

# Computers

FEBRUARY 1985 \$1.95

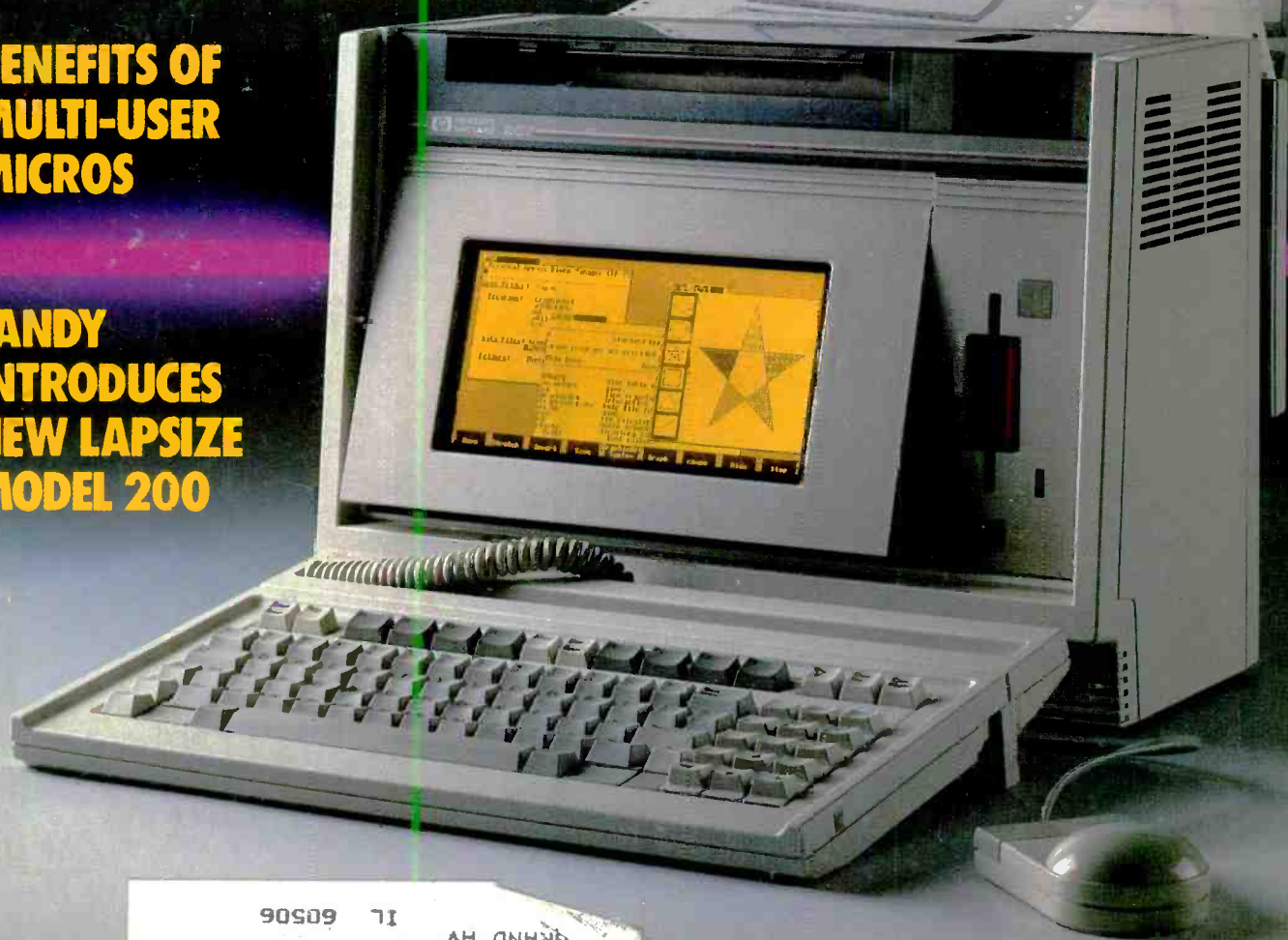
& ELECTRONICS

**HP'S NEW INTEGRAL COMPUTER:  
TRUE UNIX TRANSPORTABILITY**

**GETTING THE MOST OUT OF  
ONLINE DATABASES**

**BENEFITS OF  
MULTI-USER  
MICROS**

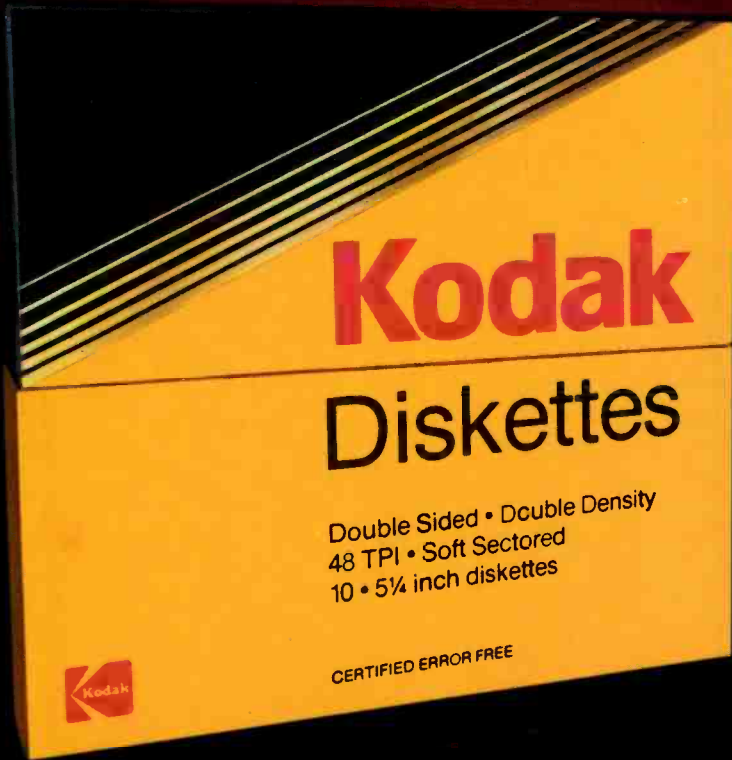
**TANDY  
INTRODUCES  
NEW LAPSIZE  
MODEL 200**



\*\*\*\*\*5-DIGIT 60506  
390736 DHM 09976093 641D SEP85  
MRS EDNA DAHM  
48 GRAND AV  
IL 60506  
02#VJ

**VIEWS: JANE, TURBO PASCAL,  
ITT XTRA, AND MORE**





# A NEW LEGEND BEGINS.

## INTRODUCING NEW KODAK DISKETTES.

For as long as anyone can remember, the world has trusted Kodak film to capture its memories. Now the world can trust legendary Kodak quality to capture its computer data.

Introducing Kodak diskettes. And the beginning of a new legend.

We know you expect nothing less than extraordinary performance from a Kodak product. We didn't disappoint you.

These remarkable new diskettes are so thoroughly tested, they're certified error-free.

Every Kodak diskette has a highly burnished head surface for optimum read-write accuracy. And every standard diskette is made to

withstand 4½ million passes before significant wear occurs.

With accuracy and durability like that, we can offer this no-questions-asked replacement policy:

*This KODAK Diskette will be free from manufacturing defects, or we will replace it.*

