The program continues comparing prices until it finds one that differs by the significant factor and draws the appropriate pie slice. The program follows this procedure until it has exhausted the supply of data.

You’ll notice that our Blip Chart lacks a time scale on the x-axis. Time isn’t relevant in a Blip Chart (or in a booth at the rear of McGinty’s). The left-to-right movement between pie slices does not represent a day or a week—it indicates only a significant change in price. In this sense the Blip Chart is similar to the familiar point-and-figure chart that stock analysts use to scout trends. (Point-and-figure charts are similar to our Blip chart except they use Xs and Os to plot price movement.)

Before running BLIP, you need a spreadsheet frame called DATA consisting of data on the stock of your choice, arranged in the five columns that make up a Dow Jones historical quote. The daily closing prices are indicated in the D column (see Screen 2). (If users of *Framework II* copy the downloaded quote from a telecommunications frame into cell A1 of the DATA spreadsheet frame, *Framework II* will position the data correctly.)

To run BLIP, enter the statement @BLIP(*n*)—where *n* is one more than the number of days of data available—into the formula area of a frame, and recalculate that frame. (The reason *n* exceeds the total number of days is simply to make room for the spreadsheet’s headings in the first row.) Alternatively, you can call the @BLIP routine with any other FRED program.

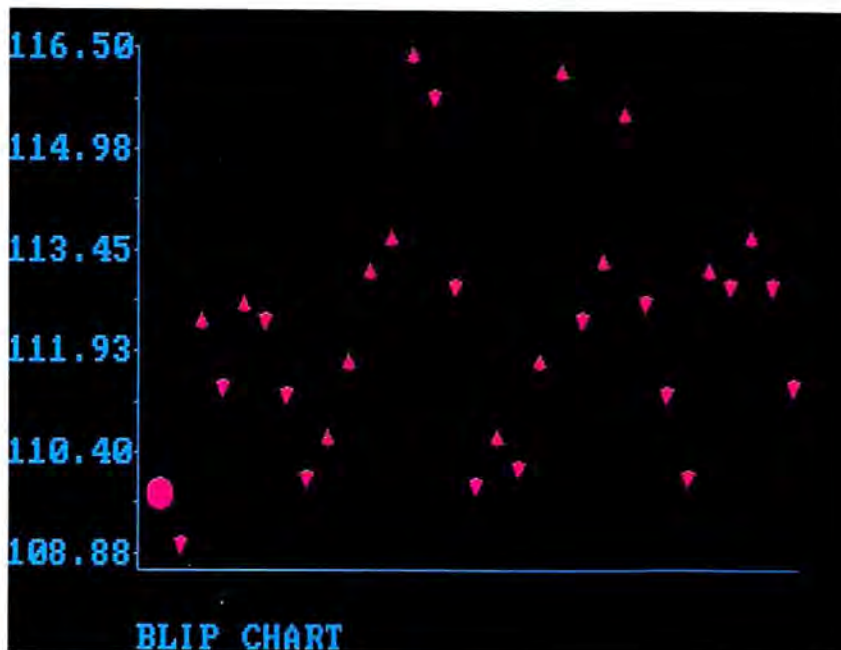
Defining and Scaling the Data

We begin each section of the program using @LOCAL to define variables used in that section (see Listing 1, lines 4-6). Starting each section this way, rather than listing all the variables at the top, keeps the variables closer to the section of code in which they’re used and thus simplifies making changes or additions.

Next, assign the *n* value, which is passed to BLIP as the first and only parameter (@ITEM1) and assigned to the variable DEPTH (line 8). This number tells us, in effect, how much data must be processed.

Right away we encounter FRED functions that can’t take a variable as a parameter. We need to determine the lowest and highest values contained in our range of data, and the @MIN and @MAX functions will do that nicely. Unfortunately, @MIN and @MAX require you to specify as constants the spreadsheet cells at the beginning and end of the range of data to be examined. If you always deal with 49 days’ worth of data (which would fit into the D column of the DATA spreadsheet between rows 2 and 50), you could use @RETURN(@MIN(DATA.D2:DATA.D50))

If you had more or fewer days’ worth of data, though, you’d run into problems. For example, with only 20 rows of prices, the spreadsheet itself would not extend 50 rows down. The resulting reference to a nonexistent cell would trigger an error and halt the program. (Because the user specifies the size of a *Framework* spreadsheet according to need, we aren’t



Screen 1: The Blip Chart in all its splendor, with each pie slice pointing in the direction of a stock's performance after a "significant" change has occurred.

dealing with a huge matrix of fixed size, as with some other spreadsheet programs.) If you had data for more than 49 days, the spreadsheet matrix would be deep enough, but the program would never examine data below row 50. Either way, the answer would almost certainly be wrong because the range of DATA cells is variable, while the specified range in @MIN is fixed.

The solution begins when we turn DEPTH, which is an integer, into a string called DEPTHSTRING (line 9). We use DEPTHSTRING in the next step to build the FRED code that generates and returns the @MIN value of the data. The trick is to type in the phrase (line 11) as if the range were fixed, but replace the lower row number with DEPTHSTRING. To do this, you must begin the line with double quotes, close the text with double quotes just before you would normally write the intended cell's row number, then add the concatenation operator (the ampersand) followed by the string variable name and another ampersand. Enclose the rest of the phrase—two closing parentheses—inside a pair of double quotes. The result is:

```
"@RETURN(@MIN(DATA.D2:DATA.D" &
  DEPTHSTRING & "))"
```

The effect is to concatenate the DEPTHSTRING string variable within the @MIN phrase.

Suppose we had passed 47 as n [@BLIP(47)], so that DEPTHSTRING was the string representation of 47; as *Framework* read through line 11 in the source code it would see the line as "@RETURN(@MIN(DATA.D2:DATA.D47))". Each time the program is passed a different n value, the result of this line of the source code changes. If the program changes the contents of DEPTHSTRING itself—even as part of a loop—the effect of this line changes accordingly. Therein lies the real power of concatenating a phrase with our string variable trick.

The string we have just concatenated is still a string, however, and FRED treats it differently from the identically phrased function we'd type to find the minimum value in column D of our spreadsheet. Because we need an executable function—and because we can turn a string variable into one by placing an at sign (@) in front of it—we assign the string to a variable (in this case LOWER).

In the final step of this little dance, the value that the function @LOWER returns is assigned to MINVAL (line 14), which is what we wanted all along. Although massaging the source code with the string variables, double quotes, and ampersands is a bit of a kludge, it allows us to use FRED's @MIN function to do something it wasn't intended to do: find the minimum value in a variable amount of data.

This string variable technique has wide application. It can be used to create a *Symphony* form letter that inserts names and addresses in fixed text, for

Listing 1: BLIP,
a FRED program
that calculates and
draws a custom
Blip Chart

```

1  ;*****
2  ; BLIP - a FRED(tm) program to calculate and draw a Blip Chart
3  ; (c) copyright 1986 by Arc Tangent, Inc.
4  ;*****
5
6  ; ===== DEFINING AND SCALING THE DATA =====
7
8  @LOCAL(DEPTH, DEPTHSTRING, MINVAL, MAXVAL,
9  LOWER, UPPER,
10 RANGE, SCALE, FACTOR),
11
12 DEPTH := @ITEM1,
13 DEPTHSTRING := @INTEGER(DEPTH),
14 LOWER :=
15 " @RETURN(@MIN(DATA.D2:DATA.D" & DEPTHSTRING & ")),
16 UPPER :=
17 " @RETURN(@MAX(DATA.D2:DATA.D" & DEPTHSTRING & ")),
18 MINVAL := @LOWER,
19 MAXVAL := @UPPER,
20 RANGE := MAXVAL - MINVAL,
21 FACTOR := RANGE / 20,
22 SCALE := FACTOR * 2,
23
24 ; ===== DEFINING AND DRAWING THE AXES & LABELS =====
25
26 @LOCAL(YHOME, XHOME,
27 YMAX, XMAX, YSCALE,
28 YSTEP, XSTEP,
29 YPOS, XPOS, COUNT),
30
31 YHOME := 5000,
32 XHOME := 5000,
33 YMAX := 30000,
34 XMAX := 30000,
35 YSCALE := (YMAX - YHOME) / (RANGE / SCALE),
36 YSTEP := (YMAX - YHOME) / RANGE,
37 XSTEP := 800,
38
39 @DRAW(
40 4, XHOME, YHOME - XSTEP,
41 9, XHOME, YMAX,
42 4, XHOME, YHOME - XSTEP,
43 9, XMAX, YHOME - XSTEP,
44 4, XHOME, 100,
45 "BLIP CHART"
46 ),
47 XPOS := XHOME,
48 YPOS := YHOME,
49 @DRAW(
50 4, XPOS, YPOS,
51 9, XPOS - 150, YPOS,
52 4, XPOS - 5000, YPOS,
53 @DECIMAL(MINVAL)
54 ),
55 @LOCAL(VAL),
56 VAL := MINVAL + SCALE,
57 YPOS := YPOS + YSCALE,
58 COUNT := 1,
59 @WHILE(YPOS <= YMAX,
60 @DRAW(
61 4, XPOS, YPOS,
62 9, XPOS - 150, YPOS,
63 4, XPOS - 5000, YPOS,
64 ),
65 @IF(@MOD(COUNT, 2) = 0, @DRAW(@DECIMAL(VAL))),
66 YPOS := YPOS + YSCALE,
67 VAL := VAL + SCALE,
68 COUNT := COUNT + 1
69 ),
70 )

```

(continues)

Listing 1
(continued)

```

67 ; ===== RETRIEVING THE DATA AND DRAWING THE PIES =====
68
69 @LOCAL(GETNEXT, CURVAL, NEWVAL, DIFF),
70 GETNEXT := "
71 @LOCAL(NEXT),
72 NEXT := @GET(DATA.D2:DATA.D" & DEPTHSTRING & "),
73 @NEXT(DATA.D2:DATA.D" & DEPTHSTRING & "),
74 @RETURN(NEXT)",
75
76 CURVAL := @GETNEXT,
77 YPOS := YHOME + (YSTEP * (CURVAL - MINVAL)),
78 XPOS := XHOME + XSTEP,
79 @DRAW(
80     11, 2,
81     12, 14,
82     13, XPOS, YPOS, XSTEP, 0, 360
83 ),
84 NEWVAL := @GETNEXT,
85 @WHILE(@ISNUMERIC(NEWVAL),
86     DIFF := CURVAL - NEWVAL,
87     @IF(@ABS(DIFF) >= FACTOR,
88         @LIST(
89             CURVAL := NEWVAL,
90             YPOS := YHOME + (YSTEP * (CURVAL - MINVAL)),
91             XPOS := XPOS + XSTEP,
92             @IF(DIFF > 0,
93                 @DRAW(
94                     13, XPOS, YPOS, XSTEP, 330, 30
95                 ),
96                 @DRAW(
97                     13, XPOS, YPOS, XSTEP, 150, 210
98                 )
99             )
100         )
101     ),
102     NEWVAL := @GETNEXT
103 ),
104
105 @SETSELECTION("BLIP"),
106 @PERFORMKEYS("{F9}")
107

```

example. The quotes and ampersands work as they do in *Framework* and *FRED*, but instead of placing a variable name between the ampersands, you use the range name of a single cell that contains a string, which amounts to the same thing.

Once we have *MINVAL* and *MAXVAL*, we can calculate the difference between the lowest and highest prices and store that figure in *RANGE* simply by subtracting the larger value from the smaller one (line 16).

Two other variables can now be calculated. *FACTOR* (line 17) is the significant factor—the amount by which a price has to go up or down to warrant a pie slice—and we've defined it as $\frac{1}{20}$ of *RANGE*. Why? Only because that much leeway seems to eliminate the minor tremors in the stock's day-to-day prices and thus shows the basic trend more clearly. *SCALE*, the value that determines the scale of the y-axis, is set to twice *FACTOR* (line 18), because through trial and error (mostly error) we found that method a satisfactory way of placing the chart neatly on screen.

Defining and Drawing Axes and Labels

We start the second section as we started the first, by defining the local variables to be used (lines 22-25). The values then assigned to *YHOME*, *XHOME*, *YMAX*, and *XMAX* are calibrated (lines 27-30) to the pixel coordinate system used by the *@DRAW* function. (The lower left corner of *DRAW*'s virtual screen is defined as row 0, column 0, and the upper right corner as row 32000, column 32000.) The first two variables pinpoint the intersection of the y- and x-axes, while the second two set the maximum allowable values for these axes.

Next, we calculate the values for the variables *YSCALE*, the number of virtual pixels *@DRAW*'s electronic "pen" will move between hash marks on the y-axis, and *YSTEP*, the distance in pixels that will correspond to a significant change in the stock price (lines 31-32). Note that the range of the y-axis settings varies in different graphs according to the range

of stock prices to be shown. The variable XSTEP is, however, always the same; the pen moves right just a little more than the width of a pie slice each time the price changes significantly.

Drawing the x- and y-axes of the chart is next, and here we can see how @DRAW really works. As lines 35-41 demonstrate, a batch of @DRAW commands can be grouped under one @DRAW command. The first task is to move the imaginary drawing pen to the starting position. This is done with the phrase

```
@DRAW(4, XHOME, YHOME - XSTEP)
```

The '4' is a mode number that tells the @DRAW function to "pick up" the pen and move it, without writing, to the coordinate location given by the next two parameters (in this case the pixel found at XHOME and YHOME - XSTEP). The FRED phrase @DRAW(9, XHOME, YMAX) then draws the y-axis line. Mode '9' means "put the pen down and draw to the given coordinates."

The pen is returned to the starting position, from which it draws the x-axis (line 39). After the pen is repositioned below the x-axis, line 41 instructs it to draw a title.

With the chart now outlined and titled, the program proceeds to the y-axis and draws the hash marks and numbers that will indicate the change in stock price. First, the pen goes "home" again (lines 43-46), draws the bottom hash mark (line 47), moves the pen to the left (line 48), then draws the decimal representing the lowest stock price in the data range (line 49).

The rest of the y-axis hash marks and labels are drawn using an @WHILE loop (lines 55-65). This loop moves the pen up the y-axis in steps equal to YSCALE. To make the chart more readable, the test "@IF(@MOD(COUNT, 2) = 0, ...)" restricts the drawing of labels to every other step.

Retrieving Data and Drawing Pies

Now for the really good stuff. After defining the local variables used in this third section (line 69), we'll use another @WHILE loop to wade through closing prices and make draw-a-pie-slice or don't-draw-a-pie-slice decisions. First we must retrieve each closing stock price. We want to use @GET to retrieve

one price after another from column D, and we can walk through that spreadsheet region with FRED's @NEXT function. Once again, we confront FRED's inability to deal with a variable-size region. Concatenating specific cell references with a string variable again saves the day. Lines 70-74 establish the variable GETNEXT just as lines 10-13 established LOWER and UPPER.

Next, we need to mark the chart with a circle that shows the starting stock price. We set the variable CURVAL to that value, which corresponds to the first cell in the data range (line 76). Determining the circle's x position is easy—because the circle is the first mark, it goes in the chart's first column. Then, to find the y coordinate for that circle, we start at YHOME and move up. By subtracting the lowest stock price (the dollar value of the bottom line of our chart) from the value in CURVAL, we obtain the difference between the two. By multiplying that difference by the YSTEP value (the number of pixels for each step on the y-axis), we know exactly how far up from the bottom to go.

The circle, marking the beginning price, is then drawn using

```
@DRAW(11, 2, 12, 14, 13, XPOS, YPOS, XSTEP, 0, 360)
```

In this phrase, 11, 2 sets fill color to 2, and 12, 14 sets fill type to 14. The @DRAW function's mode '13' specifies a filled-in pie slice; the other parameters specify the coordinates of the pie's point, that the radius is XSTEP, and that the pie starts at 0 degrees and runs around to 360 degrees. The result is a filled-in circle.

Finally, we reach the heart of the matter—the @WHILE loop that draws the pie slices representing blips in the stock's price. The next day's stock price is called and assigned to a variable called NEWVAL (line 84). We test to make sure NEWVAL is a number—if not, it means we've run through all of our data, and the loop will break. If NEWVAL is a number, it is subtracted from CURVAL (the last value charted), and the result is assigned to DIFF.

Here's the big test: If the absolute value of DIFF is less than the significant FACTOR, we don't draw a pie slice. The loop fails, the next daily stock price is retrieved and assigned to NEWVAL, and the loop starts over.

If, however, the stock price went up or down the significant amount and the DIFF test is true, the @LIST function (lines 88-100) sets off a chain reaction. First, CURVAL takes the value of NEWVAL for



Screen 2: The spreadsheet frame DATA consists of 40 days' worth of price information on a single stock.

the next test. The position on the y-axis is recalculated, just as before, and the x position is moved over one step. Finally, an @IF statement (lines 92-99) tests whether DIFF is a positive or a negative number. If positive, the pie slice is drawn pointing up. If negative, it points down.

When the test for a numeric value finally fails in line 85—which means we've run out of data—the lines following our @WHILE loop execute. The @SETSELECTION function (line 106) selects the BLIP frame where the chart has been drawn, and the @PERFORMKEYS function "presses" the <F9> key to zoom to it. Our Blip Chart, at last!

As for the Blip Chart itself, we still aren't certain how useful it really is. If it helps you make a killing in the stock market, the authors would appreciate a call. If we're not in the office, try McGinty's Pub. ●

William Urschel is president of Arc Tangent, a software development firm in Santa Barbara, California. He and head programmer Terry Lawhon are developing a mailing-list-management system for PCs.

Generalizing From Blip

FRED's @DRAW function augments Framework's analysis tool. No other graphics/spreadsheet package we're aware of, including 1-2-3, Symphony, Javelin, and VP-Planner, has this "draw-your-own-symbol" capability.


The concatenate-a-specific-reference-from-a-variable trick, on the other hand, is not so much a powerful feature as it is a cumbersome circumvention. (Why didn't Ashton-Tate just let all FRED functions take variables as parameters?) But it solves the problem in FRED as well as in other languages in which a particular function requires a constant but the application demands use of a variable.

*Framework II
Ashton-Tate
20101 Hamilton Ave.
Torrance, CA 90502-1319
213/837-9333
List price: \$695
Requirements: 384K, two disk
drives (extra memory and hard
disk recommended)*

Supportable Sales

As paradoxical as it may sound, too much success can be just as devastating to your company as an unexpected downturn. A simple 1-2-3 application shows you how far your reach can safely exceed your grasp.

Gregory R. Glau

 The notion came to Bill moments after company memo #357 floated into his gray cubicle: No more memos! he thought. No more ties and suits! Time to strike out, to start a business, my own business. Set my own hours, be my own boss, get a Keogh, and perhaps if things work out, snag that little Porsche Turbo I've had my eye on.

In true start-up fashion, Bill sold his Volkswagen; called that friend of family entrepreneurs, Uncle Al, for a loan; and pawned his cat. With a healthy \$100,000 grubstake, he opened a shop and started selling notions (common and preferred) in a chic downtown district. Soon Bill's pluck, diligence, and enthusiasm turned a trickle of customers into a cataract of frothing consumers.

Sales boomed— notions left the shelves faster than Bill could replace them. The coffers seemed crammed with cash, but something was amiss. Suppliers called daily for payment on invoices that somehow slipped into arrears; not

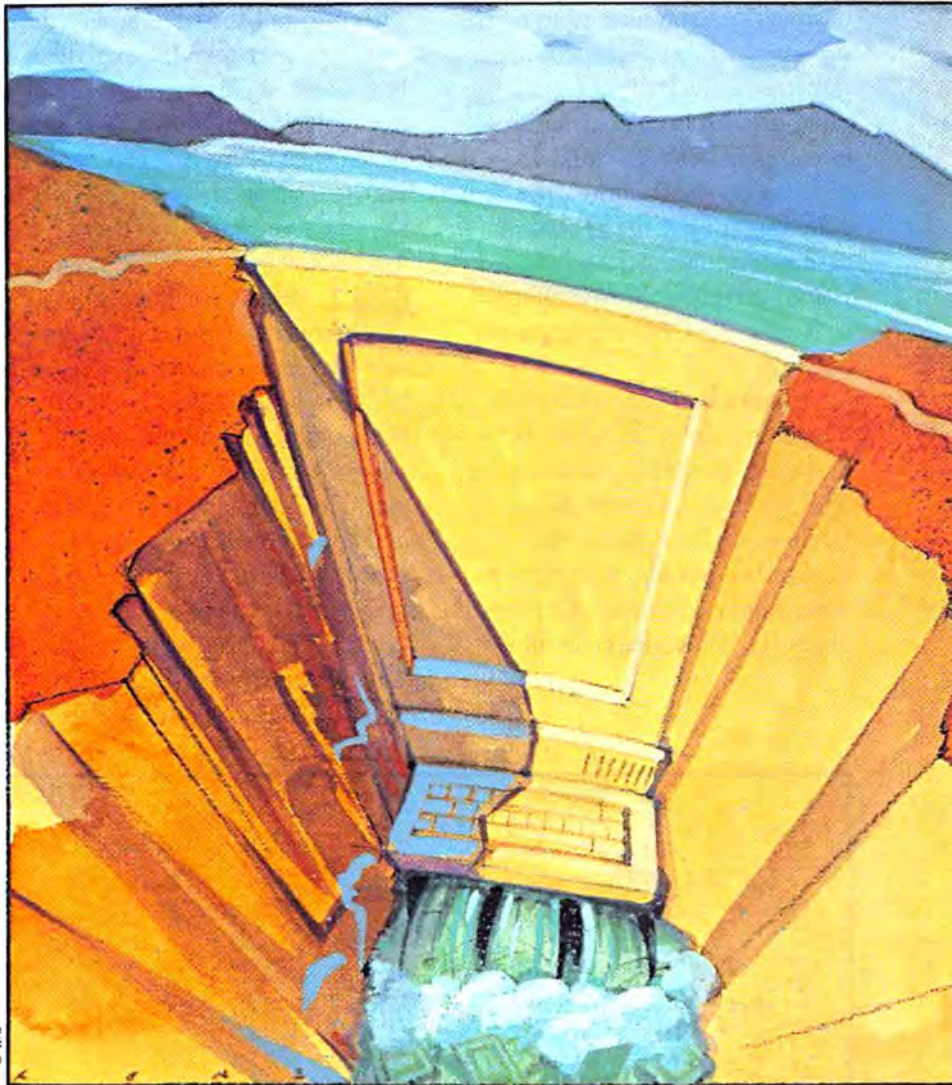
surprisingly, the shelves didn't fill up as quickly with new goods. But the clang of the cash register lulled Bill into daydreams of leather upholstery. Before he knew it, sales were so good the company went bankrupt. What happened?

Bill learned an age-old lesson: Sales alone won't keep a business in the black. There's an exact and unforgiving relationship between sales and working capital. Increase one without the other, and your company can collapse or stagnate. But what's the proper balance—and what do you do when the financial scales tip because of unexpected success, a downturn in the economy, or a decision to expand? One way to avoid trouble is to calculate the relationship between supportable sales and working capital and make reasonable predictions based on changes in your company's financial fortunes. With such data in hand, a start-up company can determine how

much money it must devote to inventory to maintain growing sales, while an established firm can control growth and better cope with seasonal fluctuations.

With 1-2-3's data table function and a few well-honed assumptions, analyzing your options for success is relatively simple. But before delving into formulas, macros, and other spreadsheet minutiae, consider the basics of supportable sales.

Suppose your Uncle Al isn't as generous as Bill's, and you start a business with only \$1 in working capital. With that dollar you buy inventory, price it at \$1.50, and wait for customers to flock to your store. In that first month, someone comes along and buys your entire inventory. Out of the total sales volume of \$1.50, you must pay the month's overhead—rent, utilities, phone, and so on. With overhead paid, you're left with \$1.10, a net profit of ten cents. You pocket the dime, use the dollar to buy another batch of inventory, and price it again at \$1.50.



Bill Cone

Continue this practice for 12 months, and at the end of a year total sales would amount to \$18. Depending on your point of view, that original dollar of working capital supported—or limited you to—\$18 in sales. In traditional financial terms, the company turned the dollar over 18 times and thus had a sales/working-capital ratio of 18 to 1—vital information for determining how far your capital can carry the company.

■ When More Is Dangerous

Of course, if your company is like most, the idea is to go as far as possible. When sales skyrocket, overhead may initially remain unchanged, but direct costs such as labor and material will increase dramatically. For example, a business averaging \$50,000 in monthly sales might have direct costs of 65 percent, or \$32,500. If sales rose by 20 percent to \$60,000, direct costs would increase correspondingly to \$39,000. Consequently, the company would have to find an extra \$6500 a month just to stay in

business. Since bills tend to arrive promptly while checks from customers are always in the mail, the rapid growth in sales would result in a serious cash shortage. Depending on the situation, the company might raise the necessary cash by issuing stock, selling a division, getting a short-term loan, or having the CEO mortgage the house.

If there's no ready source of outside money to draw on, the first thing a company seizes is the cash set aside for overhead. Unfortunately, utility companies and landlords don't like waiting for their money any more than suppliers do. When the grumbings

turn into full-throated howls, the company may take the expedient but inevitably disastrous route of not replacing inventory. In short order, shelves are stripped, cash registers silenced, and front doors slammed permanently shut.

Formulas for Success

You can avoid this unseemly scenario and prepare for success by building a 1-2-3 formula embodying the sometimes subtle connections among the key business variables (sales, capital, markup, and the sales/working-capital ratio). With this formula, you can arrive at a single figure for supportable sales. But what if Uncle Al comes through with an extra \$50,000 in capital, or the K-mart

down the street forces you to slash prices by 5 percent? Measuring the effect of such changes is easier if you use this supportable sales formula to create a 1-2-3 data table. Such a table places before your eyes the spectrum of good and bad possibilities—in this example, changes in markup and the sales/working-capital ratio. More important, it reveals the effects on supporting sales. Answering a "what if" is a matter of sliding your finger down the grid and finding the answer (see Figure 1).