Kodak diskettes for home and business PC use are available in standard 8- and 5¼-inch formats, high-density 5¼-inch diskettes, and 3½-inch micro diskettes in our HD 600 Series.

New Kodak diskettes. Because the only thing that can follow a legend is another legend.



**KODAK.**  
The name says it all.



**GO FOR THE BEST,  
REGARDLESS OF COST  
EVEN IF IT'S CHEAPER.**



	<b>THE LEADING EDGE™ PERSONAL COMPUTER</b>	<b>THE IBM® PERSONAL COMPUTER</b>
<b>Display</b>	Hi-res monochrome display standard	Monochrome display—\$275. Monochrome controller—\$250.
<b>Memory</b>	256K Standard	256K Standard
<b>Speed</b>	7.16 MHz and 4.77 MHz Standard	4.77 MHz Only
<b>Expandability</b>	Expandable to 640K No additional boards	Expandable to 640K Must add two boards
<b>Disk Drives</b>	2—360KB Drives Standard	One Drive Standard Additional Drive—\$425.
<b>Battery Backed Clock/Calendar</b>	Standard	Not available from IBM
<b>Ports</b>	Both Parallel and Serial Standard	Serial—\$100.
<b>Expansion Slots</b>	7 slots Standard of which 4 remain open after expansion to 640K	5 slots Standard of which none remain open after expansion to 640K
<b>Warranty</b>	One Full Year parts and labor	90 Days parts and labor
<b>Support</b>	Lifetime no charge toll-free hotline Standard. The best in the industry	None on hardware. Software optional at \$40 per call.
<b>Service</b>	Nationwide Service Centers	Nationwide Service Centers
<b>Price</b>	\$1,995 Complete	\$3,110 (Configured as basic Leading Edge PC)