The supportable sales formula—the heart of this crystal ball—states that each dollar of working capital supports sales equal to the marked-up working

	A	B	C	D	E	F	G	H	I	J
				<====Change in sales/working capital ratio====>						
15	Starting supportable sales	1,000,000	-2	-1	0	1	2	3	4	5
16		-5	738,462	830,769	923,077	1,015,385	1,107,692	1,200,000	1,292,308	1,384,615
17		-4	750,000	843,750	937,500	1,031,250	1,125,000	1,218,750	1,312,500	1,406,250
18		-3	761,905	857,143	952,381	1,047,619	1,142,857	1,238,095	1,333,333	1,428,571
19		-2	774,194	870,968	967,742	1,064,516	1,161,290	1,258,065	1,354,839	1,451,613
20		-1	786,885	885,246	983,607	1,081,967	1,180,328	1,278,689	1,377,049	1,475,410
21	Change in markup	0	800,000	900,000	1,000,000	1,100,000	1,200,000	1,300,000	1,400,000	1,500,000
22	percentage	1	813,559	915,254	1,016,949	1,118,644	1,220,339	1,322,034	1,423,729	1,525,424
23		2	827,586	931,034	1,034,483	1,137,931	1,241,379	1,344,828	1,448,276	1,551,724
24		3	842,105	947,368	1,052,632	1,157,895	1,263,158	1,368,421	1,473,684	1,578,947
25		4	857,143	964,286	1,071,429	1,178,571	1,285,714	1,392,857	1,500,000	1,607,143
26		5	872,727	981,818	1,090,909	1,200,000	1,309,091	1,418,182	1,527,273	1,636,364
27		6	888,889	1,000,000	1,111,111	1,222,222	1,333,333	1,444,444	1,555,555	1,666,667
28		7	905,660	1,018,868	1,132,075	1,245,283	1,358,491	1,471,698	1,584,906	1,698,113
29		8	923,077	1,038,462	1,153,846	1,269,231	1,384,615	1,500,000	1,615,385	1,730,769
30		9	941,176	1,058,824	1,176,471	1,294,118	1,411,765	1,529,412	1,647,059	1,764,706
31		10	960,000	1,080,000	1,200,000	1,320,000	1,440,000	1,560,000	1,680,000	1,800,000
32		11	979,592	1,102,041	1,224,490	1,346,939	1,469,388	1,591,837	1,714,286	1,836,735
33		12	1,000,000	1,125,000	1,250,000	1,375,000	1,500,000	1,625,000	1,750,000	1,875,000
34		13	1,021,277	1,148,936	1,276,596	1,404,255	1,531,915	1,659,574	1,787,234	1,914,894
35		14	1,043,478	1,173,913	1,304,348	1,434,783	1,565,217	1,695,652	1,826,087	1,956,522
36		15	1,066,667	1,200,000	1,333,333	1,466,667	1,600,000	1,733,333	1,866,667	2,000,000

Figure 1: With the appropriate formula and a few pieces of information, 1-2-3 can generate a data table that shows how much sales volume is possible given changes in markup and the sales/working-capital ratio. The 0 points on each axis represent assumptions built into the worksheet—in this case, a sales/working-capital ratio of 10 to 1 and a 40 percent markup.

capital multiplied by the sales/working-capital ratio. Formally stated, the relationship is POSSIBLE SALES = (WORKING CAPITAL / MARKUP PERCENTAGE) * SALES/WORKING-CAPITAL RATIO.

Setting the Table

Before you can feast your eyes on a completed data table, you have to enter some simple financial information and basic assumptions (see Screen 1). Set the width of the first column in the worksheet at 30, and enter the labels in cells A1 through A15. Starting from the top of column B, enter assets and then liabilities. In cell B4, liabilities are subtracted from assets to determine working capital, so type in the formula **+B1-B2**. In this example, a 40 percent markup on goods or services is assumed, so enter **40** in cell B6.

The sales/working-capital ratio (taken from a current financial statement) is **10** and is entered in cell B8. If your company is a start-up and lacks a financial history, you can obtain equivalent information from *Annual Statement Studies* (Robert Morris Associates, Philadelphia). The book categorizes financial information by industry and company size and provides a handy way for established companies to measure their success (or lack of same) against that of other firms in the same line.

A 1-2-3 data table lets you run different numbers through a formula and observe the results. In this application, two changing

numbers modify the starting supportable sales figure—the change in markup and the change in sales/working-capital ratio. These variables in cells B11 and B13 are referenced in the formula. When the data table is finally generated, 1-2-3 substitutes a range of data for these variables and calculates the data table's values.

Cell B15 contains the formula that calculates supportable sales. Use the */Range Format*, 0 command to format the cell for commas but no decimal places. The first section of the formula, **100*(B4/(100-B6-B11))**, calculates the markup on the working capital. The marked-up working capital is then multiplied by the sales/working-capital ratio expressed by **(B8+B13)**.

Note that the markup is based on an item's retail price. If you want to mark up a \$500 item by

40 percent, you answer the question, “\$500 is 60 percent of what price?” or $500 = .60X$. The same effect is achieved in the formula by subtracting the markup—B6-B11—from 100 and dividing the working capital by the result. Since this method uses whole numbers rather than decimals, the quotient is multiplied by 100.

When you enter the formula and press <Enter>, the figure \$1,000,000 pops into the cell. It represents the sales volume that \$60,000 in working capital, at a 40 percent markup and a sales/working-capital ratio of 10, can support. Remember that this figure represents starting supportable sales—the data table will illustrate how changes in markup and the sales/working-capital ratio affect it.

B15: (,0) 100*(B4/(100-B6-B11))*(B8+B13)

Current assets	100000
Current liabilities	40000
Net working capital	60000
Starting markup percentage	40
Starting sales/working capital ratio	10
*** Variable fields ***	
Change in markup percentage	0
Change in the sales/working capital ratio	0
Starting supportable sales	1,000,000

Screen 1: Before creating a data table, you have to lay a foundation with key pieces of information (working capital, starting markup, and sales/working-capital ratio), variable fields, and a formula that computes supportable sales. The result shown in cell B15 is only the starting point—the data table will illustrate how changes affect this figure.

Data on the Range

With the formula in place, you can determine the size and scope of the data table. Like an x - y graph, a data table has an origin and two axes (see Figure 1). In this case, the origin is cell B15, the x -axis marks off the changes in the sales/working-capital-ratio, and the y -axis, the percentage changes in markup. To create the y -axis, move the cursor to cell B16, select */Data Fill*, anchor the cursor, and point to cell B36. When 1-2-3 requests the beginning value in the range, type in -5 and press **<Enter>**. The program then asks for the step or increment of values in the range and suggests 1. Accept the step by pressing **<Enter>**. Finally, the program wants to know where to stop; type in 15. Press **<Enter>**, and column B fills with numbers ranging from -5 to 15 in increments of 1. Note that a markup of -5 means selling a loss leader at 5 percent below cost.

You use almost the same process to specify the range for changes in the sales/working-capital ratio (the x -axis). Select

/Data Fill, press **<Backspace>** to clear the previously highlighted range, and move the cursor to cell C15. Highlight the latitude from cell C15 to cell J15. This time the fill values begin at -2 and extend to 5 in increments of 1. A negative value for the sales/working-capital ratio indicates that you aren't turning capital over quickly—in other words, sales are in a slump.

To finish the job, you must pace off the area of the data table and reference the variables in cells B11 and B13. Since the table is dependent on the formula, the range starts at cell B15. Issue the command */Data Table 2*, highlight to cell J36, and press **<Enter>**. To format the range for commas and no decimal places, select */Range Format*, 0, anchor the cursor at cell C16, paint out a box that ends at cell J36, and press **<Enter>**.

Now you can link the table to the two variables. 1-2-3 asks for the addresses of two input cells. For input cell 1, move the cursor to B11 and press **<Enter>**; for input cell 2, point to B13, and press **<Enter>**. After the CALC indication appears, the WAIT indicator

flashes for a moment, and the worksheet is suddenly stuffed with numbers.

To ensure that the process works properly, remember that Input Cell 1 will only use data from a column and Input Cell 2 will only use data from a row. Mismatching the input cell assignments will produce a table with erroneous calculations. One way to check your steps (and your math) is to put a 0,0 point in the data table. With no change in either the markup or the working capital ratio, the supportable sales volume at this junction should be \$1,000,000. As cell E21 in Figure 1 confirms, the math is correct. Note that 1-2-3 does not automatically recalculate the numbers in a data table when you change a value referenced by the formula. Thus, if you change the starting markup percentage in cell B6, you must recast the data table by pressing the Table key (**<F8>**).

Instant What-If

With little muss and fuss you now have an interactive periodic table of your company's most important financial element—supportable sales. For example, if you increase markup on inventory from 40 percent to 41 percent, how much sales volume can your business support? (The answer is in cell E22.)

The effect is even more dramatic if you turn over the working capital one more time during the year, boosting the sales/working-capital ratio from 10/1 to 11/1. Assuming inventory isn't priced any higher, you can, according to the result in cell F21, safely support sales of \$1,100,000. You might accomplish this feat by speeding up

```

\A      /XnENTER YOUR BREAK-EVEN SALES VOLUME: "N16"
        {goto}N16"
        /WCS12"
        /C"N17.N36"
        /GRG
        XB16.B36"
        AN16.N36"
        BC16.C36"
        CF16.F36"
        DI16.I36"
        OC"
        LA = BREAK-EVEN "
        LB = -2 "
        LC = +1 "
        LD = +4 "
        TF BREAK-EVEN VERSUS SALES VOLUME "
        TX <-- CHANGE IN MARKUP --> "
        TY <-- CHANGE IN SALES VOLUME --> "QQ
        {graph}"
    
```

Listing 1: This macro graphs your estimate of break-even sales against three different scenarios selected from the data table.

collections, selling to faster-paying customers, requiring a down payment for services, or financing contracts through an outside agency. Of course, raising your prices or asking for down payments may have unforeseen consequences, but at least with this supportable sales table, you're better prepared for the future.

The Break-Even Graph

Planning for success is all well and good, but sometimes finding out if you're going to break even is paramount. Getting this information from a screen full of numbers is a bit time-consuming, but with a short macro you can quickly graph your estimate of break-even sales volume against different scenarios. In this example, the macro graphs columns in the supportable sales table representing -2, +1, and +4 changes in the sales/working-capital ratio.

Find a clear space in the worksheet to the right of column N, type in the macro shown in Listing 1, and name it \a. The first line prompts you for a break-even amount and puts the answer in cell N16. The macro then expands the column width to 12 to accept larger numbers. The third line moves the cursor to cell N16, while the fourth copies the break-even value into cells N17 through N36, matching the amount of data that will be graphed from the data table. /GRG resets all graph settings, while the following four lines of the macro select the X data range and the four columns (the latter three from the data table) that equal your estimate and -2, +1, and +4 changes to the sales/working-capital ratio. OC sets the screen to display in color. A legend is then created for each graphed data set, and the chart is

labeled at the top and along both axes. The last line of the macro tells 1-2-3 to draw the graph.

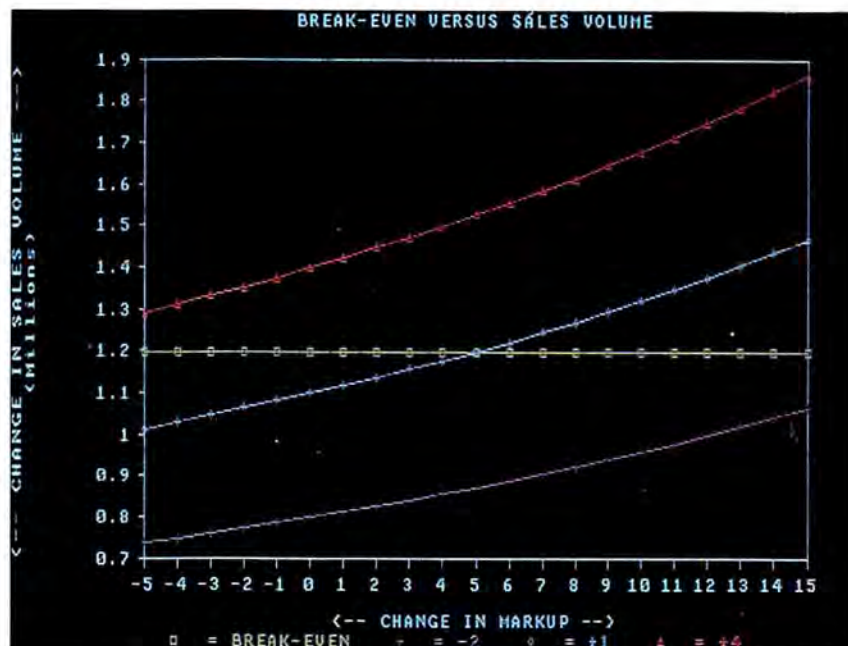
The result, shown in Screen 2, illustrates how a major dip in sales can be ruinous. The break-even sales volume figure of \$1,200,000 appears as a straight line across the graph. The y-axis shows sales volume changes, and the x-axis shows a change in the markup percentage from -5 percent to 15 percent. As the lowest ascending line shows, if the sales/working-capital ratio drops from 10/1 to 8/1, the available working capital will not support enough sales for the company to break even, no matter how much the markup is changed. The lines studded with diamonds and triangles show the range of positive possibilities if the ratio increases to 11/1 and 14/1 respectively.

The Bottom Line

There are other ways to analyze cash flow, but a supportable sales data table and a break-even graph show clearly how your business is affected when the fates—good, bad, or ugly—take an interest in your bottom line. Although this custom-fit application won't attract customers, it may help keep the wolves from your door. ●

Gregory R. Glau is a freelance writer in Prescott, Arizona. His most recent book is Business Graphics with the IBM PC/XT/AT (Dow Jones-Irwin, Homewood, IL, 1986.)

This article is adapted from Controlling Your Cash Flow with 1-2-3 or Symphony by Gregory R. Glau (Dow Jones-Irwin, Homewood, IL, 1986).

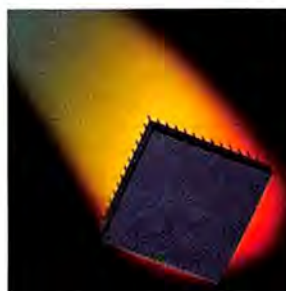


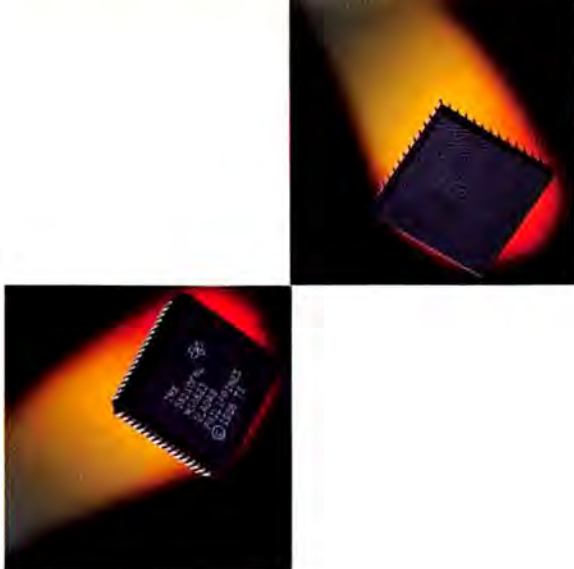
Screen 2: Will you just break even or go for broke? This chart quickly demonstrates the possibilities as sales volume and markup change.

Power Chips Paint Pictures

Using divergent approaches, graphics coprocessor chips from Intel and Texas Instruments promise to lift the graphics burden from software and the PC's CPU and to raise graphics standards to unprecedented heights.

TJ Byers





||||| Graphics is arguably the fastest advancing area of PC technology. This may come as a surprise to millions of users hobbled by the pedestrian IBM Color/Graphics Adapter (CGA), which until recently represented the only widely addressed color graphics standard for the PC. Even IBM's Enhanced Graphics Adapter (EGA) falls far short of the variegated palette and razor-sharp resolution of mainframe graphics workstations.

But relief may be just around the corner. Two new alternatives—Intel's 82786 Graphics Coprocessor and Texas Instruments' (TI) 34010 Graphics System Processor—are paving the way for standards that may well surpass even the wildest expectations of graphic designers. The Intel and TI chips, which are essentially dedicated graphics processors, exhibit outrageous performance values. These breakthrough entries promise thousands of colors plus screen resolution a full magnitude higher than is currently possible on the PC.

In addition to the performance gained by sheer processing power, the 82786 and the 34010 incorporate routines in their firmware and execute them at lighting speeds to relieve applications programs of rote tasks. Built-in text-enhancement features for scaling multiple fonts and controlling character attributes, as well as firmware for text and graphics integration, will undoubtedly help drive the next generation of desktop publishing programs. And for CAD (computer-aided design) applications, the chips' drawing routines will boost the performance of PC CAD dramatically.

Before examining the new graphics processors in detail, a brief look at the techniques implemented in IBM's CGA and EGA will help illustrate the concepts underlying recent advances.

■ The Board Behind the Screen

Along with the PC, IBM proudly offered the world the CGA, a video display board carrying 16K of memory for displaying graphics in a maximum of four simultaneous colors. Although its resolution is coarse and the 16-color palette restrictive, the CGA brought with it memory mapping, a display technique that ties pixels on the screen to specific bits in video memory.

In the CGA's two-color (black-and-white) graphics mode, the CGA arranges 640 pixels in 200 rows, yielding a 128,000-pixel matrix. Each pixel in the matrix corresponds to one bit in the CGA's memory map. The 1, or "on," bits of video memory determine which pixels are lit, while the 0, or "off," bits specify the pixels that are dark.

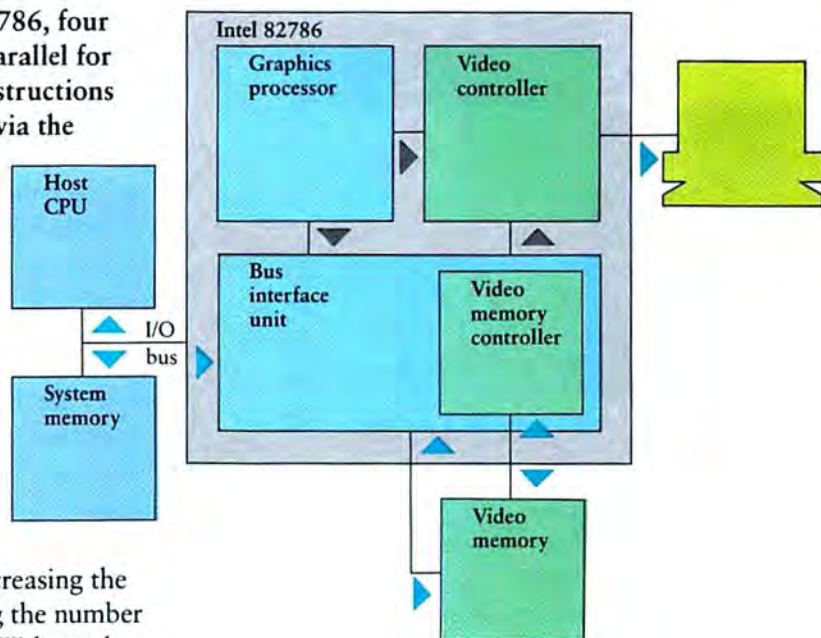
Relying on instructions from graphics software, the host central processing unit (CPU)—the same processor that controls all other functions carried out by the computer—defines the image in video memory. When you draw a line with a mouse or key in a command to alter a graph, the application software calls on the CPU to change the appropriate bits. As the CPU performs this task, the memory map is read by the video controller. The video controller is a processor on the CGA board that sweeps the CRT's electron gun row by row across the screen, matching pixel data in video memory to the corresponding physical pixels on the screen.

The resolution of an image is proportional to the number of pixels that form it. This, in turn, is commensurate with the amount of available video memory: At 1 bit per pixel, a screen composed of 640 by 200 pixels needs 128,000 bits, or just under 16K. Dedicating 2 bits per pixel, however, yields 4 possible binary combinations, each of which is assigned a different color in the CGA's medium-resolution color mode. Although this mode doubles the number of bits per pixel, it cuts the horizontal resolution in half (from 640 to 320), with the same 16K.



David Bishop

Figure 1: In Intel's 82786, four modules operate in parallel for faster throughput. Instructions from the CPU arrive via the I/O bus.



The EGA set a new standard by increasing the number of bits per pixel to 4, thus upping the number of simultaneously available colors to 16. With resolution increased to 640 by 350 pixels, a grand total of 112,000 bytes is required to hold a single enhanced-graphics image. But as boards like the EGA expand the video memory map, the more time it takes the CPU to manipulate all that data—valuable time that the CPU needs for other chores. To date, this has been the biggest limitation of memory mapping.

Sharing the Burden

The obvious way to prevent overburdening the CPU is to give the task of managing video memory to another processor. This is precisely the purpose of graphics coprocessors. Unlike a video controller, which cannot function without the host CPU's capabilities, a graphics coprocessor is a microprocessor designed to relieve the CPU of its video-memory-management duties.

The concept is analogous to that underlying the 8087 math coprocessor: Just as the 8087 is dedicated to number crunching, graphics coprocessors deal exclusively with video information. In effect, two computers—the system processor and the video processor—coexist within one frame. The host must still pass some instructions to the coprocessor, but otherwise the two operate independently.

Intel's 82786 Graphics Coprocessor is a leading representative of this new technology (see Figure 1). Aboard this chip is a dedicated microprocessor approximately as powerful as an 8086, with an instruction set modified to respond only to graphics commands. In the CGA and EGA, the host CPU must

interpret, calculate, and write the myriad changes to video memory necessary to carry out an application's graphics commands. In the 82786, graphics instructions are in ROM and rely on assembly language labels to activate complete drawing routines. To draw a polygon, for example, the 82786 need only receive a brief label from the host CPU to activate the routine. The task of drawing the polygon—of the size and at the location specified by the graphics application—is turned over to the 82786. A video controller built into the chip then reads the mapped data and transfers a polygonal pixel pattern to the screen.

The rationale behind this strategy is clear. Instead of executing 100 or more video instructions, the host CPU simply issues one video command to the graphics coprocessor. The 82786 focuses all its processing power—which is comparable to the host CPU's—on controlling pixel status and location, thus radically improving performance.

Because chips like the 82786 are microprocessors unto themselves, any memory addresses generated are unique to the video environment. This autonomy means that video memory is no longer limited to the 128K allocated by DOS—in fact, the 82786 can support up to 4MB of video memory. With such capacity an 82786-based video adapter could display a 256-color image with 1024-by-1024-pixel resolution and still have 3MB to spare.

The Third Generation

Even as Intel's 82786 is readied for market, developers are preparing for the next round of video graphics. Centering on a high-performance Reduced Instruction Set Computer (RISC) engine similar to the one found in IBM's new RT PC, TI's 34010 Graphics System Processor is the foremost harbinger of the generation to come (see Figure 2).

The 34010 is an applications processor. Unlike the 82786, which relies on the host CPU to translate commands from applications software into brief assembly language instructions, the 34010 is surrounded by a software shell that enables it to carry out graphics commands written in the high-level C language. Performing C-to-assembly translation frees the 34010 completely from dependence on the host CPU.

The software-based approach has many advantages over hardware-implemented graphics. For one, the software shell lets programs communicate with the 34010 as if it were an independent computer without first having to address the host CPU. In fact, the chip can function entirely on its own, a feature that makes it a likely candidate for stand-alone terminal applications. And with its high-performance RISC engine, the 34010 processes code at speeds matching hardware-based routines.

More important, all aspects of an applications processor such as the 34010 are programmable. As

new graphics techniques become available, the 34010's software-based algorithm can be modified to further improve its performance. Such alterations are impossible with chips like the 82786, which have a fixed algorithm and must conform to a preselected standard.

Revamping Video Memory

One of the most impressive capabilities offered by the 82786 and 34010 is a technique called bit blitting, derived from the acronym BitBlt (for "bit block transfer"). Essentially, blitting is the process by which a graphics processor enters video memory and updates portions of data without having to rewrite the entire memory space—a process impossible with conventional programming techniques. Instead, blitting can only be performed where bit mapping defines video memory. Although memory mapping and bit mapping have the same roots and are often confused in common parlance, the terms are not interchangeable.

In memory mapping, each pixel is assigned a screen location rigidly defined as an absolute memory address in the video memory register. Bit mapping,

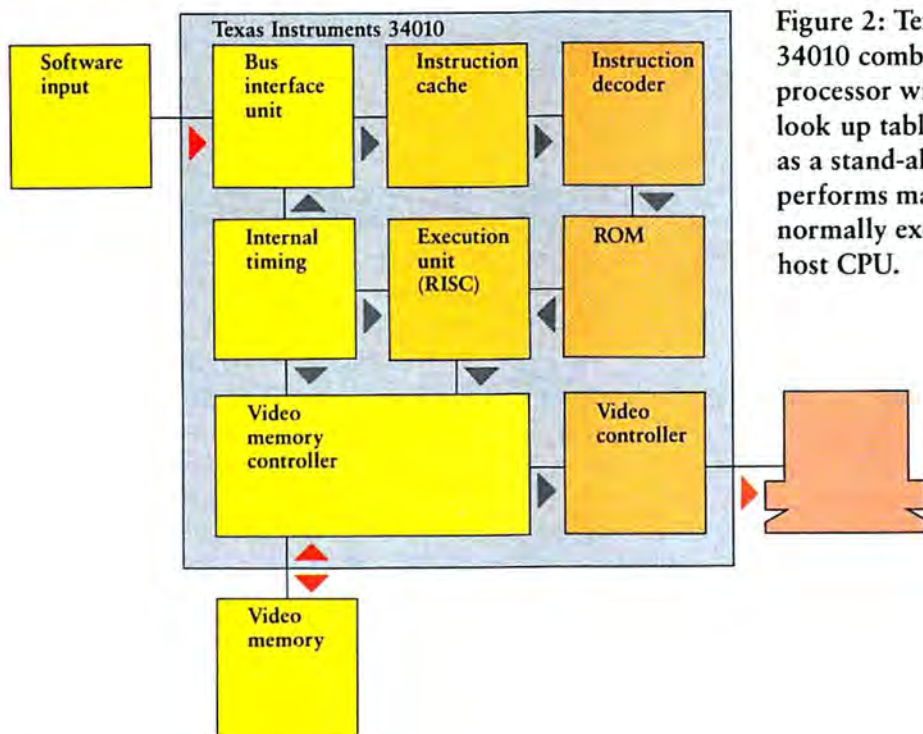


Figure 2: Texas Instruments' 34010 combines a 32-bit RISC processor with cache memory, look up tables, and logic. Acting as a stand-alone processor, it performs many tasks that are normally executed by the host CPU.

on the other hand, uses relative memory addressing. If blitting is used to define a block of pixels, for example, each pixel has an address relative to that section's other constituent pixels. This concept is akin to the way 1-2-3 defines cells in a worksheet: Absolute cell addresses are fixed but relative cell addresses are not.

Once a bit block is defined, it can be manipulated in several ways. Moving the rectangular pixel block, for example, is simply a matter of transferring data from one memory location to another by redefining the beginning memory address. On screen, this reorganization of video memory makes the image appear to move from one location to another. Because shifting the bit block has no effect on anything else in video memory, the result is a pronounced reduction in screen drawing time.

Simple memory address changes are only a small part of the capabilities granted by blitting. Because a bit block is a binary matrix, mathematical operations can be performed on it—including Boolean algebra. A bit block and a block of pixels of equal size can be the objects of an OR, AND, or XOR (exclusive or) operation, making it possible to combine one image with another. Arithmetic functions, such as add, subtract, max, and min, are also well within the realm of blitting operations.

But that's not all. Blitting augments zooming, panning, clipping, scaling, and windowing—traditional graphics operations that, until now, were generally implemented in software. Incorporating these features in hardware reduces software overhead while increasing operational speed by 5 to 50 times.

In the long run, perhaps the biggest benefit of bit mapping is the way it facilitates integration of graphics and text. Although text is theoretically just another form of graphics data, it's more efficient in practice to treat text as a distinct entity. Once a character is defined, its relative addresses can be stored in an area of memory reserved for text and quickly retrieved for display when needed.

This technique offers more latitude than you might imagine. Because text characters are defined as a matrix of dots with relative addresses, they adapt well to blitting. Characters can be expanded, compressed, or rotated, and fonts are easily mixed and matched. Furthermore, these textual manipulations can take place at the same time that screen graphics are being defined.

Compatible Standards

One obvious use for either the 82786 or the 34010 is to combine existing graphics standards on a single multifunction video display board. Beyond this, manufacturers will introduce a variety of new color and resolution standards, each vying for acceptance as the next rung up from the EGA (see the sidebar "Pepper Sets New Standards").

An important side benefit of dedicated graphics processors is efficient implementation of virtual device interfaces. These software-based intermediaries enable graphics programmers to write software to a single virtual device, which can pass commands to the actual device drivers written for all popular PC output devices. Because additional CPU time is required to translate generic commands into commands for specific hardware, this device-independent approach has generally been impractical until now. Thanks to the increased speed afforded by the new chips, performance degradation caused by a virtual device interface is negligible.

However, virtual device interface is pointless without industry-wide acceptance. Currently, the two most popular interface standards are Graphics Software Systems' Direct Graphics Interface Specification and Microsoft's Graphics Device Interface. Both chips are flexible enough to incorporate either standard, but the 34010's programmability gives it the advantage of being able to implement any interface standard that may arise.

The immediate beneficiaries of both device independence and overall performance improvement will be CAD and desktop publishing. The increased speed afforded by built-in drawing routines will make high-performance desktop CAD a reality, and smooth text and graphics integration should help desktop publishing proliferate like no other application in recent history. Driven by the demands of these massive new markets, advanced graphics boards may be available by year's end.

What lies beyond is anyone's guess, but one outcome is certain: New graphics standards will soon exponentially improve the color and resolution of the PC's video display. In a market beleaguered by haphazard development and a maddening lack of standards, graphics technology is finally approaching a watershed. ●

TJ Byers is an ex-NASA engineer and the author of several books on PC hardware.

Pepper Sets New Standards

The Pepper Graphics System from Number Nine Computer Corporation is among the first video display boards to incorporate the new Intel 82786 coprocessor in its design. Priced under \$1000, the Pepper board comes equipped with Number Nine's own virtual device interface and 256K of video memory, expandable to 4MB. In addition to establishing the Pepper mode (a new 640-by-480-pixel-resolution standard offering 64 colors from a 256-color palette) the board emulates IBM's Color/Graphics Adapter (CGA), Monochrome Display Adapter (MDA), and Professional Graphics Adapter.

One of the Pepper board's most interesting features is the way in which it redefines the MDA and CGA screen resolutions. The MDA mode's new resolution is 1280 by 700 pixels, or four times the resolution of the original monochrome mode. The CGA screen displays 640 by 400 pixels—twice the resolution of the original. In other words, each screen location now has 4 pixels replacing the original 1. The key benefit of this ploy is text enhancement. Number Nine has redefined text characters, using the new pixel density for better definition and supplanting the chunky characters that make using the CGA so exhausting.

To support existing software in the Pepper mode, the board has the Number Nine Interface Operation Shell (NNIOS) built into its ROM. Introduced in 1985, the NNIOS interface permits communication with any Number Nine video mode using stan-

dard graphics commands, regardless of the hardware employed. The NNIOS standard is already supported by many applications, including *Windows*, *1-2-3*, *Symphony*, and *AutoCAD*.

Whereas the EGA mode supports a maximum video memory of 256K, the Pepper mode is fully expandable. With the addition of one 768K memory module, the board supports 256 colors from a 16,000-color palette. Because of the NNIOS interface and the 82786's 4MB ceiling, Number Nine will eventually be able to offer even more memory, adding more pixels to the bit map without disturbing the interface between software and hardware.

Number Nine is gambling that the combination of the 82786 and the NNIOS standard will be too much competition for IBM's EGA. Whether the company wins that bet remains to be seen. Meanwhile, with a retail price comparable to the EGA's, plus support for four high-performance video modes, the Pepper Graphics System looks like a prime contender for a healthy share of the graphics board market. —TJB

The Pepper Graphics System
Number Nine Computer Corp.
725 Concord Ave.
Cambridge, MA 02138
617/492-0999
List price: \$999

One-Stop Business Graphics

Promoted as both a decision-making and a presentation graphics tool, *GraphStation* opens the door to a throng of graphics functions without sacrificing ease of use.

Richard Jantz

||||| Door number 1, 2, or 3? Many graphics programs pose a disappointing deal: You win sophisticated drawing and editing functions, but you lose the ability to draw graphs from spreadsheet data. Or you might enjoy an agreeable user interface, only to find yourself confined to lackluster output. Clearly, there's an audience out there itching for a program with a full house of graphics features.

GraphStation from Software Clearing House may be the most eclectic PC graphics package to date, marshaling a mass of drawing, business graphics, and data

analysis functions in a single package. The program encourages graphical analysis of keyed-in or imported data, while permitting free-form manipulation of text and graphics elements. Add a consistent, ingratiating user interface, and you have a front-runner in the PC graphics derby.

Aside from its crowd-pleasing cavalcade of features, *GraphStation's* hook is its graphical spreadsheet. Essentially, the program can tie graphs to a built-in spreadsheet application for reverse "what if" analyses. If you lengthen a bar in a chart, for example, the underlying variable changes accordingly—a trick that *Javelin* also performs. And if you've imported a 1-2-3 or *Symphony* worksheet file that includes formulas, alterations to on-screen graphs cause the spreadsheet to recalculate as you go along, making the program ideal for informal modeling and projection.

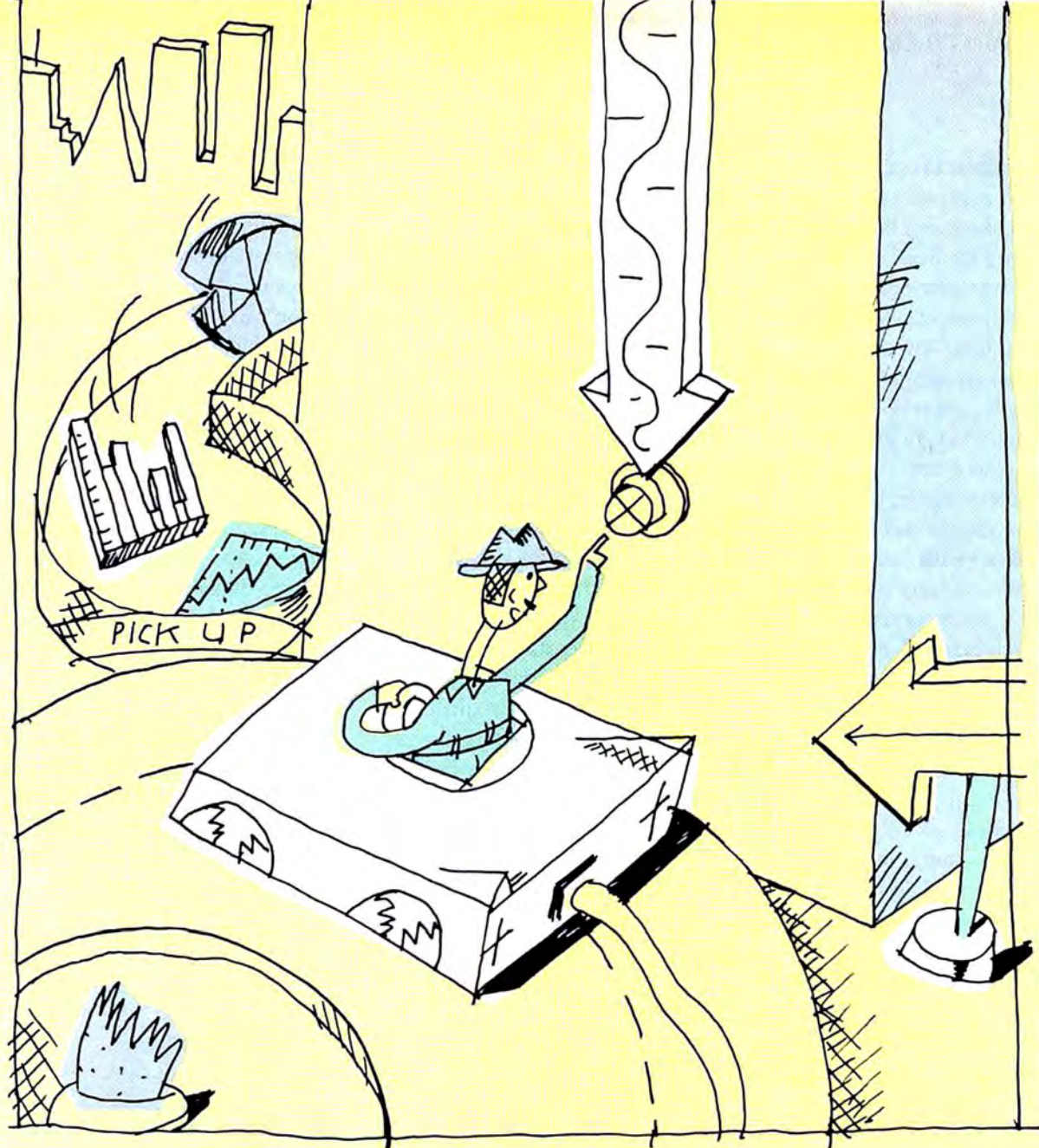
Packing all these features into one program has its liabilities—with about 2MB of C code spread over six floppy disks, you must

have a hard disk. *GraphStation* is also slow to repaint the screen and display text entries, especially with 8088-based machines.

Full-Scale Functionality *GraphStation* offers a menu-driven installation utility. Each step of the way, you're prompted by yes/no options that only Daffy Duck could foul up. When copying *GraphStation* to a hard disk, however, be prepared to wait awhile as the program's 92 files are read from your floppy drive.

Once it's installed, what strikes you immediately about *GraphStation* is its engaging user interface. *GraphStation's* streamlined screen anatomy and intuitive menu system add up to a short learning curve. You control a single arrowlike pointer with a mouse to select and execute all program functions. Although you can substitute cursor keys for a mouse, they move the pointer too slowly to be practical.

The program's display resembles that of many CAD (computer-aided design) programs. Four-fifths of the screen is taken up by a workspace window, while menus



are relegated to the border of the display (see Screen 1). To help you navigate the treelike menu structure, the program highlights the current path of menus and sub-menus as well as the last option selected. In addition, *Graph-Station* offers three levels of user prompts and adequate on-line help.

If you've struggled with programs that make you shuttle between the graphics display and a

full-screen menu, you'll be relieved to have the whole shebang on one screen. It encourages an aim-and-shoot approach: First you select a text or graphics element from an image, then choose what you want to do with it by sliding the pointer to the appropriate menu option. For example, if you want to modify text in a graph, simply point to the desired text, and the menu

changes to list all the relevant text options.

A minor failing of *Graph-Station*'s aim-and-shoot method is that it's easy to forget which text or graphics element you've selected. You can, however, enter a command to highlight the active item, which flashes for three seconds as the computer beeps. Programs like *Freelance* and *Diagraph* avoid this song and dance by automatically framing the active item with special boxes or symbols.

Graphs From Scratch

To generate a graph from numeric data, you begin by loading a data file from one of *GraphStation*'s graphics data bases, or catalogs, each of which can hold up to 90 files. You can create data files from scratch in the program's edit mode, entering data sets and labels until you've produced what amounts to a small spreadsheet. Data entries can be added, deleted, or moved and labels shuffled or replaced with little hassle. The maximum number of data sets or points is purely practical—you can cram tick marks, labels, and numbers into a graph up to the limits of legibility. The program can also convert worksheet or text files in 1-2-3, *Symphony*, SYLK, and ASCII formats, and save them as catalog files.

The next step is to plug your data into one of *GraphStation*'s chart formats. The program's array of business graphs is fairly standard, delivering bar, stacked bar, line, and pie charts, as well as stacked line charts and marker charts. Though a limited number of business users will need them, the program also provides X:Y marker, X:Y line, and X:Y random-line charts for scientific and statistical applications.

GraphStation also produces text charts. You enter the text directly into the graph window, and you can move a text element anywhere on screen, center it, or align it with other text. You can also edit or erase text easily and change its color, font, size, spacing, and shadowing. *GraphStation* offers eight typefaces in five sizes and supports 11 letter-spacing variations, plus four orientations for

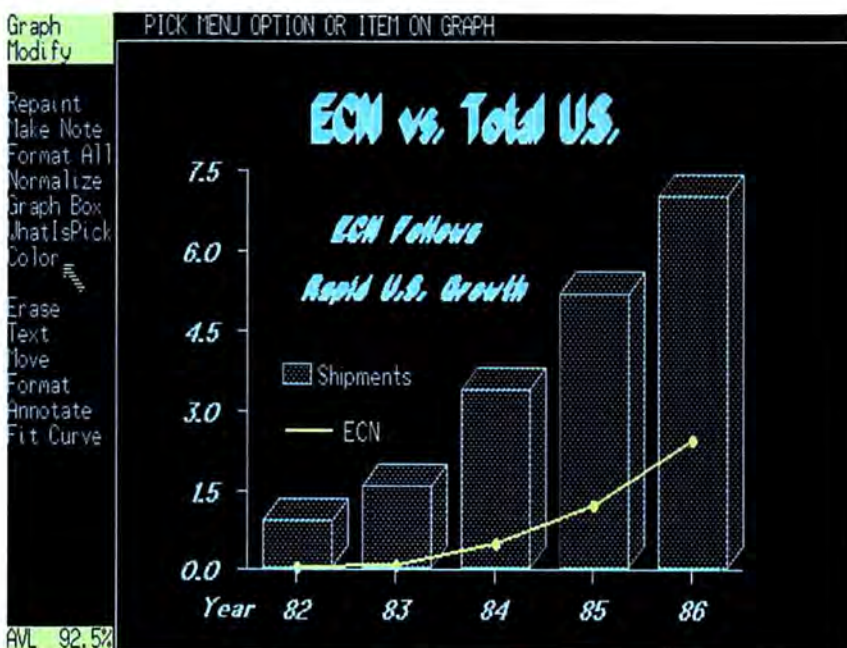
each font (used for vertical text labels or even upside-down text). These capabilities—which can also be used for labels and titles in graphs—give the program far more textual flexibility than such graphics mainstays as *Chart-Master*, *Microsoft Chart*, or *Graphwriter*.

After you've selected the desired data and format, you're ready to enter the Draw Graph command. *GraphStation*'s graph window goes blank for a few seconds and then brings up the default version of the chart you've chosen. Once the graph is on screen, *GraphStation* proves its mettle with a stellar array of editing options. For openers, if you're not thrilled with, say, the line chart format you've chosen, you can change it to a bar chart with a single command. If you've made modifications to the original chart, such as color and text-attribute altera-

tions, *GraphStation* carries them over to the new format.

When you're happy with the format, few obstacles stand in the way of dazzling enhancements. You can add, erase, or change the value of any data point; modify the unit notations on the Y-axis label; and add vertical or horizontal grid lines. With bar, line, and marker graphs, *GraphStation* offers a choice of 18 fill styles, 11 line styles, and 10 marker types, respectively. You can give bars a three-dimensional look with 12 different depth perspectives and establish a variety of bar borders, spacings, and widths. Although no three-dimensional effects are offered for pie charts, slices can be exploded or rejoined easily. And because *GraphStation* enables you to change the orientation of the axes, you can turn a standard bar graph into a horizontal one.

Screen 1: GraphStation puts the menus and work area on one screen, making mouse-driven interaction as simple as using most draw and paint programs.



For those who need graphical data analysis for scientific applications, *GraphStation*'s curve fitting by running average, linear and nonlinear regression analyses, and four-quadrant graphing of scatter and line graphs should prove useful. Also available are Fourier reductions (see Screen 2), polynomial best fit, semilog and log-log scales, plus a connect-the-dots mode for curves that turn back on themselves (isotherms, gradients, and hysteresis data).

Finally, when you've fine-tuned a graph to your heart's content, you can display it in the photograph mode—which rids the image of its menu display—or save the graph as an image file and subject it to further manipulation using *GraphStation*'s Draw functions.

GraphStation also has a slideshow mode for displaying a series of image files. Although the program lacks *PC Storyboard*'s fancy dissolves, images can be shuffled into any order, and you can set up the show for an automatic run that displays each slide for 30 seconds. *GraphStation* fully supports IBM's Enhanced Graphics Adapter, and on an enhanced color display, a well-designed slideshow looks pretty snazzy.

■ Making 1-2-3 Sing

Unlike packages such as *Freelance* that import 1-2-3 .PIC files, *GraphStation* reads worksheet files from either 1-2-3 or *Symphony*. Before you import a worksheet file, you identify data sets and text labels using 1-2-3's /Range Name Create command, a

simple procedure that entails naming worksheet cells with special codes. For example, you use %T for the range name of a title, %N for notes, %X for X-axis tick mark labels, %Y for various data sets, and so on.

GraphStation also gives you the option of including spreadsheet formulas. If you decide to import formulas, changing a data point on a graph will change all other points tied to it whenever the data points are automatically or manually recalculated. When you change a data point in the graphical spreadsheet mode, an "odometer" beneath the menu indicates the new value as you move the pointer up or down (see Screen 3). Any changes made to data points in this manner can be saved directly to an existing or a newly

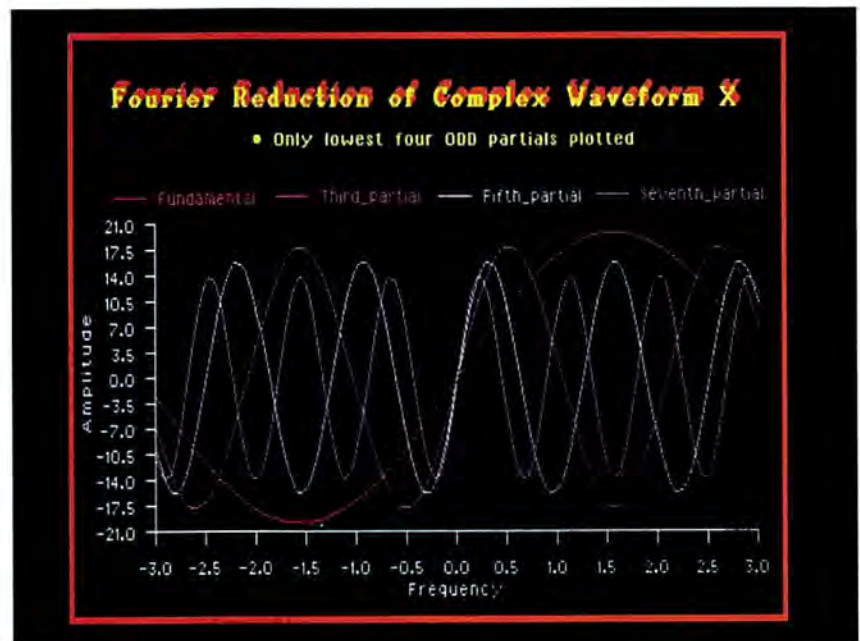
created worksheet, which you can use again with 1-2-3 or *Symphony* (see Screen 4).

A similar interactive graphics modeling approach is offered by *Javelin* (see "Javelin: Beyond Rows and Columns," *PCW*, March 1986). Fast and easy data manipulation of this kind may be useful in revealing trends (slope and second derivative), comparisons of magnitude, and other general information. It's easy to see, however, how careless hands entering data into a graph could open the door to misleading or worthless data.

■ Artistic Inclinations

GraphStation falls short of a high-end paint or draw program, but the artistic tools it includes are more than adequate to enhance

Screen 2: This Fourier reduction chart provides a good example of *GraphStation*'s extensive scientific graphing capabilities.



graphs for presentation. The Draw portion of the program enables you to load and modify image files from the Graph component as well as create images from the ground up.

Included in *GraphStation's* toolbox are freehand, straight, horizontal, and vertical lines, all of which are adjustable in width and color. You can make the same adjustments to rectangles, arcs, and circles. The flood option gives you a choice of 19 different fill patterns for any enclosed shape or image. Unfortunately, there's no way to adjust the line width for stylus or brush styles, and although an erase function is provided, the absence of an undo command is a significant omission.

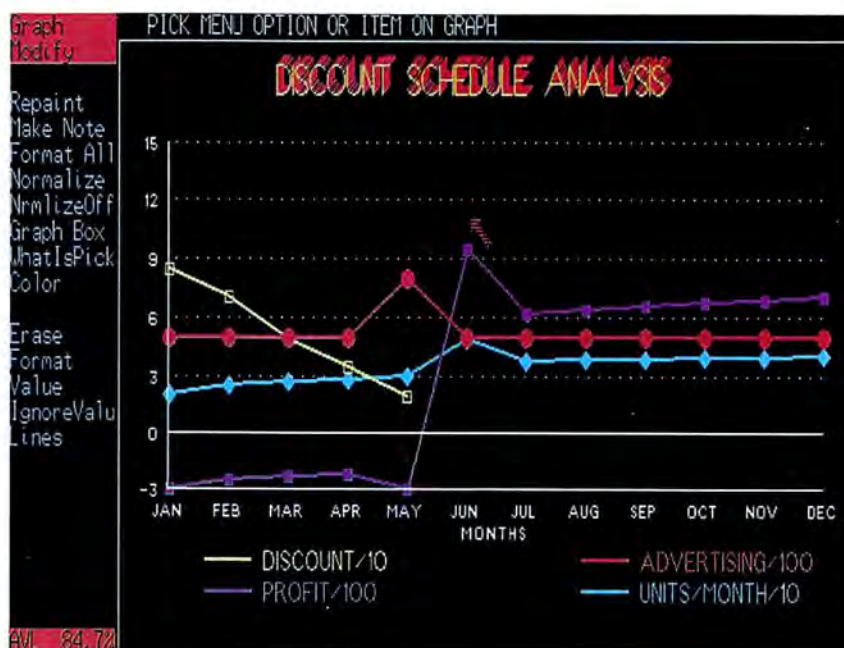
The Show X:Y command helps accurately calibrate graphics elements, and a copy buffer allows you to duplicate any on-screen area surrounded by a movable box. This capability makes it easy to create organizational charts and diagrams composed of boxes of the same size (see Screen 5). Although it's somewhat cumbersome, you can also use the copy function to combine several business graphs on one page by sizing and saving each constituent graph separately, reading them into the graph window one by one, and then saving them as a single image file.

When compared with chart enhancement programs like *Free-lance*, *GraphStation* reveals a similar range of drawing tools. *GraphStation's* main advantage is a freehand drawing mode; *Free-lance* limits its drawing capabilities to combining arcs, rectangles, circles, and lines. However, since *GraphStation* is more like a painting program that draws pictures pixel by pixel, you can't zoom in

Screen 3: Using *GraphStation's* Change Value function, you can modify a 1-2-3 .WKS file by moving a data point. The Scaled Value readout at the bottom of the screen serves as the graphical spreadsheet's "odometer."



Screen 4: Because the .WKS file in Screen 3 includes formulas, changes made to a single data point cause the line chart to recalculate.



or out on drawings or stretch, rotate, or flip objects as you can with *Freelance*. Nor can you plot freehand drawings on a plotter. *GraphStation* also lacks a symbol library, although Software Clearing House claims the program will soon offer a library of business images.

Audience Considerations

GraphStation supports over 30 output devices, including the Hewlett-Packard LaserJet, Hewlett-Packard and IBM pen plotters, and dot matrix printers from IBM, Epson, Okidata, Toshiba, NEC, and others. For higher quality output, you can hook up a Celtic or Polaroid Palatte film recording device, and Software Clearing House expects to expand support to include the high-resolution Matrix Instruments cameras in the near future.

GraphStation's flexibility with text and graphics elements equips it well for presentation applications, but it's the graphical spreadsheet that sets the program apart. While other programs that emphasize presentation graphics have abandoned the concept of graphical data analysis at the desktop, *GraphStation* revives this notion with interactive charting features that many business users will find attractive. Scientists, engineers, and statisticians would have to look to a vertical market graphics application to get a comparable array of technical charting features.