\*as of 10-4-84

**LEADING EDGE PC: THE GREAT UNKNOWN**

LEADING EDGE PRODUCTS, INC.  
LEADING EDGE PC AND SYSTEMS DIVISION, 225 TURNPIKE STREET, CANTON, MA 02021. 800-343-6833. (617) 828-8150.  
FORTUNE DIVISION, 225 TURNPIKE STREET, CANTON, MA 02021. 800-354-0554. (617) 828-8150.

IBM is a registered trademark of International Business Machines Corporation.

Circle No. 20 on Free Information Card

# Computers

## & ELECTRONICS

## Features

COVER PHOTO BY DAVID ARKY



### 42 HP Introduces First Unix Portable

By Mark Rollins

Speedy new Unix machine aimed at end users.

### 46 What You Can Get Online

By Jeff Hecht

Database services are powerful research and business tools.

### 54 Making Online Databases Useful

By Kerry Leichtman

How to get the most out of large databases.

### 59 Guide to Online Information Services

### 62 Sprites and Graphics

By TJ Byers

Even low-powered micros can do animation with sprites.

### 66 New Flat Panel Displays

By Bob Margolin

Gas plasma and vacuum fluorescent displays may replace LCDs.

### 70 Multi User Micros

By Michael K. Guttman

Much of the power of minicomputers for a fraction of the cost.

### 76 Tandy's New Model 200 Briefcase Computer

By Kerry Leichtman

Successor to Model 100 has improved text editor and Multiplan.

## Reviews

### 28 ITT Xtra

By Robin Webster

### 33 Ultraterm

By Jaine Saffir

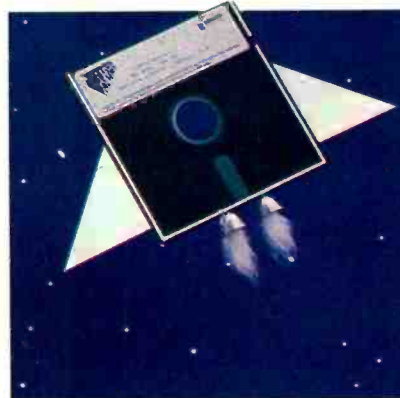
### 36 ProKey

By John Smith-Richardson

### 37 Jane

By Gordon McComb

### 38 Turbo Pascal



By David Frankel &amp; Michael K. Guttman

## Columns

### 12 Bits & Bytes

By Sol Libes



### 16 Les Solomon on Computer Hardware

Hi there, can we communicate?

### 22 The Computer Scientist

By Forrest M. Mims, III

Psychological testing.

## Departments

### 4 Editorial

By Seth R. Alpert

### 6 Letters

### 78 New Products

### 99 Computer Mart/ Electronics Classified

### 108 Manufacturers' Index

COPYRIGHT © 1985 BY ZIFF-DAVIS PUBLISHING COMPANY. All rights reserved. Computers & Electronics (ISSN 0032-4485) February 1985, Volume 23, Number 2. Published monthly by Ziff-Davis Publishing Co., at 3460 Wilshire Blvd., Los Angeles, CA 90010. Richard P. Friese, President; Selwyn Taubman, Treasurer; Bertram A. Abrams, Secretary. One year subscription rate for U.S. and Possessions, \$16.97; Canada, \$21.97; all other countries, \$24.97 (cash orders only, payable in U.S. currency). Second Class Postage Paid at Los Angeles, CA 90052 and at additional mailing offices. Authorized as second class mail by the Post Office Dept., Ottawa, Canada, and for payment of postage in cash. POPULAR ELECTRONICS including ELECTRONICS WORLD trademark registered. Indexed in the Reader's Guide to Periodical Literature. Ziff-Davis also publishes Boating, Car and Driver, Cycle, Flying, Popular Photography, Skiing, Stereo Review, Electronic Experimenter's Handbook, and Tape Recording & Buying Guide. POSTMASTER: Send address changes to COMPUTERS & ELECTRONICS, Circulation Dept. P.O. Box 2774, Boulder, CO 80302. Please allow at least eight weeks for change of address, enclosing, if possible, an address label from a recent issue. Permissions. Material in this publication may not be reproduced in any form without permission. Send requests for permission to Jean Lamensdorf, Rights and Permissions, Ziff-Davis Publishing Co., One Park Ave., New York, NY 10016.