Nevertheless, in trying to cover the waterfront, *GraphStation* misses a trick here and there that would make its presentation capabilities stronger—notably, a full range of type fonts and three-

dimensional effects. And given the limitations of its Draw functions and plotting capabilities, the labor required to create well-executed images may not be worth the effort for those who'll use an image only once.

Ultimately, *GraphStation* will probably find a home in the corporate world, particularly among middle managers who work with 1-2-3 and *Symphony* and need to make presentations quickly, easily, and effectively. Housing data analysis, drawing, and business presentation graphics under one roof, *GraphStation* is no less than an integrated package of graphics functionality. ●

Richard Jantz is a freelance writer based in Berkeley, California, and principal author of Creating the Best Impression: All About Business Graphics Software (Hayden Book Company, Hasbrouck Heights, New Jersey, 1986).

GraphStation
Software Clearing House, Inc.
771 Neeb Rd.
Cincinnati, OH 45238
513/451-6950
List price: \$495
Requirements: 384K; hard disk;
Hercules Graphics Card, IBM
Enhanced Graphics Adapter, or
IBM Color/Graphics Adapter

Screen 5: Using *GraphStation*'s Draw mode, you can easily create an attractive template for a series of word charts in which only the text will change.



On a Wang and a Prayer

Just when you thought dedicated word processing was kaput, along came Wang Word Processing for the IBM Personal Computer and MultiMate Advantage—Wang-oriented programs for the PC that are sold with their own dedicated keyboards.

Vincent Flanders

Since its introduction in 1976, Wang word processing has been the standard fare for corporate America. One important ingredient in Wang's success was a dedicated keyboard with logically arranged and labeled function keys. The keyboard helped make word processing easy to learn; instead of being forced to memorize a series of commands, an operator could glance at the keyboard and quickly find the right key.

The success of the IBM PC loosened Wang's grip on office word processing, and PCs began to replace dedicated word processors. Today the trend has so accelerated that Wang is having difficulty placing new dedicated systems, and IBM recently discontinued its DisplayWriter dedicated system.





When the first PCs appeared in corporate offices, however, only a few comparatively feature-poor word processing programs were available, and none of them were familiar to the thousands of secretaries who came of age using Wang systems. To remedy this situation, in 1982 an insurance company contracted with programmer Wilton Jones to create a word processing program for the PC that mimicked Wang word processing. What Jones created became *MultiMate* (from Multimate International Corporation, now a subsidiary of Ashton-Tate). Within two years, *MultiMate* had taken corporate America by storm.

Wang Laboratories was working on a PC version of its word processing software during much of this time, but internal bickering and indecision delayed the program's release until December 1985. Meanwhile, *MultiMate* was upgraded several times and ultimately offered in two configurations, of which *MultiMate Advantage* is the deluxe model. This review compares *Wang Word Processing for the IBM Personal Computer* version 1.0 (hereafter called *Wang/IBM WP*) and *MultiMate Advantage* version 3.60 (hereafter called *Advantage*).

Common Ground

Two primary attributes make *Wang/IBM WP* and *Advantage* Wang-like: their multiplicity of function keys and their page-oriented method of handling text. To support the heavy use of function keys, both programs offer dedicated keyboards that contain numerous prominently labeled special keys. In *Wang/IBM WP*'s case, the keyboard is required. These alternate keyboards can also be used with other PC programs.

Both programs work with one page at a time, a throwback to the days when computers had limited RAM at their disposal. All other pages are stored on disk, and you must give a separate command to access them—one at a time. You can easily repaginate a document, but this also requires a separate procedure. Although you can define a page length of up to 4000 characters in *Wang/IBM PC* and 6144 characters in *Advantage*, these artificial boundaries can be a nuisance to those who are accustomed to document-oriented word processors that load an entire file into memory at once. The on-screen appearance of a page is similar in the two programs.



Figure 1: The Wang dedicated keyboard is based on Wang's 101-key universal keyboard. Because Wang/IBM WP requires the dedicated keyboard, the program can run only on IBM PCs and XT's, not on compatibles.

Further similarities include the programs' adoption of overtype instead of insert as the default mode and their use of glossaries. (The Wang glossary was a forerunner of macro programs, allowing you to store and quickly insert command strings and boilerplate text.)

■ Diverging Paths

Although both programs have their roots in dedicated Wang word processing, their PC versions show important differences. *Advantage* is an expanded version, or superset, of *MultiMate 3.3 Series*; *Wang/IBM WP*, in contrast, is derived from the word processing program Wang Labs developed for its own MS-DOS-compatible Wang PC. That program is a subset of the original Wang word processing software, which makes *Wang/IBM WP* a subset of a subset—in essence, a more limited program than its predecessors and *Advantage*.

Because *MultiMate* has been competing in the PC marketplace for nearly four years, its features have generally kept pace with advances in word processing. The Wang entry, on the other hand, emulates office word processing circa 1976, without such embellishments as text columns, multiple headers and footers, or table of contents generation.

Perhaps the most significant difference between *Advantage* and *Wang/IBM WP* is in their DOS com-

patibility. While *Advantage* has followed PC-DOS conventions and enables you to use most memory-resident utilities, *Wang/IBM WP* leaves DOS behind. It operates in Wang-emulation mode, so that once you load the program, you're isolated from DOS. The IBM screen-handling routines and the IBM keyboard aren't recognized. As a result, *Wang/IBM WP* doesn't work with any memory-resident programs.

■ Dedicated Keyboards

Because *Wang/IBM WP* requires a Wang keyboard, the program can only be used with an IBM PC or XT. No compatibles are supported, not even an IBM AT or the Wang PC. Although the *Advantage* keyboard is optional, it, too, shackles you to IBM models.

The Wang keyboard is a modified version of Wang's 101-key universal keyboard (see Figure 1). It is a touch-typist's dream with just the right amount of bounce, but you can't turn off the keyboard's distinctive click, which sounds like a tommy gun when you type fast.

In keeping with the keyboard's Wang emulation, the function keys are spread across the top rather than clustered at the left side. Wang has assigned inalterable operations to all the function keys and labeled them in black. A small plastic strip below these keys displays the standard IBM labels in light blue. A few of the standard keys are awkwardly placed, such as the backslash, <Ctrl>, and <Alt> keys. Pressing <Ctrl>-<Alt>- requires the finger spread of a basketball player or concert pianist.

Advantage's keyboard, which also works with *MultiMate 3.3*, contains 116 keys and is 4 inches wider and 2 inches deeper than its PC counterpart (see Figure 2). Its larger size is due mainly to an attempt to accommodate both IBM and Wang by retaining the 10 standard PC function keys along the

left side while adding another 17 Wang-inspired function keys along the top. In addition, a group of 14 function keys resides between the typewriter keys and the numeric keypad. To use any of the added function keys, you must first install special software that is provided with the keyboard. Twenty-two of the function keys are programmable; you can redefine each key with any sequence of up to 19 keystrokes.

The arrangement of the *Advantage* keyboard is even worse than the Wang's. The keys have very little spring—when you press down it feels like you've struck bottom. In comparison, the Wang keyboard is clearly superior.

MultiMate Advantage: Pro

If you compare the features offered by the two programs, *Advantage* seems to be superior (see Table 1). Like *Wang/IBM WP*, *Advantage* provides the usual editing and formatting commands, such as block moves and global search and replace (see Screen 1). For the most part, the editing and formatting commands are straightforward; most involve only one function key. For example, moving a block of text is a matter of pressing <F7> three times, interspersed with moving the cursor. If you want to move the format line with the text, you must also press <F9>. You can highlight by character, word, line, sentence, paragraph, screen, and page.

Advantage has several useful features that the Wang program does not offer. Chief among them is the program's handling of columnar text. Columns can be copied, deleted, inserted, and moved, although

these operations cannot cross page boundaries. *Advantage* offers up to eight columns in two formats: *snake* and *bound*. Snake columns are like newspaper columns in that the text wraps from the bottom of one column to the top of the next, but their width cannot vary. Bound columns do not snake, but they can vary in width.

Unlike *Wang/IBM WP*, *Advantage* supports footnotes, which it stores in a separate file. Only one footnote format line is allowed per document, but each footnote can be up to eight lines long. During repagination, each footnote is measured to compute the overall page length.

You can also create an outline or table of contents using Roman numeral or Arabic numeral formats. When you make changes to the outline, the program automatically rennumbers the headings. Setting the format criteria for an outline is a bit tricky, however.

Unlike *Wang/IBM WP*'s spelling checker, *Advantage*'s can run in the background and verify single words. A 40,000-word on-line thesaurus is a notable extra, as is the ability to draw lines and boxes within a document. One recent addition is the Information Handling component, which creates forms, templates, and merge-print files. This feature is much easier to use than the program's conventional method of merge printing.

Moreover, *Advantage* includes two separate software packages: On-File, a mini data-base program, and GraphLink, a screen capture utility. On-File uses the familiar index-card format to manage information. You can enter data either free-form or within a template. The cards can be selected, edited, sorted, or printed. You can also save data in the appropriate format for merge printing with *Advantage*. One clever feature is the program's ability to flip the card over and let you add more information—just as



Figure 2: Multimate's optional keyboard works with both *Advantage* and *MultiMate 3.3*. The keyboard provides 10 PC-compatible keys on the left, 17 Wang-like keys on the top, and 14 additional function keys. Twenty-two of the keys are programmable.

Table 1: Comparison of Wang/IBM WP and Advantage features

	Wang/IBM WP 1.0	Advantage 3.60
Section numbering		●
Table of contents		●
On-line data file capabilities		●
Supports multiple directories	●	
Automatic document backup		●
Imports graphics		●
Works with data base package		●
Line/box drawing		●
Creates ASCII file		●
Imports ASCII file	●	●
Document summary screen		●
Search comments		●
File utilities available from main menu		●
System-generated page breaks		●
Supports independent columns		●
Multiple headers and footers		●
Automatic date and time stamp		●
Supports proportional spacing		●
Thesaurus		●
Runs spelling checker in background		●
Single-word verification		●
Maximum page width	158	156
Maximum number of characters per page	4096	6144
Maximum document file size (in bytes)	492,544	131,072
Number of words in main dictionary	66,000	110,000

you would with a real index card. On-File's only significant deficiency is that you must run a separate utility to display a directory of files.

GraphLink is an 85K memory-resident program that captures whatever is on the screen, saves it on disk, and later incorporates it into a printed *Advantage* document. Because GraphLink and *Advantage* together consume approximately 403K of memory, if you're running other memory-resident programs, you could quickly exhaust available memory.

MultiMate Advantage: Con

After I began using *Advantage*, my enthusiasm dimmed. The program is feature-rich but performance-poor. In almost every operation except loading, *Advantage* is much slower than Wang/IBM WP (see Figure 3). The sluggishness of *Advantage*'s spelling checker compared to Wang/IBM WP's is due partly to the size of *Advantage*'s dictionary—nearly twice that of the Wang/IBM WP's.

The *Advantage* spelling checker has some other foibles. For example, it accepts any hyphenated word as long as each of its parts is accurate, allowing such ludicrous combinations as *goofy-beans-kettle* and *pseudo-quasi-semi-car*. The program also takes liberties with possessives: It promptly accepted *of's*, *is's*, *I's*, *the's*, and *be's*. Furthermore, *Advantage* flags as incorrect any words connected by double hyphens, which stand for em dashes and are legitimate symbols.

Advantage has several quirks in addition to its slow speed and spelling limitations. The most hazardous concerns the program's file-size limit of 128K. Although files that large may not be desirable, many offices routinely use them. Instead of being warned as you approach the limit, you discover that your file is too large only when you try to save it or move from one page to the next: You end up losing the current page. Similarly, running the spelling checker on a file longer than 128K causes the system to freeze and lose excess text.

Another problem—*Advantage* does not support multiple directories. Finally, the driver for the Epson FX series printers contains a bug that adds unwanted characters to the top of the page whenever you choose proportional or justified type.

Although the easy-to-use Wang/IBM WP offers few luxuries, its features are well implemented and present fewer problems than those of *Advantage*. You use function keys to perform block moves much as you do with *Advantage*, but you can only highlight by character, word, line, page, and next occurrence of a character.

The Glossary is Wang/IBM WP's strongest feature, while *Advantage's* glossary function is less powerful and more difficult to use. Wang/IBM WP's Glossary creates documents that can store both text and formatting commands, which you access with just two keystrokes. You can easily add new text to a Glossary file or change its contents. For instance, in a Glossary document that contains the format for a business letter, you could direct the program to stop the formatting process at a specified place and resume formatting only after you've added the current date from the keyboard.

Wang/IBM WP's Decision Processing feature helps you locate the cursor during a Glossary operation. This feature lets you design an invisible form by marking points on a page for data entry and prompting you when your cursor is moved to the correct spot. For example, you could have the program prompt you when the cursor arrives at the correct line and column for typing in your title at the bottom of a boilerplate letter.

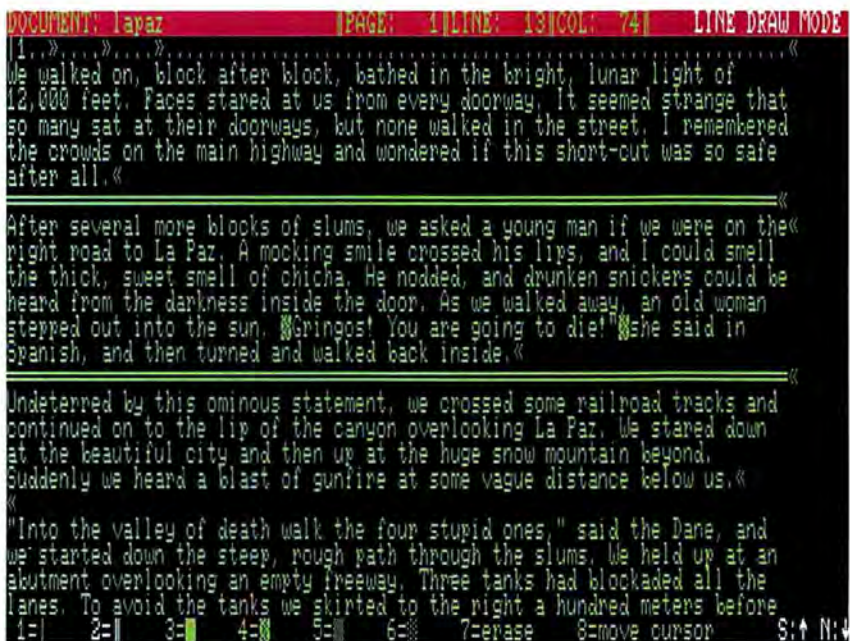
Because Wang/IBM WP runs under Wang's proprietary operating system, the program provides its own commands for disk operations. The easy-to-use,

menu-driven system utilities perform directory display; file copying, renaming, deletion, and creation; and removal of subdirectories. Wang also includes a useful utility for modifying the program's menus and help screens as well as creating new ones, a feature that offers great flexibility for developing training programs and custom interfaces.

You can easily convert ASCII text files to the Wang OIS (Office Information System) format, but you can't convert data from Wang format to ASCII. *Wang/IBM WP* creates and stores documents in the same format used by Wang's other word processing software, making it easy to shuttle documents between the PC and Wang systems. Unfortunately, you can't reliably import an existing Glossary file from a Wang dedicated system. (See the sidebar "Bringing Wang Into the Fold" for information on Wang-to-PC conversion products.)

Wang/IBM WP's greatest drawback is its incompatibility with PC-DOS. In this era of megabyte RAM boards and burgeoning memory-resident programs, Wang's program is literally stuck in its shell.

Less serious, but equally annoying, is having to leave the main component of the Wang program to use the system utilities. From the editing screen, all filing operations are beyond your reach except the ability to save the current document.



Screen 1: Editing screen of MultiMate Advantage, displaying the line and box drawing mode

One frustrating bug—if you repaginate while the cursor is within an indented paragraph, the indentation does not carry over to the next page. In addition, you can use print spooling (background printing) only by running Wang's version of PRINT.COM from PC-DOS 2.00 or 2.10 before you load the program. If you're running PC-DOS 3.00 or a later version, print spooling is not supported, and the program's Directory Display utility will not list directories or subdirectories.

Documentation and Support

The documentation for *Wang/IBM WP* is excellent, except for the Glossary and Decision Processing features, which receive cursory coverage. *Advantage's* documentation is good, although it provides a rather weak explanation of columnar text operations.

Wang does not currently charge for support. If you're a registered *Advantage* owner, support is free for the first 60 days. After that, the company charges a \$50 annual subscription fee.

Wang also provides a toll-free hot line for registered purchasers. When I encountered a problem, it took me less than a minute to get through to a competent support technician. My experience with *MultiMate* was just the opposite. Not only does the company lack a toll-free number, but the lines were often busy; when I finally got through I had to wait 9 minutes to talk to a support technician who had never worked with the *Advantage* keyboard. After admitting that only one person in the department had ever

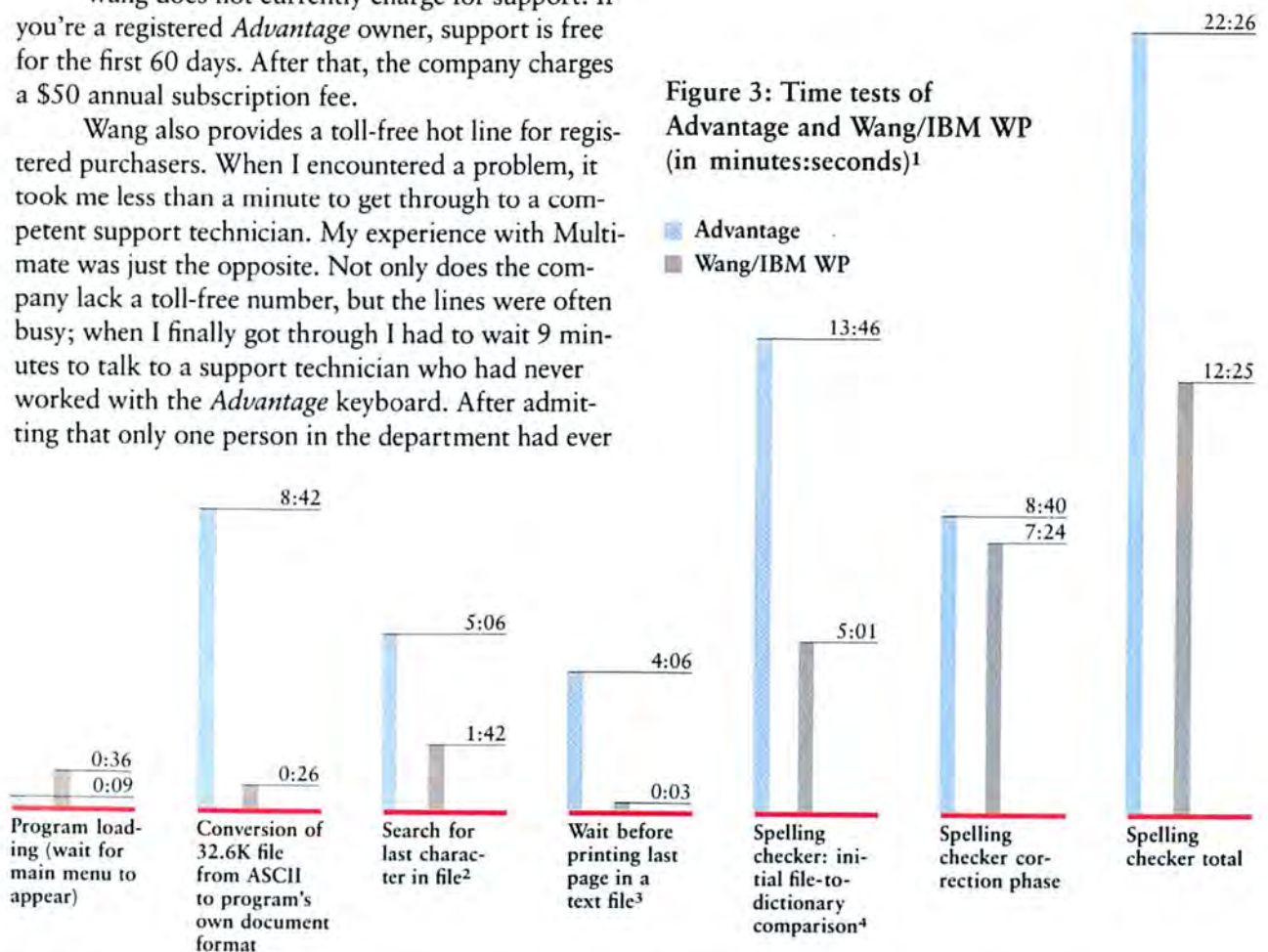
used the keyboard, she promised to have her supervisor call me. Three months later, I'm still waiting.

Because *Wang/IBM WP* is in its first release, an upgrade policy has not yet been established. *Advantage* users can obtain updates to the *Advantage* series for \$60, while *MultiMate 3.3 Series* owners can upgrade to *Advantage* for \$100.

Wang/IBM WP is not supported on any local area networks. The *MultiMate Advantage Local Area Network* version is supported on the IBM PC Network and the 3Com and Novell networks. A universal version that runs on most other networks is also available.

While Wang is concentrating its marketing effort on its current customers, *Wang/IBM WP* and one Wang keyboard can be purchased by mail from the MCS Group, which also throws in its Wang-to-PC conversion software, the *Word Doctor*.

Figure 3: Time tests of *Advantage* and *Wang/IBM WP* (in minutes:seconds)¹



¹ Tests were performed on an XT with a 20MB hard disk and 640K RAM.

² Advantage file, 128K; Wang file, 492K

³ Advantage file, 57 pages; Wang file, 120 pages

⁴ Spelling checker tests were performed on an 11,379-word, 82,432-byte file for Advantage and a 10,667-word, 93,184-byte file for Wang/IBM WP.

Bringing Wang Into the Fold

Until recently Wang Laboratories had failed to develop an acceptable strategy to lasso the millions of IBM PCs into the Wang world. But on July 31, 1985, Wang Labs announced a series of products that strive to close the gap and turn PCs into local and remote Wang terminals: *Wang/IBM WP*, the Wang Local Office Connection, and the Wang Remote Office Connection.

Wang seems less interested in selling *Wang/IBM WP* on the street than in leveraging the large installed base of IBM PCs to promote its VS minicomputer. When Wang can't persuade a customer to buy a VS or MS-DOS-compatible Wang PC, its last resort is to push the Local Office Connection. At least it's a foot in the door. The message is clear: "For \$1895, you can turn your IBM PC into a terminal on a Wang VS, the premier office minicomputer."

The Local Office Connection consists of *Wang/IBM WP*, the Wang keyboard, a terminal emulation board, emulation software, and a coaxial cable. This hardware/software combo enables an IBM PC or XT not only to connect directly with a Wang VS minicomputer, Office Information System (OIS), or Alliance office system, but also to function as a workstation. The VS connection permits IBM PC users to access such programs as *Wang VS Integrated Word Processing*, *Wang Office* (Wang's information management software), and *Pace* (Wang's relational data base). The connection provides access to modems, storage devices, and printers.

The Remote Office Connection consists of *Wang Systems Networking* software, *Wang/IBM WP*, a telecommunications board, the Wang keyboard, and an RS-232C cable. The user must supply the modem. This package enables an IBM PC to remotely log on to a VS system and run VS programs. It also permits the transmission of word processing documents and binary files such as spreadsheets. The package does not support programs that require you to download microcode (such as *VS Word Processing* and *WP Plus*).

Meanwhile, Multimate has concocted its own strategies for connecting to Wang. The company's MultiMate Business Advantage Communications Board (plus conversion software) provides direct document exchange from either *MultiMate* or *Advantage* to a Wang VS or OIS. Multimate also offers free document conversion software for *Wang PC WP* (which runs on the Wang PC) and Wang's dedicated *WPS (Word Processing System)*. A competing translation board from the M/H Group, called TextCom, provides document conversion between the PC and Wang equipment. In addition, the M/H Group sells *W-Links*, a series of programs that convert Wang PC documents to and from *MultiMate*; *DisplayWrite 1, 2, and 3*; *WordPerfect*; and *WordStar* formats. The MCS Group, which has a license to sell *Wang/IBM WP*, markets a competing Wang-PC-to-IBM-PC conversion series in *WordStar*, *MultiMate*, and *DisplayWrite 3* formats. —V. F.

Side by Side

Wang/IBM WP should appeal most to companies whose IBM PCs or XTs (not ATs or clones) could be connected to Wang office automation equipment or whose secretarial staff is already familiar with Wang word processing. The program's appeal will probably not extend beyond the Wang universe. Its proprietary operating system can cause problems if you use the PC for anything other than word processing. *Wang/IBM WP* is as easy to use as *pfs:write*, but considering its dearth of features (compared to dedicated Wang systems), its \$695 price is too steep.

Even with the inclusion of On-File and Graph-Link, *Advantage*, at \$595, is also expensive. I recommend the \$350 keyboard only for users switching from the Wang dedicated environment, but I suggest a trial run. Although *Advantage*'s numerous features position it at the high-end of word processing software, I found version 3.60 too slow and too buggy to recommend.

Both manufacturers had better act fast to clear up their respective programs' deficiencies. Not only are other Wang-oriented programs, such as Office Solutions' *OfficeWriter*, competing on their turf, but some users are beginning to look outside the Wang world altogether. They may find that, with a little retraining, they can get more features and better performance with document-oriented programs. Meanwhile, adding a special keyboard does not solve problems that should be corrected in the software itself. ●

Vincent Flanders is the associate editor of Access 86, an independent computer magazine based in Austin, Texas, that covers the Wang marketplace.

MultiMate Advantage version 3.60
Multimate International Corp.
 52 Oakland Ave.
 East Hartford, CT 06108-9911
 203/522-2116
List price: \$595 (includes On-File and GraphLink); optional keyboard \$350; MultiMate Advantage Local Area Network

version \$1195 for three user licenses, additional license \$295 per node; MultiMate Business Advantage Communications Board \$995

Requirements: 320K, two disk drives, DOS 2.00 or later version; keyboard can be used only with IBM models and Compaq Deskpro

Wang Word Processing for the IBM Personal Computer version 1.0

Wang Laboratories, Inc.
 One Industrial Ave.
 Lowell, MA 01851
 617/459-5000

List price: \$695 (includes keyboard), Wang Local Office Connection \$1895, Wang Remote Office Connection \$1200

Requirements: IBM PC or XT, 256K, two disk drives, DOS 2.00 or later version

Wang Word Processing for the IBM Personal Computer and the Word Doctor

The MCS Group, Inc.
 2465 W. Chicago St.
 Rapid City, SD 57702
 605/341-6755

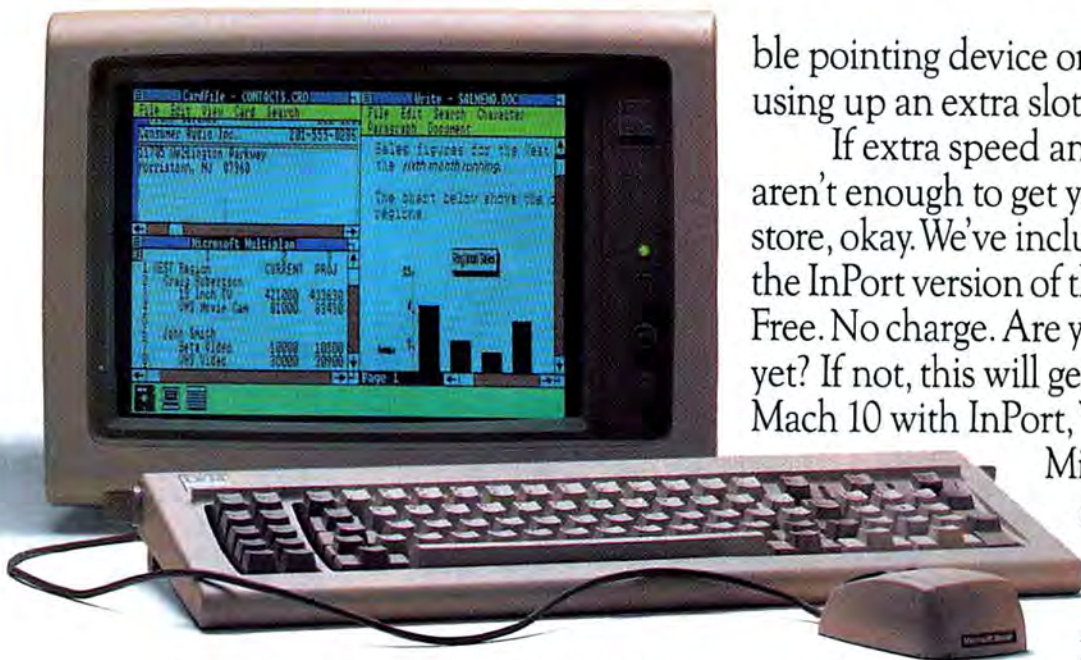
List price: \$695 (includes keyboard and one conversion version of the Word Doctor), the Word Doctor \$195 per conversion version

W-Links and TextCom

M/H Group
 222 W. Adams St.
 Chicago, IL 60606
 312/443-1222

List price: W-Links \$395; TextCom \$989 (includes board, software, and cable)

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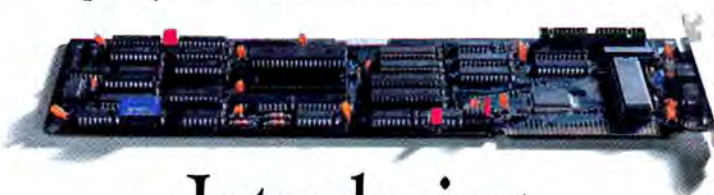
ble pointing device or tablet without using up an extra slot.

If extra speed and an extra port aren't enough to get you hurrying to the store, okay. We've included Windows and the InPort version of the Microsoft Mouse. Free. No charge. Are you out of your chair yet? If not, this will get you moving: The Mach 10 with InPort, Windows, and the Microsoft Mouse costs only \$549.

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Earth will be destroyed in 12 minutes to make way for a hyperspace bypass. Should you hitchhike into the next galaxy? Or stay and drink beer?

Slip the disk in your computer and suddenly you are Arthur Dent, the dubious hero of *THE HITCHHIKER'S GUIDE TO THE GALAXY*, a side-splitting masterwork of interactive fiction by novelist Douglas Adams and Infocom's Steve Meretzky. And every decision you make will shape the story's outcome. Suppose for instance you decide to linger in the pub. You simply type, in plain English:

>DRINK THE BEER

And the story responds:

YOU GET DRUNK AND HAVE A TERRIFIC TIME FOR TWELVE MINUTES, ARE THE LIFE AND SOUL OF THE PUB, THEY ALL CLAP YOU ON THE BACK

>WRAP THE TOWEL AROUND MY HEAD

And the story responds:

THE RAVENOUS BUGBLATTER BEAST OF TRAAAL IS COMPLETELY BEWILDERED, IT IS SO DIM IT THINKS IF YOU CAN'T SEE IT, IT CAN'T SEE YOU.

AND TELL YOU WHAT A GREAT CHAP YOU ARE AND THEN THE EARTH GETS UNEXPECTEDLY DEMOLISHED, YOU WAKE UP WITH A HANGOVER WHICH LASTS FOR ALL ETERNITY. YOU HAVE DIED.

Suppose, on the other hand, you decide to:

>EXIT THE VILLAGE PUB THEN GO NORTH

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rumblings at the
regional phone
companies and
gateways to 700
on-line data bases
via EasyLink and
CompuServe

Edited by Eric Brown

Watson Watch

Baby Bells Rattle the Retail Crib

This couldn't have been the way Judge Greene planned it.

In the AT&T breakup as scripted by U.S. District Judge Harold Greene, Ma Bell was supposed to joust with IBM in high-tech Valhalla while the seven Baby Bells continued the mundane business of connecting caller A with caller B.

In the two-and-a-half years since divestiture, however, the Regional Bell Operating Companies (RBOCs)—Nynex, Bell Atlantic, Bell South, Ameritech, US West, Pacific Telesis, and Southwestern Bell—have proven more precocious

and less regional than anyone imagined. Collectively, the RBOCs have approached the PC market with greater agility and aggressiveness than Mother herself.

The world got wind of the incipient trend when Nynex, the New York area RBOC, took IBM's Product Centers off Big Blue's hands earlier this year. Nynex forked over \$150 million for 81 storefronts in 33 states—outlets that were reportedly losing \$40 million a year. Swallowing the Product Centers was merely the most voracious act in the RBOCs' methodical foraging for corporate customers.

While AT&T is scrambling to locate its place in computer manufacturing, the Baby Bells have

(continues)



turned Judge Greene's ban on RBOCs' manufacturing to their advantage. Despite a flat, even depressed, retail marketplace, they're exploiting retail sales and value-added resales in a manner that befits players with deep pockets and big plans.

International Resource Development, a Connecticut market research firm, suggests that the federal prohibition on RBOCs' manufacturing protects the holding companies from diverting resources to a potentially unprofitable endeavor. Although RBOCs are clearly enamored of the retail/distribution universe, they've made no secret of their desire to

churn out products of their own. Meanwhile, RBOCs are pushing the limits of the FCC regulations. RBOCs are today engaging in design, prototyping, and testing of PBX equipment, telecomputers, and especially, integrated services digital network (ISDN) products (see "ISDN: The Network of the Future?" PCW, January 1986).

A gradual relaxation in the rules limiting RBOC activity began in late 1984 with Bell Atlantic, which obtained from Judge Greene a coveted exception to the restriction barring regionals from selling anything without a dial tone. There's been no looking back since that green light, and mainstream retailers are now watching the upstarts warily. Says Alan

Hald, CEO of the MicroAge chain, "The RBOCs parachuted into this industry—their entry has become a real onslaught. These seven companies, each worth from \$12 billion to \$22 billion, quickly became national, then international."

Like Snow White's compadres, each of the seven RBOCs has a distinct bent. A closer look at the individual holding companies follows.

Nynex. Of all the RBOCs, Nynex has shown the fastest growth in retail operations. The IBM Product Centers—soon to bear the Nynex Business Center

(continues)

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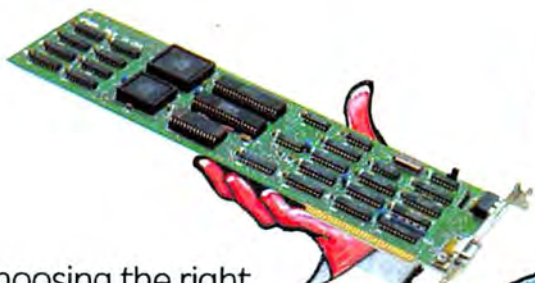
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Circle 55 on reader service card

name (and nestle Compaq, Apple, and AT&T machines next to PCs)—swell Nynex's already substantial retail operation. Shortly before the acquisition, Nynex absorbed 6 former ComputerLand franchises into its 19-store Datago chain. That's enough to place Nynex third behind Sears and Businessland among the nation's largest nonfranchise computer chains.

Bell Atlantic. Next to Nynex, Bell Atlantic is the most ardent retail player among the RBOCs. In mid-1985, the firm resuscitated the ailing 55-store, 13-state CompuShop chain at a reported cost of \$23 million, and this year it

moved eastward with 7 Bell Atlantic Business Centers. With CompuShop's recent acquisition of General Microcomputer, Bell Atlantic's retail outlets now number 67, en route to 75.

Mindful of the ban on RBOC manufacturing, Bell Atlantic slaps its own label on Compaq's Telecompaq, among other machines, and is now angling for status as an authorized IBM dealer. Should a machine need fixing, users can turn to Bell Atlantic's Sorbus subsidiary, the nation's largest computer maintenance operation.

PacTel InfoSystems. Under the Pacific Telesis umbrella, PacTel InfoSystems sells PCs, and PacTel Communications offers voice/data products. Until the FCC lets the

twain meet, PacTel InfoSystems will adhere to plans to double the number of its retail centers (presently 13) and beef up its corporate sales and telemarketing offices. The nucleus of the PacTel chain is Byte Shops Northwest, 10 stores with \$40 million in sales.

PacTel InfoSystems has a knack for marketing, once giving away cellular phones and now offering a communications bundle—a Hayes-compatible half-slot 1200-bps modem, *pfs:access*, delivery, installation, and support—for a scant \$499. PacTel has also received Judge Greene's blessing to buy Communications Industries of

(continues)

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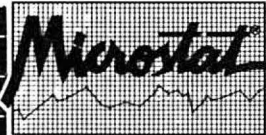
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Dallas, a cellular phone company with offices nationwide.

Bell South. Bell South's Advanced Systems group—one of its 11 subsidiaries catering to the business market—recently inked contracts to sell and install PC and minicomputer hardware and software. Bell South is also dabbling in the resale of medical and hotel management software and intends to expand its vertical market activities.

Ameritech, US West, Southwestern Bell. The decibel level is somewhat lower at the remaining RBOCs. The big news at Ameritech is the acquisition of Applied Data Research, a major IBM

mainframe software house based in New Jersey. Like Bell South, US West has embarked on a vertical market strategy, but in five specific areas: recreation, professional services, manufacturing, finance, and government. Southwestern Bell has rarely strayed from telecommunications.

Operating units under the RBOC umbrellas are also testing the competitive waters. Bell of Pennsylvania, Illinois Bell, Mountain Bell, and Northwestern Bell have launched on-line white pages directories. While priced at a steep \$150 to \$400 (plus connect-time charges), all four offerings are positioned as extensions of directory assistance—thereby skirting an FCC restriction barring RBOC

contributions to on-line data base services.

Is all this mercantilism fitting for what are first and foremost phone companies? The North American Telecommunications Association (NATA) thinks not. The Washington-based lobby has asked the FCC to determine how Nynex paid for the IBM Product Centers. NATA, which is dubious that Nynex can turn a profit when IBM did not, suggests ratepayers may ultimately foot the bill for the chain's operating losses.

NATA isn't alone in suspecting that RBOCs are subsidizing their competitive activities with phone

(continues)

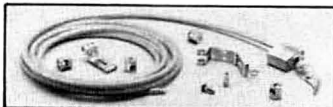
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Password: Communicate

bill revenues. The Association of Better Computer Dealers (ABCD) and Businessland are urging the FCC and the California legislature, respectively, to crack down on unregulated RBOC endeavors. The ABCD is requesting legislation that would prohibit the sharing of information, real estate, and personnel among regulated and unregulated enterprises. The lobbying group also wants the legislature to bar phone rate hikes if an unregulated venture operates at a loss. The RBOCs counter that they're investor financed, set prices that are hardly bargain basement, and remain too closely scrutinized to elude existing regulations.

The government's regulatory grip, meanwhile, appears to be easing. In May, the FCC shelved regulations requiring AT&T and the RBOCs to offer enhanced services through separate subsidiaries. That loosens the ban against so-called "cross-subsidies," in which one RBOC unit can aid another. Even before the FCC decision, AT&T won an official OK to combine its communications and information systems divisions.

The balance sheet hints that regulation or no, making money is far from a sure thing. Industry sources report that the seven RBOCs have collectively lost (or invested) \$500 million to \$1 billion in retail and equipment start-ups.

The payoff, claims Alan Hald, lies in the RBOCs' ability to sponsor the fusion of computers and phones. "Their strategy for inte-

grated voice/data terminals is taking longer than expected," he says. "The technology must be standardized."

Ah, competition. —Ken
Greenberg

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Although their parent utilities differ in scope and membership, IQuest and InfoMaster (previously called InFact) are quite similar in cost, operation, and content. In fact, both services have the same source—Telebase Systems of Narberth, Pennsylvania. Telebase also markets a stand-alone gateway service, called EasyNet, which is essentially the same as InfoMaster and IQuest (see "Gateways to On-Line Services," PCW, May 1985).

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The scope of the information available through IQuest and InfoMaster is impressive. Each of the 700-plus data bases in the system contains thousands to millions of bibliographic citations, many of which include abstracts. About 250 data bases provide the full text of the item cited. These data bases include magazines, newspapers, news-wire services, government reports, financial data, doctoral dissertations, and special-interest newsletters from around the world.

Both IQuest and InfoMaster offer the full text or abstracts of the *Boston Globe*, the *Chicago Tribune*, the *Los Angeles Times*, the *Washington Post*, and England's *Financial Times* and *Guardian*. News wires include AP and UPI, plus Japan's Asahi News Service and Russia's Tass (both in translation). A dozen data bases provide stock market information, another 19 deal with legal issues, and at least 31 are devoted to medical matters.

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-

*PrtSc=prnt Alt-T=tran R=recv U=view D=dial E=echo M=msg X=exit <Home>=Help

Screen 1: CompuServe's IQuest.
The gateway service uses a series of menus to narrow your search. IQuest then selects a data base from over 700 sources.

many of which are up-to-the-minute newsletters. Among the timely—and usually high-priced—newsletters offered by IQuest and InfoMaster are *Outlook on IBM*, *Report on IBM*, *Seybold Report on Professional Computing*, the *Spang Robinson Report on AI*, the *Klein Newsletter on Computer Graphics*, and *Stewart Alsop's P.C. Letter*. And that's just the tip of the iceberg. InfoMaster also includes the TRW Business Profile data base, which provides credit information on 8 million businesses.

The search process is almost identical in both services. After selecting IQuest from within CompuServe or InfoMaster from within EasyLink, you are connected to the Telebase computer, which provides menus, commands, and help information. Brief explanations appear at each step in the process, including ex-

amples of the correct format for search terms. If any of these items are confusing, you can use the SOS command to contact an experienced searcher, who answers your questions on line, in real time.

InfoMaster and IQuest offer two search methods: a menu-driven search in which the service chooses the data base, and a command-driven search of a specified data base. The menu-driven search is essential for anyone who is unfamiliar with commercial data bases. You conduct this search by making a succession of choices from on-screen menus (see Screen 1) and then specifying the exact search terms. The Telebase software selects the appropriate data base to search, using the information you supplied at each menu selection.

Once you have entered the search terms (sometimes just one word is required), the software connects to the data base and conducts the search, reporting its

(continues)

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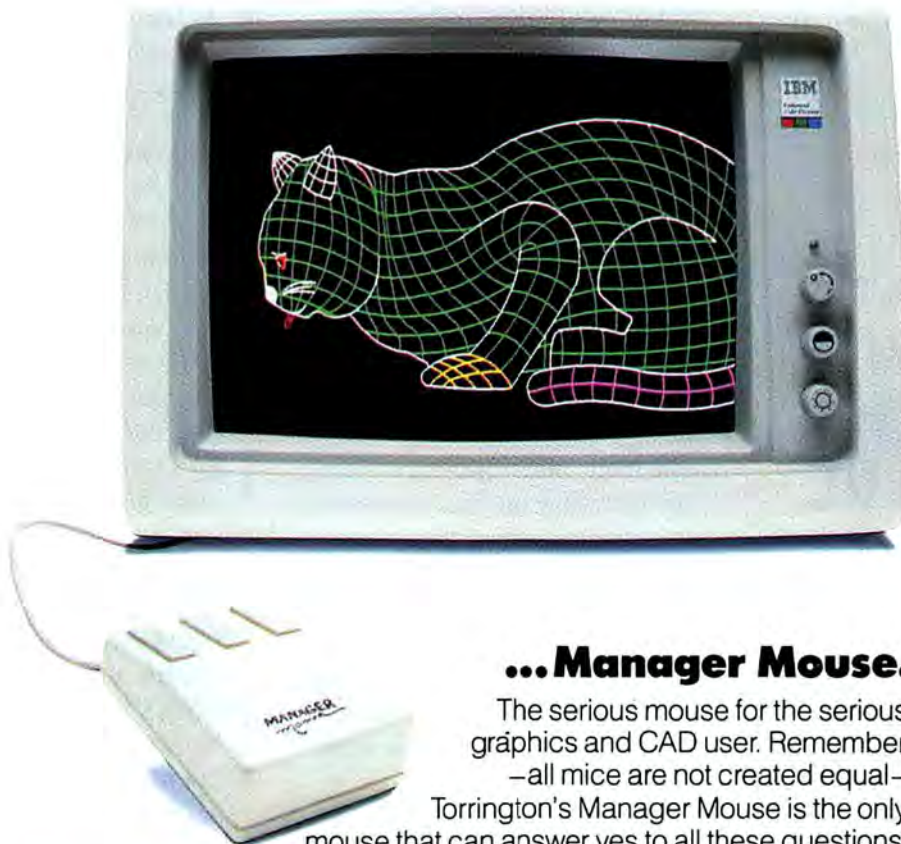
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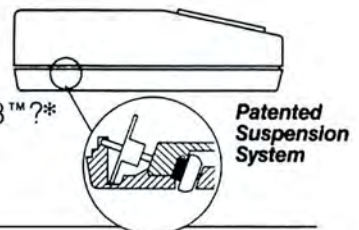
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parent utilities. For example, CompuServe displays all its information as videotex pages, produced one page at a time. Because CompuServe's Scroll command doesn't work with IQuest, you must press <Enter> after each citation is displayed; this clears the screen and displays the next citation. While the page-by-page arrangement allows plenty of time to read the citations, it can be time-consuming and frustrating. If you are storing the citations on disk, you don't need extra time to read them, and if you are printing the data while on line, you waste a lot of paper because the printer starts each citation on a new page.

InfoMaster automatically scrolls the citations located in a search, but it often displays text in an odd screen format that splits words during word wrap (without benefit of hyphenation).

All this searching costs money, of course, but the rates for both services are surprisingly modest. Although using IQuest or InfoMaster is not always the most economical way to search, it is an excellent resource for beginners and for people who search occasionally or want to sample various commercial data bases before establishing accounts. For occasional searchers, InfoMaster and IQuest offer easy access to the vast reaches of on-line information.

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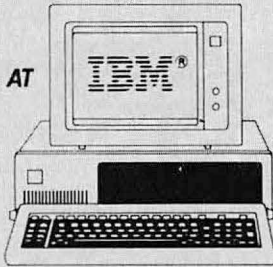
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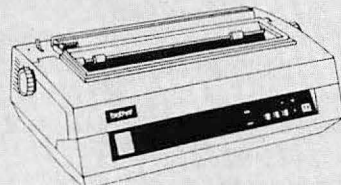
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The Help Screen

PC World offers answers and advice at every level



This month: Learn how to shave the cluster size of 10MB and 20MB hard disks, clear a memory-resident program from RAM, patch the problem of changing drives in WordStar 3.30, and pass precious parameters

Karl Koessel

Recovering Unused 10MB Hard Disk Space

Daniel Berger, a reader in Schaumburg, Illinois, dropped me a note after a frustrating bout with his computer. Motivated by "Hard Disk Elbowroom" (*.*., PCW, April 1986), he attempted to liberate the unused space on his 10MB hard disk by reducing the disk's cluster size from 4K to 2K. (DOS allocates disk space in units called clusters. Because hard disks often accumulate many files smaller than 2K, a smaller cluster size frees up half the disk space those files occupy.) Unfortunately, Mr. Berger was not successful in his efforts to emancipate his hard disk.

What Mr. Berger learned is that the cluster size that FORMAT uses is set by the DOS utility FDISK when it creates a hard disk's DOS partition. If FDISK reports that the 'DOS partition already exists', you must delete the partition, create a new one, format the disk, and restore the files you'd already backed up before deleting the DOS partition.

If your hard disk currently uses clusters larger than 2K, you may be able to recover some unused space. To determine cluster size, run the DOS utility CHKDSK, create a 1-byte file (which occupies one cluster on the hard disk), run CHKDSK again, and note the difference in available memory (reported as 'bytes free'). To create the 1-byte file, type **COPY CON 1BYTE**, press <Enter>, type a 1, press function key <F6>, and press <Enter> again. The difference is the cluster size of your hard disk.

If the cluster size is larger than 2K, 10MB hard disk users should

follow the instructions in "Hard Disk Elbowroom," keeping in mind the lesson learned by Mr. Berger. Those with 20MB hard disks, read on ...

More Cluster Busters

Q. After switching from a 10MB to a 20MB hard disk, I was surprised to discover that 9.5MB of files took up 14.5MB. I suspected that the way DOS 2.xx stores data on hard disks was responsible. Hoping to remedy my storage problem, I reformatted the disk using DOS 3.10, but nothing changed. All the vendors I spoke to about this issue pointed an accusing finger at IBM, which, they claimed, sets the cluster size on 20MB hard disks at 8K.

Why should a 20-byte file take up 8192 bytes of disk storage? Is there any remedy for this sad waste of hard disk real estate?

*Kip Koehler
Larkspur, California*

A. Contrary to those vendor's claims, IBM does not set 20MB hard disk clusters to 8K—it was probably the hard disk manufacturer that set up your hard disk this way. You were on the right track when you attempted to reduce the disk's cluster size by reformatting the disk—DOS 3.00 and later versions will format your 20MB hard disk with 2K clusters.

As noted in the previous item, the key step is using the FDISK utility (from your DOS disk) to delete the DOS partition and then create a new one. You then format the disk and restore your files.

There are other ways to conserve disk space. "Creating Batch Files With Echo" (*.*., PCW,

(continues)

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November 1985) explains how several ECHO commands in one large batch file can create a number of commonly used batch files in a RAM disk. Although this technique consumes some memory, RAM disks generally use a much smaller cluster size than do hard disks. The savings in hard disk storage can be considerable: For example, 40 batch files of 100 bytes each would take up 40 clusters—or a minimum of 80K on a hard disk, assuming a 2K cluster size. With this technique you need only 2 or 3 clusters to store the commands that create the batch files.

Another method of saving hard disk space is merging several batch files into one large batch file that presents a menu of choices and, in response to the user's selection, calls the appropriate routine. DOS 2.00 and later versions provide commands that enable batch files to branch, but not to accept user input. However, "Interactive Batch Files" and the QUERY.DAT correction (*.*), PCW, January and April 1986, respectively) hold the answer. Also of note: Seaware Corporation's modestly priced *Extended Batch Language* significantly extends DOS batch file programming, making it possible, among other things, for batch files to accept and process user input (see *.* in this issue).

You can also save hard disk space by linking or concatenating related text files kept only for reference (such as old memos, letters, and E-mail) into one large file and then deleting the individual files. This liberates the unused cluster space. Because files are assigned disk space in cluster-size units and,

generally, a file's last cluster is only partly used, concatenating files reduces the number of last clusters to one. The space saved is therefore about equal to the sum of the unused portions of the files' last clusters. For example, if you concatenate and then delete ten 3K files on a hard disk with a 2K cluster size, you'd save 10K. If you want to concatenate the chapters of your soon-to-be Pulitzer-prize-winning novel into a single file, use the command COPY CHAP1 + CHAP2 + CHAP3 + CHAP4 + CHAP5 + CHAP6 BOOK.

RAM Saver

Q. I read "Battle for the Background" (PCW, June 1986) and noted the sequences for loading and unloading memory-resident programs. But what do you do when a memory-resident program won't unload? Although many memory-resident programs can be disabled, they still occupy RAM. Is there a program that will clear out memory-resident programs without restarting the PC?

Kenneth Malkin
Hillsdale, New Jersey

A. This month's "From the Software Shelf" reviews such a utility, called *PopDrop*. *PopDrop* can snatch most memory-resident programs (called TSRs for terminate and stay resident), except those that store program code in expanded memory, such as *Ready* from Living Videotext. It would

(continues)

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behoove you to test *PopDrop's* effectiveness with the memory-resident programs you use.

WordStar 3.30 and DOS 3.00 Bug

Q. Recently while using WordStar 3.30, I changed the logged disk drive from C: to A: with the L command. WordStar correctly noted 'directory of disk A:', but the list of files remained unchanged. I switched back and forth between drive C: and drive A:, and the directory listing never changed. What happened?