# SETH R. ALPERT EDITORIAL

## WHO NEEDS ALL THAT POWER?



**M**ICROCOMPUTERS, as I am sure you are tired of being told, continue to get more powerful and to cost less per unit of capability. About the most publicized recent leap forward in capacity was that provided by IBM's Personal Computer AT. This machine runs around three times as fast as its older brother, comes with up to five times as much system memory, uses floppies that store four times as much information, and can be equipped with up to four times as much hard disk storage in the basic chassis. The standard for processing power in a business micro has suddenly been changed again.

I happen to be one of those individuals who is always eagerly awaiting the next quantum jump in power, be it from hardware or software, so to me this introduction of the AT was nothing but good news. My years in computing have conditioned me to believe that, for micros and mainframes alike, no matter how much power is at your fingertips, it will soon seem at best ordinary or, more likely, insufficient. People, from end users to computer professionals, just don't enjoy waiting for a computer to do its thing. Ultimately, anything less than instant response time will seem to be too slow.

Processing power has become an important issue even for home computer

buyers. Industry reports indicate that recent sales of personal computers to individuals reflect a shift from machines under \$500 to those \$500 to \$1000.

As it turns out, not everyone agrees with me on this (and, of course many other things as well). Shortly after the introduction of the AT, I found myself in a conversation with another observer of the personal computer scene who reacted by saying that it was indeed impressive, but who really needs that kind of power in a desktop computer? Clearly a more sensible attitude than that found in speed freaks like myself who can never get enough. In fact, I am embarrassed to admit that it was the first time I ever seriously considered the viewpoint my colleague was espousing.

In truth, many people have such an outlook. A good example can be found among programmers who have the Spartan view that it is somehow purer, perhaps even more macho, to work on a lean machine than a loaded one. They go so far as to argue that those who write for an 8-bit environment simply write better, more efficient, more elegant code than those who work in the 16-bit world, precisely because of the resource and memory constraints that they face. Personally, I think that is malarkey and simply misses the point. I would rather have

a programmer developing software for me free to worry about its features and user interface than about cramming every ounce into 64K of RAM.

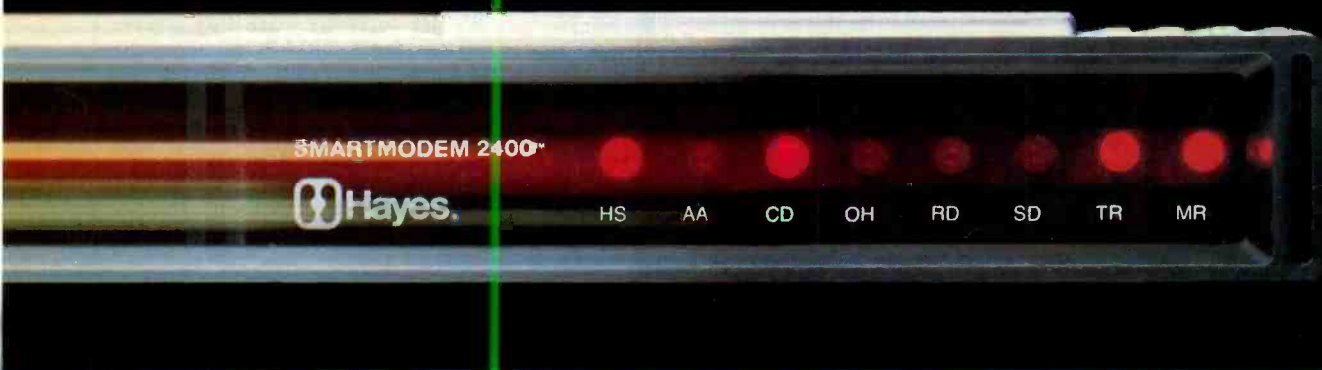
Wasteful? Perhaps, but machines like the AT will get today's jobs done faster and pave the way for the more capable software of tomorrow. How could anyone not want that? Paraphrasing one of the laws of thermodynamics, software expands to fill the hardware available. While part of that expansion may result from less efficient programming methodology, I am convinced that marketplace forces will see to it that the majority is due to expanding capabilities.