*Bjarne Ursin
Mercer Island, Washington*

A. I suspect that you have upgraded to DOS 3.00; the patch supplied by MicroPro (see Figure 1) should solve the problem. Place a copy of DEBUG (from the DOS Supplemental Programs disk) in drive A: and WordStar in drive B:.

```
A>DEBUG WS.COM
-F1F01 L5 E9 8C 05 90 90
-F2490 LA C6 06 A9 45 00 3C FF 75 01 C3
-F249A LB E9 69 FA 90 90 90 90 90 90 90
-W
Writing 5380 bytes
-Q
```

Figure 1: This DEBUG patch to WordStar 3.30 fixes the logged disk drive problem when the program is run under DOS 3.00.

Type the boldface characters shown in Figure 1 and press <Enter> at the end of each line. (The other characters are program prompts or responses.)

DOS's Dynamic Environment

Q. The DOS environment area is one place where parameters can be passed from one program or batch file to another. For example, to indicate the presence of a mouse, the AUTOEXEC.BAT file might issue the command SET MOUSE=1. Then another batch file could include the conditional line IF

(continues)

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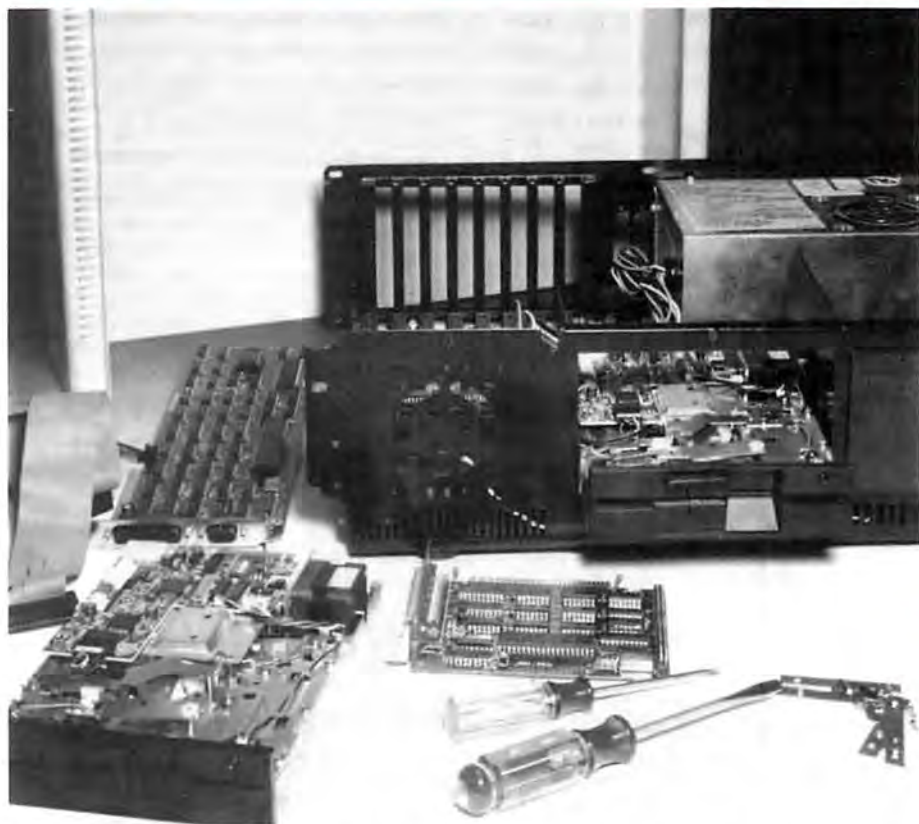
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"%MOUSE%" = "1" COPY mouse.drv PDIO.EXT before loading TopView. The % signs tell DOS to search the environment area for a line starting with MOUSE; if MOUSE=1, the condition is true and the mouse driver file is copied to PDIO.EXT for use by TopView.

*I would like to utilize this approach within the BASIC and APL*PLUS programs that I develop and have them access the DOS environment area to determine what parameters have been SET. On my PC the environment area is not kept at a fixed location*

in memory, but varies according to circumstances. Is there a fixed location in memory that contains the offset address of the environment area?

*Bruce L. Clarke
Edmonton, Alberta, Canada*

A. When you enter an external command—for example, to load BASIC or APL—or call a program via the EXEC function call, DOS puts the program 256 bytes above the lowest block of memory that can hold the program being started. The first 256 bytes constitutes the Program Segment Prefix (PSP), a control block that includes the segment address of a copy of the DOS environment

area. That segment address is kept in the PSP at offsets 2C and 2D.

But where does the PSP begin? When an .EXE program starts, the DS and ES registers are set to point to the beginning of the PSP. When a .COM program is started, all four segment registers are set to point there. You should remember, especially if yours is a TSR application, that the copy of the environment area is static; it is the invoking process's current environment. Subsequently issued SET, PATH, and PROMPT commands will not change the environment area copy.

(continues)

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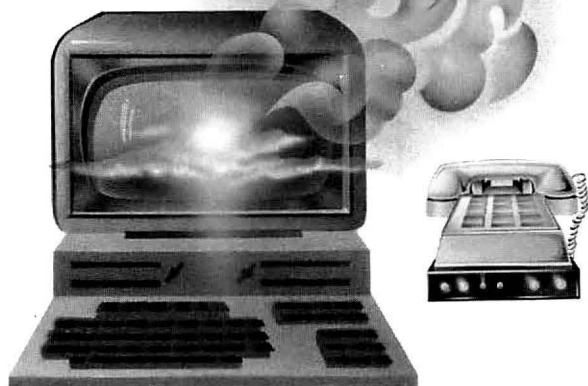
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8	9	A	B	C	D	E	F
cont. segment of long call		Terminate address IP		Terminate address CS		Ctrl-break exit address IP	
10	11	12	13	14	15	16	17
Ctrl-break exit address CS		Critical error exit address IP CS				Reserved	
18	19	2A	2B	2C	2D	2E	2F
Reserved				Segment address of environment		Reserved	
30				4F			
Reserved							
50	51	52	53	54	55	56	57
DOS call		Reserved					
58	59	5A	5B	5C	5D	5E	5F
Reserved				Unopened Standard FCB1			
60	61	62	63	64	65	66	67
Unopened Standard FCB1 (cont.)							
68	69	6A	6B	6C	6D	6E	6F
FCB1 (cont.)				Unopened Standard FCB2			
70	71	72	73	74	75	76	77
Unopened Standard FCB2 (cont.)							
78	79	7A	7B	7C	7D	7E	7F
Unopened Standard FCB2 (cont.)							
80	81	82	83	84	85	86	87
Parm length	Command parameters starting with leading blanks						
F8	F9	FA	FB	FC	FD	FE	FF
Command parameters							

Figure 2: The Program Segment Prefix, built by DOS when a program is invoked, is 256 bytes long and precedes the program's code. Offsets 2C and 2D contain the segment address of the program's copy of the environment area. A copy of the parameters following the invoking command begins at offset 81, with offset 80 containing the number of parameter characters.

The PSP contains other information that your programs may find useful (see Figure 2). In particular, a copy of the parameters following the invoking command (including leading blanks) can be found in the PSP at offset 81 hexadecimal; offset 80 notes the number of characters. Using this information, a program could bypass its opening menu and proceed directly to some function that the user specifies on the DOS command line when the program is called. You can find more information on DOS program and file control blocks in the DOS Technical Reference manual.

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Fourth, it is the best there is. There are several other boards on the market. Some are priced about the same as the *BREAKTHRU 286* and some are cheaper. We at PCSG have compared them all, but there simply was no comparison. What we discovered is that many cards being sold offer only a marginal speed up in spite of their claims. We found some to be merely versions of the obsolete 8088 or 8086, and others to be just poorly engineered. The 8MHz *BREAKTHRU 286* is unequivocally the best executed and most completely reliable speedup board manufactured today.

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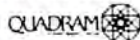
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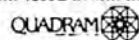
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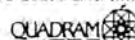
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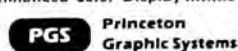
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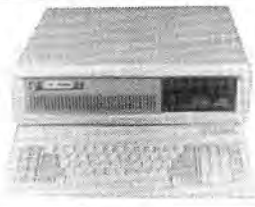
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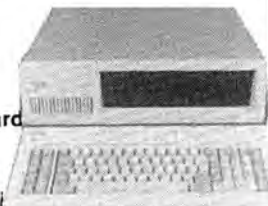


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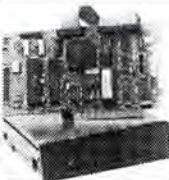
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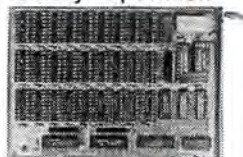


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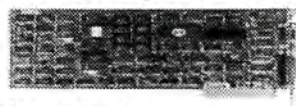


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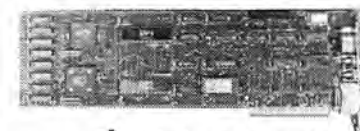
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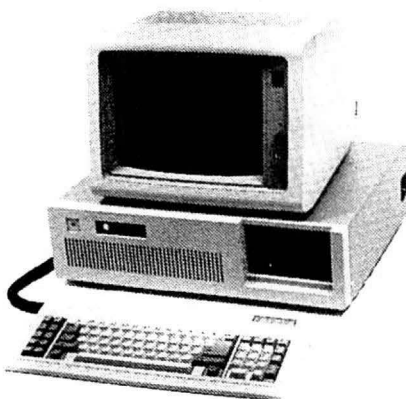
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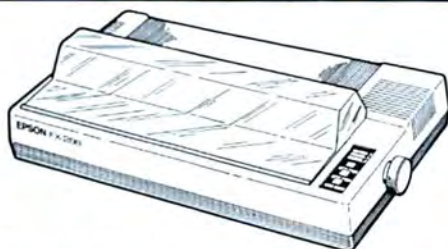
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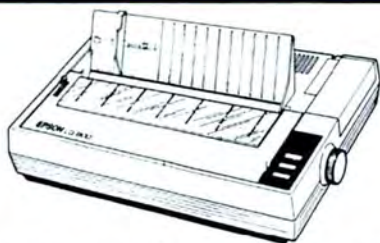
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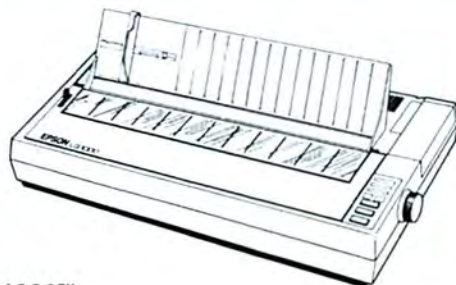
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Edited by Steven Cook

Printer Control Via SideKick
In past issues of *PC World* I've read about many methods for sending setup information to the printer. Usually these are short BASIC or assembly language programs; none of them are very convenient to use when you are in the middle of another program.

I've found a way to use Borland International's *SideKick* to send control codes to the printer. The advantage to this technique is that *SideKick* can be called up at any time from within any application.

Using *SideKick*'s Notepad, just enter the desired codes, mark the beginning and end with <Ctrl>-KB and <Ctrl>-KK, respectively (or <F7> and <F8>), and then press <Ctrl>-KP to send the codes to the printer.

Most printers require the escape character to activate some features, but *SideKick* will exit the Notepad if you press <Esc>. The solution? Hold down the <Alt> key, type 155 on the numeric keypad, and then release the <Alt> key. This sequence will generate a code that is acceptable to most printers but will not cause *SideKick* to exit the Notepad. To enter other control codes, you must first press <Ctrl>-P and then enter the desired control character or its <Alt>-keypad equivalent. ASCII codes for CHR\$(0) and CHR\$(1) can be generated by pressing <Ctrl>-@ and <Ctrl>-A.

To further streamline the process, you can create a file that contains your most frequently used code sequences, along with some descriptive labels. Then you can simply open the file with the Notepad, mark the desired codes, and send them to the printer.

*Thomas R. Casey
Torrance, California*

Editor's note: The same function can be performed by the macro processor Keyworks from Alpha Software. Keyworks provides a {Printer 1} command to send decimal control codes to a printer. You can also easily build a pop-up menu of commonly used codes.

BASIC Configuration

I have written a short BASIC program that defines BASIC's function keys and then erases itself from memory. I rely on a short batch file to start BASIC and run this program automatically so that my custom function key assignments are in place.

Defining the function key settings in this manner also lets me use the following time-saving trick. Whenever I write a BASIC program, I always put a comment on line 1 beginning with the program's name enclosed in quotes. Combining this step with the <F10> definition shown in BSTART.BAS enables me to save a program anytime with one quick keystroke.

The first part of <F10>'s definition, "LIST 1" + CHR\$(13), simply lists the first line of the current program—the line containing the program's name. The two CHR\$(30) characters move the cursor back to the beginning of the listed line. SAVE overwrites the line number and the apostrophe, leaving the file name in quotation marks intact. The last CHR\$(13) simulates pressing <Enter>, executing the SAVE command using the supplied file name.

(continues)

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Ask about ZeroDisk to run copy-protected software from a hard disk without floppies.

```
1 ' "BSTART.BAS"
10 CLS : KEY OFF
20 KEY 1, "CLS:LIST"+CHR$(13)
25 KEY 2, "RUN"+CHR$(13)
30 KEY 3, "LOAD"+CHR$(34)+"B:"
35 KEY 4, "CONT"+CHR$(13)
40 KEY 5, "KEY ON"+CHR$(13)
45 KEY 6, "KEY OFF"+CHR$(13)
50 KEY 7, "CLS:FILES"+CHR$(34)+"A:"+CHR$(13)
55 KEY 8, "CLS:FILES"+CHR$(34)+"B:"+CHR$(13)
60 KEY 9, "SCREEN 0,0,0"+CHR$(13)
65 KEY 10, "LIST 1"+CHR$(13)+CHR$(30)+CHR$(30)+"SAVE"+CHR$(13)
70 KEY LIST : NEW
```

BSTART.BAS: One example of how function keys can be automatically defined in BASIC

This technique has saved me countless hours and untold aggravation—and it should be a real boon to anyone who issues SAVE commands frequently, since it reduces that task to a single key-stroke. If you prefer to save your programs in ASCII format you can place the requisite ,A after whatever file name you specify.

Allen Jackson
Baton Rouge, Louisiana

Build a Better Batch

I have seen numerous tips in *PC World* on using DOS batch file commands, but I have never seen any mention of the very powerful *Extended Batch Language* from Seaware Corporation.

This program loads into memory and takes control of batch file execution and supplies a number of useful capabilities. It supports color screen displays, subroutines, keyboard input by character and line, and can pass parameters between programs. *Extended Batch*

Language can also search sub-directories for a file and return the path where the file is located.

William Stephenson
Gilford, New Hampshire

Editor's note: A significantly revamped Extended Batch Language, along with several utility programs and a 75-page manual, can be obtained by sending \$49 to Seaware Corp., P.O. Box 1656, Delray Beach, FL 33444.

Quick Copy

I discovered a simple but undocumented feature of the COPY command for DOS versions 2.00 and later.

The syntax for the COPY command given in the DOS manual implies that everything except the word COPY and the first filename is optional. In fact, the COPY command, like the ERASE and DEL commands, assumes a source filename of *.* if a path alone is given. Thus, the command COPY *path* is the equivalent of COPY *path*/*.*, just as the command

(continues)

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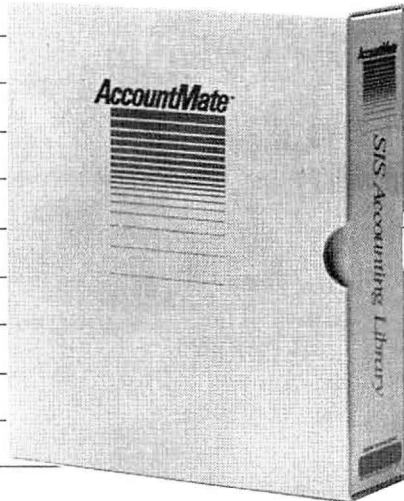


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ERASE *path* is identical to ERASE *path/*.**. The command COPY *path path* is equivalent to COPY *path/*.* path/*.**. This also works for concatenation, thus the command COPY *path filename* is the same as COPY *path/*.* filename*.

This tip may save only a few keystrokes, but if you frequently copy files between subdirectories, you'll save a lot of time.

*Diana G. Matthiesen
Gainesville, Florida*

Editor's note: This feature makes it possible to copy all of the files from a subdirectory by simply "copying" the subdirectory name. Notice that because this syntax also applies to the ERASE and DEL commands, you could inadvertently delete an entire group of files with a single command. For this reason, DOS always asks 'Are you sure (Y/N)?' before deleting all the files in a directory. That's your signal to stop and reconsider. Be sure you really want to delete every file before answering Y(es).

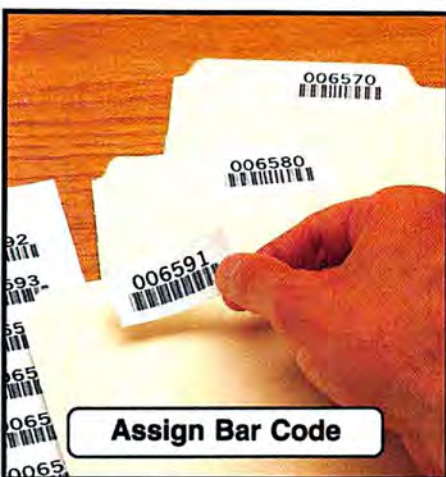
Back-Door Macro

There are many times when you want to keep spreadsheet users from breaking out of a macro-run system and working directly on a worksheet. With 1-2-3 release 2's {BREAKOFF} command you can do just that, but unfortunately, doing so can also prevent the worksheet's designer from modifying his or her creation.

The template shown in BACK-DOOR.WK1 demonstrates one technique that allows password-type access around {BREAKOFF}

(continues)

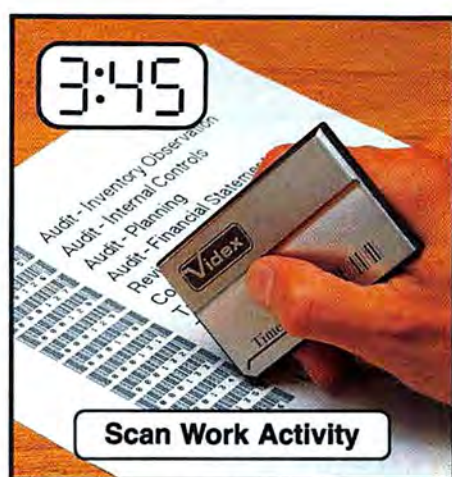
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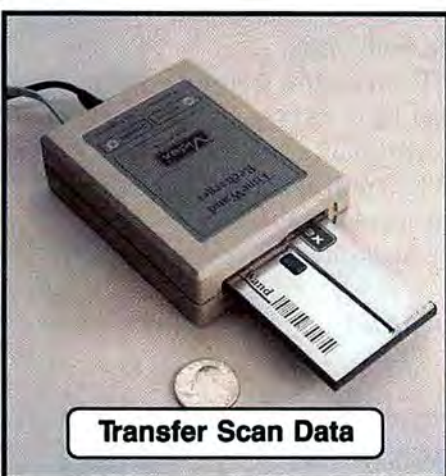
Assign Bar Code



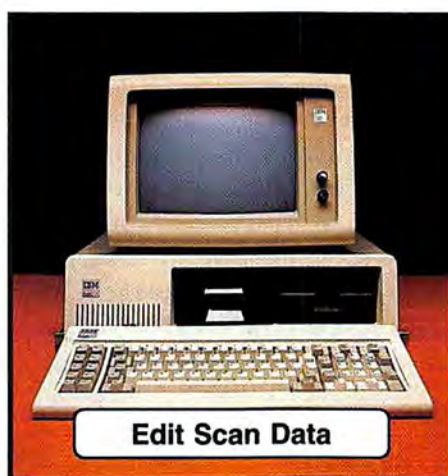
Scan File Name



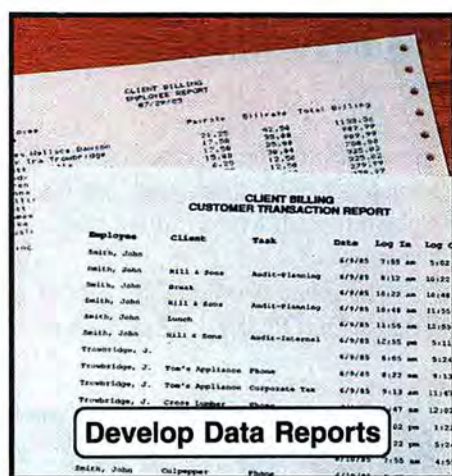
Scan Work Activity



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A	B	C	D
1 Add	Subtract	Multiply	
2 Add ten to count.	Subtract 10 from count.	Multiply count by 10.	
3 {let count,count+10}	{let count,count-10}	{let count,count*10}	{getlabel,"",passtest}
4			{if @exact(passtest,"BINGO")}{breakon}/XQ
5 {branch \m}	{branch \m}	{branch \m}	{branch \m}
6			
7			
8			
9 {breakoff}{menubrand menu}{branch \m}			

BACKDOOR.WK1: A example of how password security can be designed under 1-2-3 release 2

protection. The scheme is difficult for most users to uncover, yet it permits authorized individuals ready access.

The menu presented by the BACKDOOR.WK1 worksheet is

similar to other worksheet menus, but it contains a fourth selection that does not appear on the screen. The cursor disappears when moved to this selection, and if you press <Enter>, a macro executes to accept a password (BINGO, in this case). If you get it right, the macro executes the {BREAKON} command and quits. If you enter an incorrect password

(bingo, for example), you return to the main menu.

To create this security system, load 1-2-3 and type in the menu macros shown in BACKDOOR.WK1. You don't have to put these entries in the upper left corner of the worksheet—it is done here only

(continues)

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PC—SEPT. 17, 1985

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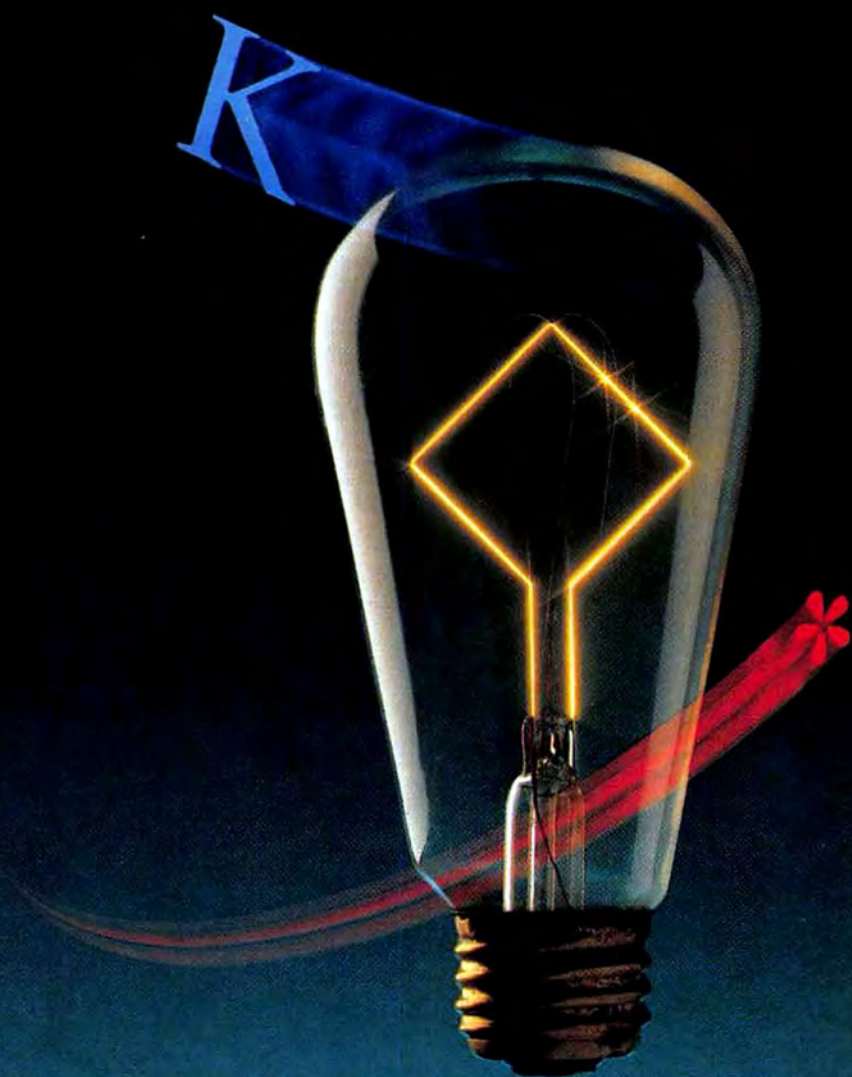
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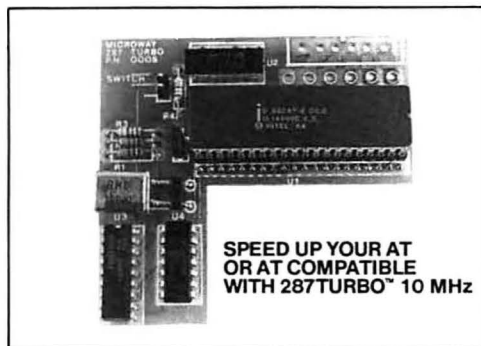
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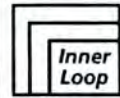
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```
prompt $e[44m~~~$e[47m~~~~~$e[90$e[1B$e[44;41m*~$e[47;41m!!!!$e[90
$e[1B$e[44m~~~$e[41m~~~~~$e[0m~$e[44m$P$g$e[0m
```

TEXFLAG: Issue this command after loading ANSI.SYS to display the state flag of Texas as a DOS prompt. Remember to enter spaces in place of the 19 ^ characters. Hold down the <Alt> key, type 223 on the numeric keypad, and release the <Alt> key for each of the 5 !s.



Screen 1: Give your prompt the Lone Star look with ANSI.SYS.

for simplicity's sake. Note that cell D1 contains an apostrophe only. Note, too, that you don't have to use BINGO as a password—merely replace it in the @Exact macro line. Assign the range name Menu to the range A1..D1 and \M to cell A9; then create a single-cell range named Count and one named Passtest. Set the cell format of Passtest and of the fourth menu item to Hidden.

Jeffrey Kahn
Setauket, New York

Lone Star Look

I enjoyed the article "Designer Screens" [PCW, November 1985] and with a little effort designed a DOS prompt that displays the state flag of Texas on a color system when ANSI.SYS is installed (see Screen 1). As TEXFLAG shows, the trick is adding ANSI.SYS commands to the DOS prompt. When the prompt is displayed, the ANSI.SYS driver generates the image. The \$p\$g near the end of the PROMPT command displays the current path and the greater-than symbol to the

right of the flag. When you actually create the PROMPT command shown in TEXFLAG, replace each of the 19 carets (^) with a space, and in the place of each of the 5 exclamation points, hold down the <Alt> key, type 223 on the numeric keypad, and then release the <Alt> key.

Instead of scrolling when it reaches the bottom of the screen, the flag prompt leaves a partially drawn image. I haven't been able to correct this problem, but the image, though perhaps inelegant, is unique.

Michael G. Weiss
Dallas, Texas

Editor's note: This is a great example of the versatility of the ANSI.SYS device driver. Having a flag appear with the DOS prompt

(continues)

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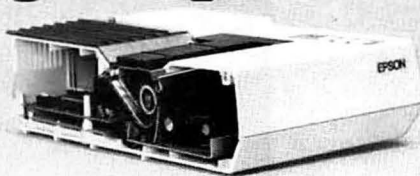


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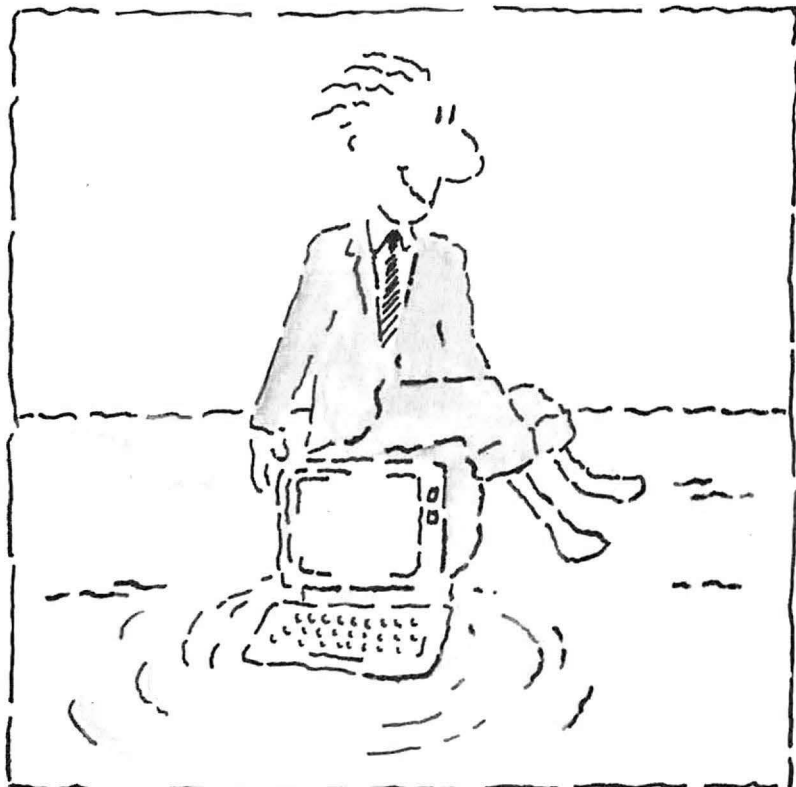
My recently acquired 20MB fixed disk has room to store seemingly infinite amounts of programs and data, but I've found that navigating around that space is no easy feat. DOS provides only the PATH and CHDIR for the task. PATH doesn't actually move you around the disk, but lets you execute programs that are not in the current directory or on the default drive. CHDIR, or CD, only reports or changes the current directory.

The UNIX operating system offers several additional navigation commands, including PUSH, POP, and DIRS. These commands maintain a list of directories on a last-in, first-out basis. The last thing pushed onto this stack is the first thing to be popped off. The stack can hold up to ten directory entries, more than enough for most applications. I have created a memory-resident program called PPD.COM that contains routines that emulate these three UNIX commands plus a routine that removes all entries from the stack. PPD performs five different functions: It pushes a directory name onto the stack, pops a directory name off the stack and makes it the current directory, lists the contents of the stack, clears the stack, and exchanges the current directory with the entry on the top of the stack.

To call the various PPD functions, I created four command

(continues)

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files: PUSH.D.COM, POP.D.COM, DIRS.COM, and CLRD.COM.

These programs call the appropriate routines in PPD. You must execute PPD.COM before using the other programs.

PUSH.D.COM can use only one parameter (the directory path), which it pushes onto the stack. If the new path is valid, PUSH.D pushes the current directory onto the stack and changes to that directory. Note that PUSH.D works across disk drives. Thus, if you are in c:\user\data and you issue the command PUSH.D a:\temp, the default disk drive changes too.

Executing the PUSH.D command without a parameter exchanges the current directory with the one on top of the stack, making it easy to switch back and forth between two directories. Just remember that PUSH.D must have been used earlier to specify a directory so there is something to switch to. You can push the current directory onto the stack by issuing the PUSH.D command with a single period as the parameter.

POP.D performs the opposite function of PUSH.D. It uses no parameters and simply removes the top entry from the stack and makes it the current directory. POP.D also works across disk drives and returns an error if the stack is empty.

Issuing DIRS displays a list of all the entries in the stack. The current directory is always the first in the list. The CLRD.COM program simply removes all entries from the stack.

PPD.COM ties into the PC's "multiplexing" interrupt, which is also used by the DOS PRINT.COM utility. In theory, the vector

```
PUSH.D .
CD\XTALK
XTALK
POP.D
```

X-TALK.BAT: This sample batch file uses the command PUSH.D to save the current directory before changing directories to run Crosstalk, so that POP.D will return you to the directory from which the batch file was called.

should be usable by all memory-resident programs that must have some means of communicating with other routines. In practice, however, a PC running DOS version 2.xx will crash when PPD.COM is run unless you first load PRINT.COM. Under DOS 3.xx you do not need to execute PRINT.COM to use PPD.COM, but if you want to use PRINT.COM you must load it first.

All of these programs return an errorlevel of 1 and display a message if a requested operation cannot be performed. PPD also returns error codes if something goes awry. Because the other programs simply call the PPD routines and check for errors, they are very short.

The PUSH.D and POP.D commands are particularly useful in batch files that load programs that either change directories themselves or, conversely, don't recog-

(continues)

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nize directory paths. *Crosstalk*, for example, can only search for its overlay files in the current directory. The batch file sequence shown in XTALK.BAT solves this problem, pushing the current directory onto the stack, changing to the *Crosstalk* directory and running the program, and then restoring the original directory when *Crosstalk* returns to DOS. The starting directory is always restored, even if the user changes the current directory from within *Crosstalk*.

If you don't want these commands to display messages, just redirect their output to the NUL: device. For example, the command `POPD >NUL` will cause `POPD.COM` to execute without displaying a message. You can use this same technique, substituting a file name for NUL, to direct the output of the `DIRS` command to a disk file.

To shorten load times, you might place these programs in a RAM disk. Remember to include the RAM disk in the PATH command.

Marc Sugiyama
Oakland, California

*Editor's note: To create the programs, load BASIC, type in the lines shown in X-MAKER.BAS followed by the lines shown in PPD.DAT, then type **RUN** and press the **<Enter>** key. Repeat this procedure for PUSH.DAT, POP.DAT, DIRS.DAT, and CLRD.DAT.*

Although PPD.DAT seems long, it can be transcribed rapidly by simply copying those lines that

(continues)

```

10 DEFINT A-Z:CLS:KEY OFF:DEF FNHEX(X$)=VAL("&h"+X$)
20 LOCATE 3,1:PRINT "X-Maker":READ F$
30 LOCATE 5,1,1:PRINT "Now testing for data errors...please wait";
40 SUM=0:READ LN:IF LN<0 THEN 80
50 READ H$:IF VAL(H$)<0 THEN 70
60 SUM=(SUM+FNHEX(H$))*2:SUM=(SUM/256)+(SUM MOD 256):GOTO 50
70 READ CKSUM$:IF SUM=FNHEX(CKSUM$) THEN 40 ELSE GOTO 170
80 RESTORE:CLS:LOCATE 3,1:PRINT "X-Maker":READ F$
90 LOCATE 5,1,1:PRINT "Press any key except ESC to create ";F$;": ";
100 A$=INPUT$(1):PRINT:IF A$=CHR$(27) THEN END
110 LOCATE 6,1:PRINT "Working...";
120 OPEN F$ AS #1 LEN=1:FIELD #1,1 AS BX$
130 READ LN:IF LN<0 THEN 160
140 READ H$:IF VAL(H$)<0 THEN READ CKSUM$:GOTO 130
150 LSET BX$=CHR$(FNHEX(H$)):PUT #1:GOTO 140
160 CLOSE:PRINT:PRINT F$;" has now been created.":END
170 PRINT:PRINT "Error in DATA line":STR$(LN);": "
180 PRINT "Check your work.":BEEP:END

```

X-MAKER.BAS: Star-Dot-Star's program-creating program

```

1000 DATA "ppd.com"
1010 DATA 1,09,88,04,00,00,00,00,00,00,00,00,00,00,00,00,-1,80
1020 DATA 2,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1030 DATA 3,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1040 DATA 4,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1050 DATA 5,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1060 DATA 6,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1070 DATA 7,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1080 DATA 8,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1090 DATA 9,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1100 DATA 10,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1110 DATA 11,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1120 DATA 12,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1130 DATA 13,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1140 DATA 14,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1150 DATA 15,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1160 DATA 16,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1170 DATA 17,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1180 DATA 18,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1190 DATA 19,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1200 DATA 20,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1210 DATA 21,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1220 DATA 22,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1230 DATA 23,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1240 DATA 24,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1250 DATA 25,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1260 DATA 26,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1270 DATA 27,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1280 DATA 28,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1290 DATA 29,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1300 DATA 30,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1310 DATA 31,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1320 DATA 32,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1330 DATA 33,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1340 DATA 34,00,00,00,00,00,00,00,00,00,00,00,00,00,00,07,-1,00

```

(continues)

**PPD.DAT: Add these lines to X-MAKER.BAS
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1350 DATA 35,01,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,01
1360 DATA 36,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1370 DATA 37,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1380 DATA 38,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1390 DATA 39,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,83
1400 DATA 40,01,3C,F8,72,01,CF,0A,C0,75,03,B0,FF,CF,1E,53,52,-1,E6
1410 DATA 41,56,0E,1F,3C,01,75,3B,2E,8B,1E,1F,03,2E,81,3E,1F,-1,9A
1420 DATA 42,03,1F,03,73,28,B4,19,CD,21,8A,D0,04,41,88,07,C7,-1,09
1430 DATA 43,47,01,3A,5C,8B,F3,83,C6,03,B4,47,B2,00,CD,21,73,-1,35
1440 DATA 44,03,E9,48,01,2E,83,06,1F,03,43,E9,44,01,B0,02,E9,-1,98
1450 DATA 45,41,01,3C,02,75,38,2E,A1,1F,03,3D,07,01,74,2A,2E,-1,AF
1460 DATA 46,83,2E,1F,03,43,B4,3B,2E,8B,16,1F,03,CD,21,73,03,-1,5E
1470 DATA 47,E9,19,01,B4,0E,2E,8B,1E,1F,03,8A,17,80,EA,41,CD,-1,30
1480 DATA 48,21,73,03,E9,06,01,E9,08,01,B0,03,E9,05,01,3C,03,-1,9F
1490 DATA 49,75,72,B4,19,CD,21,8A,D0,04,41,2E,A2,21,03,2E,C7,-1,A7
1500 DATA 50,06,22,03,3A,5C,BE,24,03,B4,47,B2,00,CD,21,73,03,-1,30
1510 DATA 51,E9,D9,00,BB,21,03,B4,02,8A,17,0A,D2,74,05,43,CD,-1,5A
1520 DATA 52,21,EB,F5,2E,8B,1E,1F,03,81,FB,07,01,74,2D,83,EB,-1,7E
1530 DATA 53,43,B4,09,BA,64,03,CD,21,BE,00,00,B4,02,8A,10,0A,-1,2D
1540 DATA 54,D2,74,05,46,CD,21,EB,F5,83,EB,43,81,FB,07,01,73,-1,F5
1550 DATA 55,E0,B4,09,BA,64,03,CD,21,E9,96,00,B4,09,BA,64,03,-1,76
1560 DATA 56,CD,21,EB,85,3C,04,75,0A,2E,C7,06,1F,03,07,01,E9,-1,8F
1570 DATA 57,7F,00,3C,05,75,71,B4,19,CD,21,8A,D0,04,41,2E,A2,-1,7A
1580 DATA 58,21,03,2E,C7,06,22,03,3A,5C,BE,24,03,B4,47,B2,00,-1,8E
1590 DATA 59,CD,21,72,58,2E,A1,1F,03,3D,07,01,74,45,2E,83,2E,-1,38
1600 DATA 60,1F,03,43,B4,3B,2E,8B,16,1F,03,CD,21,73,03,EB,3C,-1,37
1610 DATA 61,90,B4,0E,2E,8B,1E,1F,03,8A,17,80,EA,41,CD,21,73,-1,E1
1620 DATA 62,03,EB,29,90,BE,21,03,2E,8B,1E,1F,03,51,B9,43,00,-1,65
1630 DATA 63,8A,04,88,07,46,43,E2,F8,59,2E,83,06,1F,03,43,EB,-1,8C
1640 DATA 64,10,90,B0,03,EB,0D,90,B0,01,EB,08,90,B0,04,EB,03,-1,9B
1650 DATA 65,90,B0,00,5E,5A,5B,1F,CF,70,70,64,3A,20,52,65,71,-1,67
1660 DATA 66,75,69,72,65,73,20,44,4F,53,20,32,2E,30,20,6F,72,-1,87
1670 DATA 67,20,67,72,65,61,74,65,72,2E,0D,0A,24,50,50,44,20,-1,E5
1680 DATA 68,61,6C,72,65,61,64,79,20,69,6E,73,74,61,6C,6C,65,-1,42
1690 DATA 69,64,20,6F,72,20,60,75,6C,74,69,70,6C,65,78,20,6E,-1,05
1700 DATA 70,75,60,62,65,72,20,69,73,20,6E,6F,74,20,75,6E,69,-1,22
1710 DATA 71,71,75,65,2E,0D,0A,24,52,65,73,69,64,65,6E,74,20,-1,83
1720 DATA 72,70,6F,72,74,69,6F,6E,20,6F,66,20,50,50,44,20,69,-1,8E
1730 DATA 73,6E,73,74,61,6C,6C,65,64,2E,0D,0A,24,00,00,B4,30,-1,E8
1740 DATA 74,CD,21,3C,00,75,09,BA,08,05,B4,09,CD,21,CD,20,BB,-1,DB
1750 DATA 75,08,05,B1,04,03,EB,43,2E,89,1E,8C,05,B8,00,EB,CD,-1,A4
1760 DATA 76,2F,0A,CD,74,0C,B4,09,BA,2C,05,CD,21,B8,01,4C,CD,-1,99
1770 DATA 77,21,B8,2F,35,CD,21,2E,8C,06,05,01,2E,89,1E,03,01,-1,CD
1780 DATA 78,BA,67,03,8,2F,25,CD,21,B4,09,BA,67,05,CD,21,2E,-1,50
1790 DATA 79,A1,2C,00,3,CD,B4,49,CD,21,B8,00,31,2E,8B,16,8C,-1,50
1800 DATA 80,05,CD,21,-1,A1,-1

```

PPD.DAT: (continued)

```

1000 DATA "pushd.com"
1010 DATA 1,E9,77,01,70,75,73,68,64,3A,20,50,50,44,20,6E,6F,-1,97
1020 DATA 2,74,20,69,6E,73,74,61,6C,6C,65,64,2E,0D,0A,24,70,-1,76
1030 DATA 3,75,73,68,64,3A,20,44,4F,53,20,65,72,72,6F,72,3B,-1,18
1040 DATA 4,20,64,69,72,65,63,74,6F,72,79,20,6E,6F,74,20,63,-1,04
1050 DATA 5,68,61,6E,67,65,64,0D,0A,24,70,75,73,68,64,3A,20,-1,5E
1060 DATA 6,44,69,72,65,63,74,6F,72,79,20,53,74,61,63,6B,20,-1,CA
1070 DATA 7,66,75,6C,6C,3B,20,64,69,72,65,63,74,6F,72,79,20,-1,20
1080 DATA 8,6E,6F,74,20,63,68,61,6E,67,65,64,2E,0D,0A,24,70,-1,AE

```

(continues)

PUSHD.DAT: Add these lines to X-MAKER.BAS
to create the memory-resident program
PUSHD.COM.

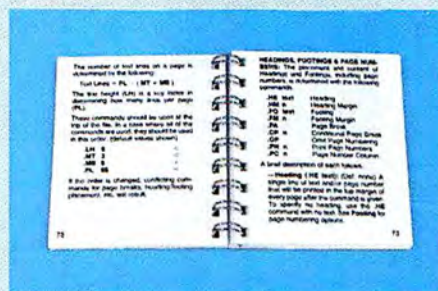
(continues)



1 The surface of each template shows the complete command structure of the program. It also includes such things as page number references to the Mini-Manual, cursor controls for various environments, etc.

[illegible]

2 The function keys are directly referenced. Colors are used to help you identify keys used in conjunction with Shift or Alt.



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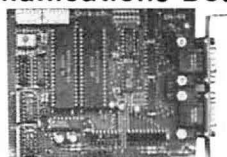
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```

1090 DATA 9,75,73,68,64,3A,20,49,6E,74,65,72,6E,61,6C,20,45,-1,92
1100 DATA 10,72,72,6F,72,3B,20,07,72,65,62,6F,6F,74,20,73,75,-1,EC
1110 DATA 11,67,67,65,73,74,65,64,2E,0D,0A,24,70,75,73,68,64,-1,C9
1120 DATA 12,3A,20,44,69,72,65,63,74,6F,72,79,20,70,61,74,68,-1,11
1130 DATA 13,20,6E,6F,74,20,76,61,6C,69,64,3B,20,64,69,72,65,-1,6A
1140 DATA 14,63,74,6F,72,79,20,6E,6F,74,20,63,68,61,6E,67,65,-1,55
1150 DATA 15,64,2E,0D,0A,24,70,75,73,68,64,3A,20,44,69,72,65,-1,D3
1160 DATA 16,63,74,6F,72,79,20,53,74,61,63,6B,20,65,6D,70,74,-1,F4
1170 DATA 17,79,3B,20,64,69,72,65,63,74,6F,72,79,20,6E,6F,74,-1,46
1180 DATA 18,20,63,68,61,6E,67,65,64,2E,0D,0A,24,70,75,73,68,-1,A5
1190 DATA 19,64,3A,20,43,75,72,72,65,6E,74,20,64,69,72,65,63,-1,35
1200 DATA 20,74,6F,72,79,3A,20,24,0D,00,00,00,00,00,00,00,00,-1,2D
1210 DATA 21,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1220 DATA 22,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1230 DATA 23,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1240 DATA 24,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,FB
1250 DATA 25,C0,75,08,BA,03,01,B4,09,EB,1B,90,B8,01,EB,C0,2F,-1,93
1260 DATA 26,0A,C0,74,18,B4,09,3C,04,75,08,BA,1F,01,B4,09,EB,-1,D4
1270 DATA 27,04,90,BA,49,01,CD,21,B8,01,4C,CD,21,8A,1E,80,00,-1,F2
1280 DATA 28,B7,00,83,FB,00,74,6A,80,BF,80,00,20,75,03,4B,EB,-1,DE
1290 DATA 29,F1,80,BF,80,00,09,75,03,4B,EB,E7,C6,87,81,00,00,-1,EE
1300 DATA 30,B8,81,00,80,3F,20,75,03,43,EB,F8,80,3F,09,75,03,-1,FC
1310 DATA 31,43,EB,F0,80,7F,01,3A,75,14,8A,17,80,E2,DF,80,EA,-1,8D
1320 DATA 32,41,B4,0E,CD,21,72,A3,80,7F,02,00,74,1F,8B,D3,B4,-1,24
1330 DATA 33,3B,CD,21,73,17,B4,09,BA,AB,01,CD,21,B8,02,EB,CD,-1,28
1340 DATA 34,2F,0A,C0,74,90,B4,09,BA,7F,01,EB,89,B8,00,4C,CD,-1,BF
1350 DATA 35,21,B8,02,EB,CD,2F,0A,C0,75,EB,B8,05,EB,CD,2F,3C,-1,87
1360 DATA 36,03,75,08,BA,E5,01,B4,09,E9,6A,FF,3C,04,75,08,BA,-1,8A
1370 DATA 37,1F,01,B4,09,E9,5E,FF,BA,1C,02,B4,09,CD,21,BB,37,-1,A3
1380 DATA 38,02,B4,19,CD,21,8A,D0,04,41,88,07,C7,47,01,3A,5C,-1,6C
1390 DATA 39,8B,F3,83,C6,03,B4,47,B2,00,CD,21,73,03,E9,2A,FF,-1,5D
1400 DATA 40,B4,02,8A,17,0A,D2,74,05,43,CD,21,EB,F5,BA,19,02,-1,DB
1410 DATA 41,B4,09,CD,21,EB,96,-1,11,-1

```

PUSH.DAT: (continued)

```

1000 DATA "popd.com"
1010 DATA 1,E9,29,01,70,6F,70,64,3A,20,44,69,72,65,63,74,6F,-1,5A
1020 DATA 2,72,79,20,6E,6F,20,6C,6F,6E,67,65,72,20,76,61,6C,-1,6B
1030 DATA 3,69,64,3B,20,64,69,72,65,63,74,6F,72,79,20,6E,6F,-1,8D
1040 DATA 4,74,20,63,68,61,6E,67,65,64,2E,0D,0A,24,70,6F,70,-1,C0
1050 DATA 5,64,3A,20,44,69,72,65,63,74,6F,72,79,20,53,74,61,-1,C1
1060 DATA 6,63,6B,20,69,73,20,65,6D,70,74,79,3B,20,64,69,72,-1,17
1070 DATA 7,65,63,74,6F,72,79,20,6E,6F,74,20,63,68,61,6E,67,-1,AA
1080 DATA 8,65,64,2E,0D,0A,24,70,6F,70,64,3A,20,50,50,44,20,-1,35
1090 DATA 9,6E,6F,74,20,69,6E,73,74,61,6C,6C,65,64,2E,0D,0A,-1,67
1100 DATA 10,24,70,6F,70,64,3A,20,43,75,72,72,65,6E,74,20,64,-1,31
1110 DATA 11,69,72,65,63,74,6F,72,79,3A,20,24,70,6F,70,64,3A,-1,C9
1120 DATA 12,20,44,4F,53,20,65,72,72,6F,72,20,72,65,61,64,69,-1,21
1130 DATA 13,6E,67,20,63,75,72,72,65,6E,74,20,64,69,72,65,63,-1,D9
1140 DATA 14,74,6F,72,79,3B,20,6E,6F,20,61,63,74,69,6F,6E,20,-1,89
1150 DATA 15,74,61,68,65,6E,2E,0D,0A,24,00,00,00,00,00,00,00,-1,71
1160 DATA 16,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1170 DATA 17,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1180 DATA 18,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1190 DATA 19,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,CA
1200 DATA 20,2F,0A,C0,75,08,BA,76,01,B4,09,EB,19,90,B8,02,EB,-1,45

```

(continues)

POPD.DAT: Add these lines to X-MAKER.BAS to
create the memory-resident program POPD.COM.

(continues)



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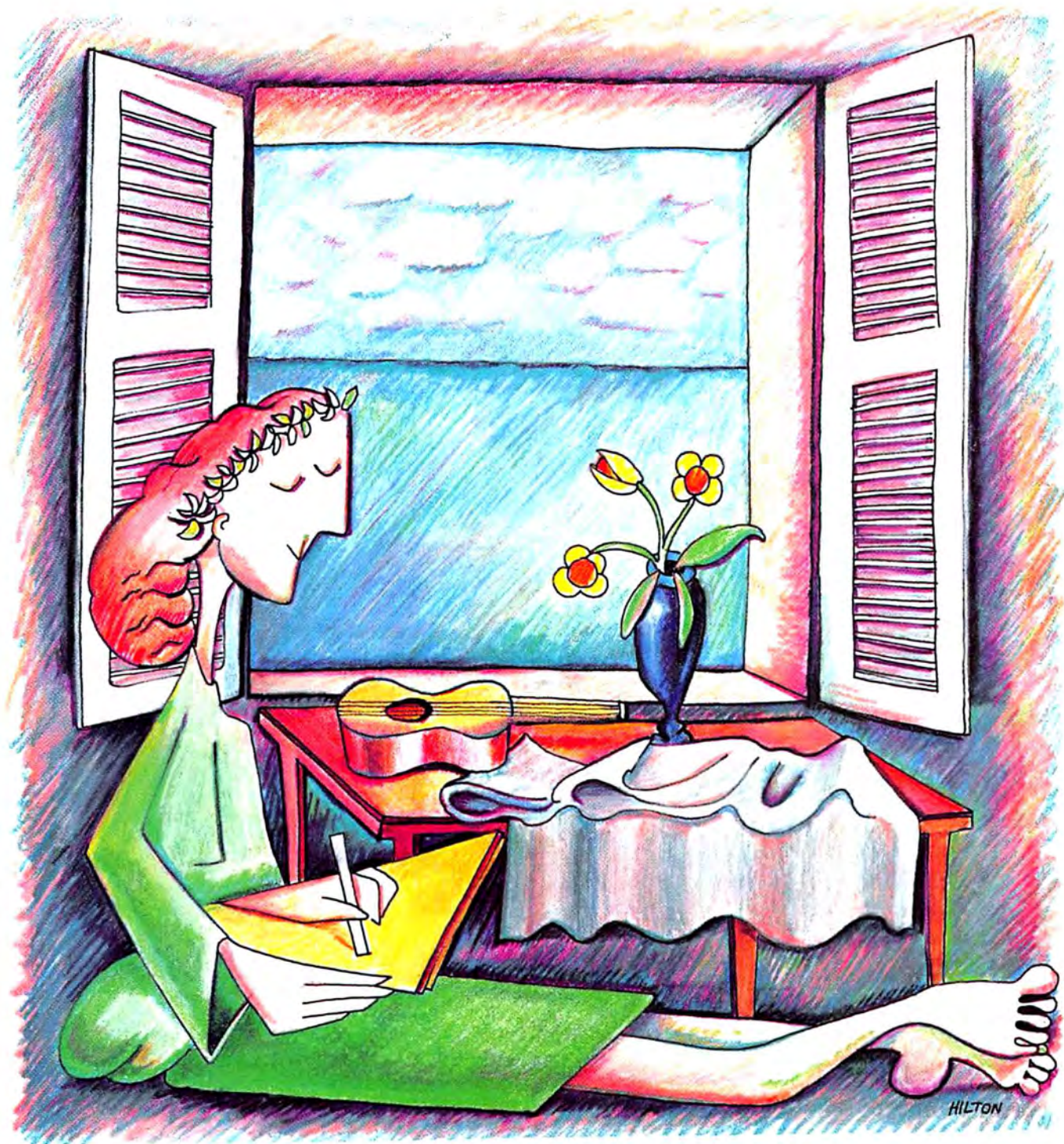
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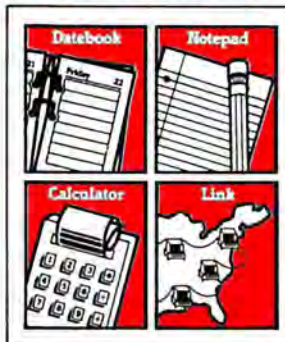
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```

1210 DATA 21,CD,2F,B4,09,3C,04,75,06,BA,03,01,EB,08,90,0A,CO,-1,22
1220 DATA 22,74,13,BA,3D,01,CD,21,B8,01,4C,CD,21,BA,AB,01,B4,-1,FD
1230 DATA 23,09,CD,21,EB,F0,BA,91,01,B4,09,CD,21,BB,E9,01,B4,-1,2C
1240 DATA 24,19,CD,21,8A,D0,04,41,88,07,C7,47,01,3A,5C,8B,F3,-1,56
1250 DATA 25,83,C6,03,B4,47,B2,00,CD,21,72,D1,B4,02,8A,17,0A,-1,2E
1260 DATA 26,D2,74,05,43,CD,21,EB,F5,BA,3A,01,B4,09,CD,21,B8,-1,DB
1270 DATA 27,00,4C,CD,21,00,00,00,00,00,00,00,00,00,00,00,00,-1,BD
1280 DATA 28,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1290 DATA 29,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1300 DATA 30,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1310 DATA 31,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1320 DATA 32,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,-1,00
1330 DATA-1

```

POPD.DAT: (continued)

```

1000 DATA "dirs.com"
1010 DATA 1,EB,5A,90,64,69,72,73,3A,20,50,50,44,20,6E,6F,74,-1,37
1020 DATA 2,20,69,6E,73,74,61,6C,6C,65,64,2E,0D,0A,24,64,69,-1,A6
1030 DATA 3,72,73,3A,20,44,4F,53,20,65,72,72,6F,72,20,72,65,-1,F0
1040 DATA 4,61,64,69,6E,67,20,63,75,72,72,65,6E,74,20,64,69,-1,2B
1050 DATA 5,72,65,63,74,6F,72,79,3B,20,6E,6F,20,61,63,74,69,-1,80
1060 DATA 6,6F,6E,20,74,61,6B,65,6E,2E,0D,0A,24,B8,00,E8,CD,-1,A7
1070 DATA 7,2F,0A,CO,75,06,BA,03,01,EB,0D,90,B8,03,E8,CD,2F,-1,12
1080 DATA 8,3C,04,75,0C,BA,1E,01,B4,09,CD,21,B8,01,4C,CD,21,-1,62
1090 DATA 9,B8,00,4C,CD,21,-1,F2,-1

```

DIRS.DAT: Add these lines to X-MAKER.BAS to create the memory-resident program DIRS.COM.

```

1000 DATA "clrd.com"
1010 DATA 1,EB,3D,90,63,6C,72,64,3A,20,50,50,44,20,6E,6F,74,-1,7C
1020 DATA 2,20,69,6E,73,74,61,6C,6C,65,64,2E,0D,0A,24,63,6C,-1,A8
1030 DATA 3,72,64,3A,20,44,69,72,65,63,74,6F,72,79,20,53,74,-1,F1
1040 DATA 4,61,63,6B,20,63,6C,65,61,72,65,64,2E,0D,0A,24,B8,-1,0B
1050 DATA 5,00,E8,CD,2F,0A,CO,75,0C,BA,03,01,B4,09,CD,21,B8,-1,6A
1060 DATA 6,01,4C,CD,21,B8,04,E8,CD,2F,B4,09,BA,1E,01,CD,21,-1,30
1070 DATA 7,B8,00,4C,CD,21,-1,F2,-1

```

CLRD.DAT: Add these lines to X-MAKER.BAS to create the memory-resident program CLRD.COM.

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So you see, paying for a "famous name" on a diskette doesn't guaranty you that you're getting any more for the money.

You may be paying for some big corporation's fleet of aircraft and their executive retreats in Minnesota and Canada, but you are not paying for any more quality.

You're simply getting rooked out of money you could have in your own pocket.

There are four kinds of diskettes:

**And Super Star™ is right up
there with the best.**

As you leaf through the pages of this magazine, you will see diskettes advertised at prices as low as 33¢. Every one, of course, claims to be the "best".

It's simply not true.

Here are the only kinds of diskettes you can buy:

High-Clip Product: this is what you get when you buy Super Star™, 3M™, Maxell™, TDK™ or any number of other famous and not so famous name diskettes. They have clipping rates of 60% or more, are certified for ten million read/write passes or more and are simply the best diskettes available. You can expect perhaps 1 out of 100,000 to fail...and that will usually be the result of dirty or misaligned drives.

ANSI Spec Product: These are "okay" diskettes. They have a clipping level of 40%. Usually they are the fall-out from a manufacturer's "high-clip" product line. You can expect about 1 out of 20 to fail in normal use.

(But that failure rate has more to do with the disk drive rather than the diskette.) The price difference between an ANSI-spec disk and a High-Clip product is only a few cents. But the failure rate of ANSI product is 50,000 times higher!

Duplicator Product: This is a catch-all category. Some of it may be High-Clip Product, some ANSI spec, some cosmetically blemished, some garbage. Usually anyone who buys product in this class justifiably anticipates that 20 out of every 100 diskettes will not format properly.

Floor Sweepings: This is just plain "garbage". For example, the 5.25" SSDD diskettes that you see advertised for 39¢ are exactly that: garbage. No decent manufacturer has sold any 5.25" SSDD diskettes in several years. SSDD is the absolute bottom of the line in terms of quality. Most of the discount diskettes you see advertised are "floor sweepings" ...bought up by brokers and passed on to the unsuspecting public by unscrupulous merchants who are simply out to make a fast buck.

**When every bit counts,
you can count on Super Star™!**

Well, I wish we had more space, but we don't.

So, here's the message in a nutshell:

1. Super Star™ diskettes are high-clip product, 100% certified, tested to 60% or higher clip levels and not less than ten million read/write passes.

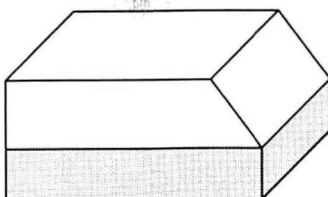
2. Super Star™ diskettes carry a LIFETIME WARRANTY.

3. Super Star™ diskettes equal or exceed the published specifications of such "famous" brand names as 3M, Maxell, TDK, etc.

4. Super Star™ diskettes give you this quality *at about half the price of the big names!*

**Save your money:
buy Super Star™ diskettes!**
That's the message:
**Super Star™ diskettes
mean the highest quality
at about half the price!**

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Buy 50 Super Star™ diskettes of either size and you can get a nice plastic storage case for only \$4.95 (shipping included!).

These are durable plastic cases with dividers.

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3.50" Storage Unit (P/N3102) \$4.95ea.

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DSDD96 (P/N3803)	.82ea.
DSDDHD (P/N3804)	\$1.61ea.

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All Super Star 5.25" Diskettes are poly-bagged in lots of 25 with Tyvec sleeves, write-protect tabs and user ID labels.

QUANTITY DISCOUNTS: 350-500 diskettes, deduct 3%. 550-700 diskettes, deduct 6%. 750-1,000 diskettes, deduct 9%. 1,050+ diskettes, deduct 12%.

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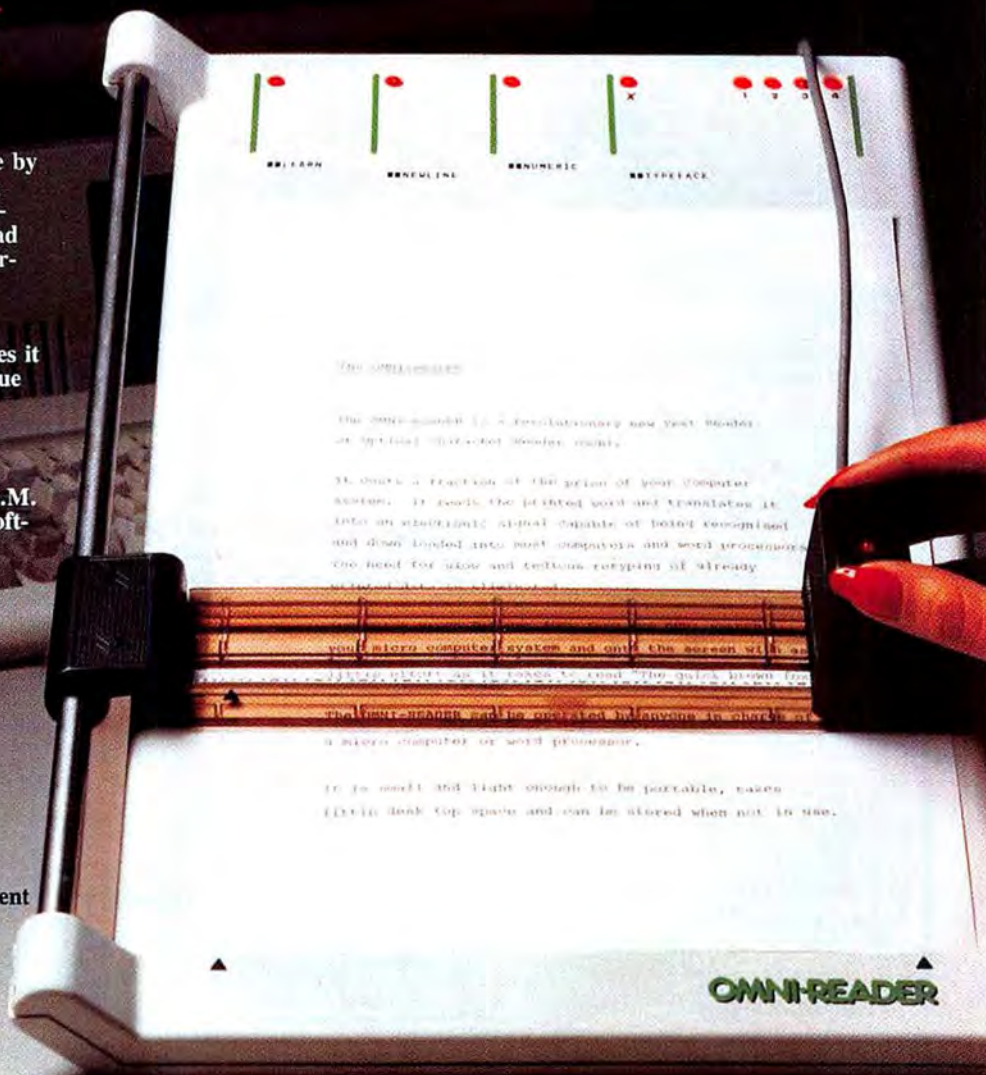
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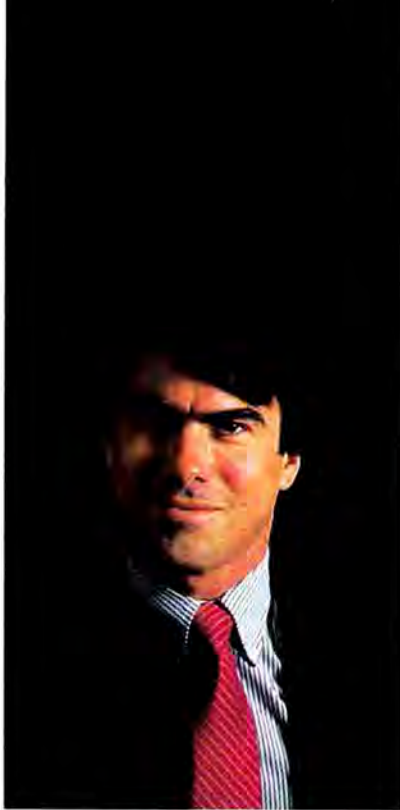


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Kevin Strehlo

The Secret Weapon

For some business-people, PC-based analysis can mean the difference between victory and defeat.

John O'Brach has it tougher than your average businessman. During the busy season he's in his office by 6 a.m., and he works until 7 p.m. or later every night. Saturday is definitely a working day, and on Sunday there's time for church in the morning and maybe a pro football game on TV. But come two o'clock, O'Brach heads for the big confab in the conference room. Even on dreary Sundays, when impending rain makes his knee hurt so bad he can barely think straight, he's got to analyze those films. Checking out the competition is pretty important.

Don't let anybody tell you college football coaches have it easy. It's one of the toughest occupations around.

Back at Bowling Green, Ohio, in the mid-seventies, O'Brach played offensive tackle and tight end. Now he coaches the University of Toledo's offensive line and uses a PC for some tedious but extremely useful game analysis.

Just as it has in the NFL, the PC is beginning to make its mark in college football (see "Handoff to the PC," *PCW*, November 1985).

"A lot of teams use computers now," says O'Brach, "but they're more prevalent in the southern states. Maybe we're just too conservative up here."

It used to take two graduate assistants more than two days to compile the notes O'Brach took as he watched films of other teams. Their job was to group plays into basic categories to determine an opponent's strategies. What plays do they call on third and long? In what situations do they pull off a corner stunt? But once the assistants completed the basic breakdown, that was it. If the coaches wanted to know something out of the ordinary—say, an opponent's tendencies during their first offensive series on the plus side of the 50-yard line—they relied on memory and gut feeling.

Certain a computer could speed up the analysis process and help provide coaches with better data, O'Brach went to the campus computer center. But while the staff there knew computers inside out, they couldn't fathom the subtleties

(continues)

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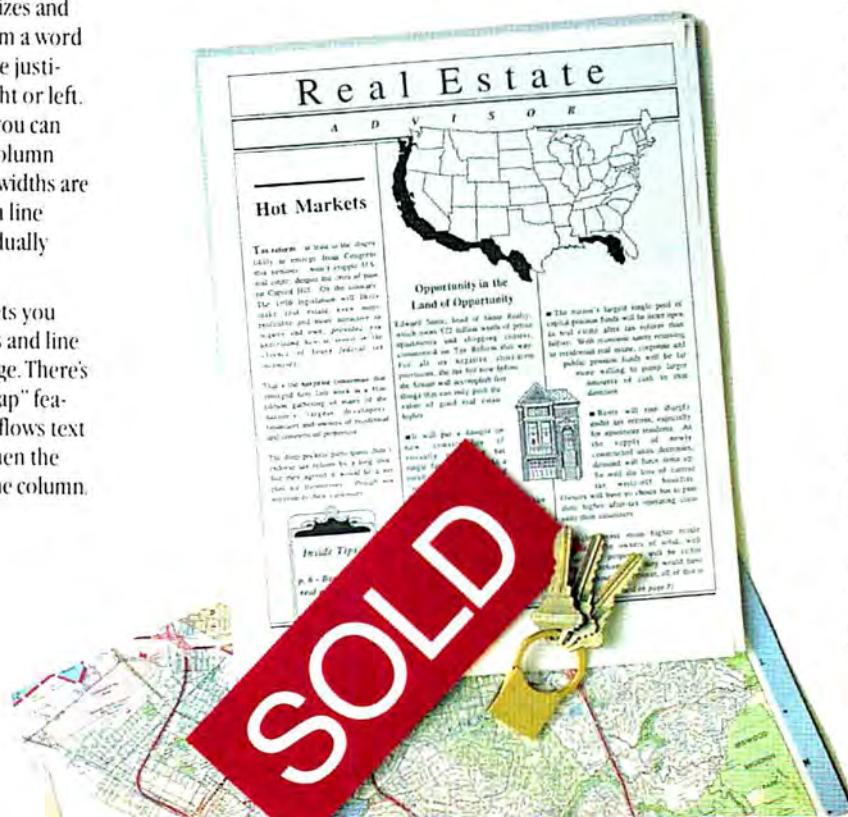
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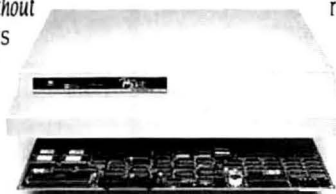
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of college football. "The game can be pretty complicated and confusing," explains O'Brach. "It's just difficult for a lay person to understand."

So O'Brach began a search outside the university—and outside Toledo's conference, because he didn't want to tip off the competition. "We met with the Detroit Lions," he recalls, "but they had a customized system that required several operators and a large computer. Then we talked with Nebraska and Stanford, both of which use the Athletech *Game Analysis* system."

Largely because it was menu-driven and easy to use, O'Brach liked *Game Analysis* as soon as he tried it. "I'm by no stretch of the imagination a computer whiz," he confesses, "but I got to know that thing backwards and forwards pretty quickly."

Sam Covault, president of Athletech Computer Systems in Clearwater, Florida, helped contribute to O'Brach's decision to go with that company. "Sam had a nice, flexible system," O'Brach recalls, "but more importantly, he used to be a coach himself, and he understood what I needed."

Covault may be the perfect football VAR. Value-added resellers need experience in the business they sell to, and Sam's ten years of coaching at the University of Ohio more than suffices. For his Ph.D. in athletic administration he wrote a mainframe-based game analysis program, and he's as comfortable at a computer keyboard as he is on the field. If Covault has a problem, it's that his

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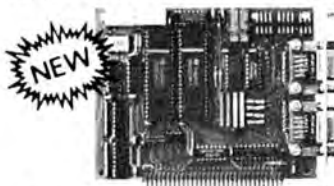
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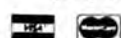
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blond hair and slender build make him look more like a water polo player than a football coach.

After talking with him, however, coaches soon realize that Covault knows their business, and that helps him sell software. Not that the programs need much help. *Game Analysis* enables coaches to record any important game factor: down and distance from the goal, position of the ball relative to the hash marks, offensive and defensive formations, type of coverage, the area of the field a pass is thrown to, and so on. More important, the software can be programmed to recognize a team's particular lexicon: "pro formation ... fly flanker ... X slant, Y flag, Z

post..." In the unlikely event that a coach can't derive a piece of information from one of the system's 1000 built-in reports, *Game Analysis* also cranks out custom reports.

But if there's one thing Covault has learned from his years in the business, it's that there's more to college football than analyzing games. Accordingly, Athletech has programs for almost every need. For instance, the college football season lasts a little longer than three months, so coaches find the quarterly reports from the university's central accounting office only marginally useful. Athletech's budgeting program enables a coach to keep track of all his line-item accounts on a day-by-day

basis. Moreover, Athletech's weight-training program helps keep players in shape by monitoring their progress and recommending lifting regimens based on position, size, and current strength. A recruiting package lets a team design its own player evaluation system and generates mail-merge letters for likely candidates. The program even logs the number of personal conversations held with a particular player to avoid violating the NCAA's strict recruitment regulations.

Athletech's latest product, an academic accountability package, was inspired by the NCAA's

(continues)

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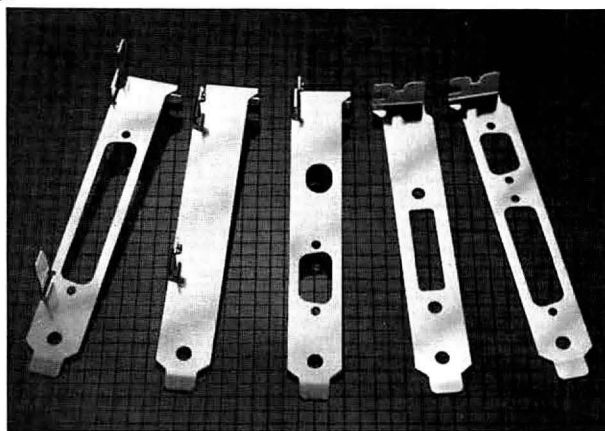
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efforts this year to improve academic performance standards for athletes. In the wake of Jan Kemp's lawsuit against the University of Georgia, how athletes fare in the classroom is a particularly hot issue. Kemp alleged she was dismissed from Georgia's Developmental Studies Program for protesting preferential treatment for Georgia athletes, and a jury awarded her over \$2 million in damages.

Because this is the first year that the academic accountability rule changes take effect, Covault thinks schools will welcome a system tailor-made for the new requirements. It maintains all the statistics the NCAA requires, in-

cluding SAT scores, high school records, and university courses in progress. It also churns out the reports required by both the NCAA and individual football conferences according to the new rules. "A buddy of mine, an academic counselor at one of the Big Ten schools, has stayed on top of the changes from the very beginning," says Covault. "He knows the format of all the reports that have to be filed, and he's doing the program design work."

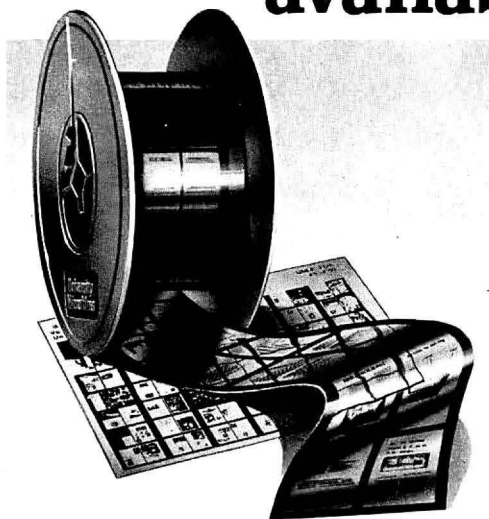
Covault is cashing in on the fact that college football is big business. If the University of Georgia made \$4.3 million on sports in 1985, certainly it can afford \$3500 for Athletech's recruitment software or \$1000 for the weight-

training package. In fact, enough schools dug deep into their pockets last year to put Athletech on one publication's list of the top 100 VARs in the country.

Covault doesn't argue the merits of new NCAA academic regulations; he merely makes sure he understands their impact. His mission is to assist people—like Toledo's John O'Brach—in the business he knows best. Covault helps them get their jobs done with PCs, and leaves it at that, as any good VAR would. ●

Kevin Strehlo hunts for PC tales from an office overlooking Silicon Valley.

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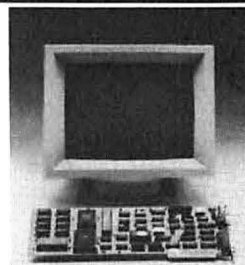
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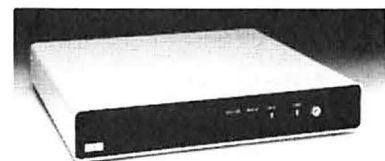
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October Preview

1986 World Class PC Contest Results



PC World's big-stakes contest is now in its fourth year. Next month you'll find out which software and hardware products our readers voted as outstanding in their respective categories.

- **Microsoft Word**
Microsoft Word comes to the rescue of disorganized thinkers and blocked writers by harnessing the power of style sheets and outline processing. A hands-on tutorial takes you through the process with a real thinking tool.

- **AT&T's Targa Board**
An in-depth review of AT&T's remarkable offering, a versatile board that both captures and alters images, supplies 256 colors, and brings you the flexibility of painting like a pro or erasing like a novice.

- **dBASE III Plus**
Ashton-Tate's newest version of its dominant data manager features a friendlier face and a tolerance for local area networking. PC World puts dBASE III Plus through its multiuser paces.

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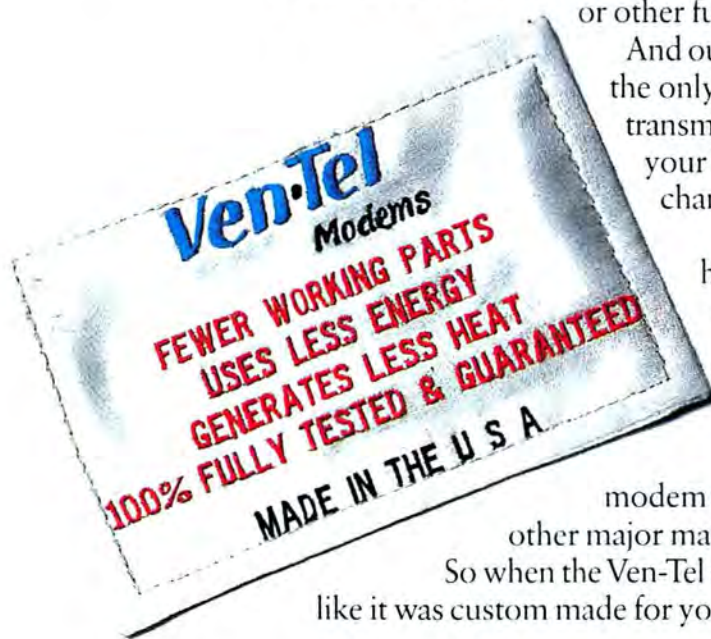
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