Are machines with the power of the AT unnecessary for most of today's micro users? Trying to be realistic (and I admit that is sometimes difficult), I think it is fair to say that today's personal computers pack adequate power for today's applications. For people whose needs are satisfied now, there is little realistic reason to move to more powerful machines. But as software that takes advantage of more powerful hardware becomes available, those who wish to benefit fully from personal computers will want to upgrade. And those who wish to remain competitive may have no choice.

One might well ask where all this will end. When will personal computers (or supercomputers for that matter) have enough power so that there is no need to go on developing more capable machines? My feeling is that that time is not even in sight. Electronic computing, after all, is less than 40 years old; personal computers have been around for a mere ten years. A whole new world of applications, many of which have been previewed in the pages of this magazine, is sitting on the horizon, waiting to soak up personal computer resources as they become available. Examples include image processing, local large databases stored on optical disks, and speech recognition and synthesis. As the hardware becomes sufficiently capable and affordable, such applications will become commonplace. And I am confident that a next generation of applications will be waiting in the wings, hungry for more computer power if only it were available.

Who needs all that power? All of us, that's who. ◇

# Hayes sets the standard for personal computer communications. Again. Smartmodem 2400.™



**The new fast mover from Hayes. The telecomputing leader.** When it comes to communications products for personal computers, we're the leader! Hayes Smartmodem 1200™ set the industry standards for quality, reliability and performance.

Now our new, faster Smartmodem 2400 goes even further to lower telephone line costs and improve user productivity. So, at twice the speed of a 1200 bps modem, it quickly pays for itself in any high-volume communications operation.

Smartmodem 2400 provides a quick link to minis and mainframes. Both synchronous and asynchronous transmissions are supported by an advanced version of the well-known Hayes "AT" command set. You can download from the IBM mainframe at the home office. Send data to the mini upstairs. And guarantee accurate transmission with information services.

With worldwide communications in mind, Smartmodem 2400 was designed to meet CCITT international standards. It provides a fast, cost-effective way to transmit data between approved countries.

**New version of Hayes Smartcom II® communications software** creates a complete telecomputing system with Smartmodem 2400. Our new Smartcom II, Version 2.1, is available for the IBM\* PC and many popular compatibles. Smartcom II makes the most of Smartmodem's exceptional features, at the same time it makes communicating easy for you. And, if you're currently using an earlier version of Smartcom II, Hayes offers a \$25 upgrade to Version 2.1.

So if you're looking for ways to streamline your communications, see your authorized Hayes dealer right away. For a hands-on demonstration of Smartcom II and our new Smartmodem 2400. Guaranteed to get you moving fast!

**Hayes Microcomputer Products, Inc.**, 5923 Peachtree Industrial Blvd., Norcross, Georgia 30092. 404/441-1617.

#### Smartmodem 2400

- Direct connect • Asynchronous and synchronous communications
- Accommodates Hayes-compatible modems of slower speeds
- Meets CCITT worldwide standards • Keyboard control of all communications parameters • High speed indicator • Voice/data capabilities • Call progress monitoring • Two-year limited warranty with optional four-year extended warranty available.

#### Smartcom II

- Hayes Verification and XMODEM protocols • Emulates DEC\* VT52 and VT100/102 • Totally unattended operation • Voice/data capabilities.

# Hayes®

Smartcom II is a registered trademark and Smartmodem 2400 and Smartmodem 1200 are trademarks of Hayes Microcomputer Products, Inc. \*Trademarks of their respective companies ©1985 Hayes Microcomputer Products, Inc.

WILLIAM S. DAVID *Publisher*

SETH R. ALPERT *Editor*

PETER COSTA *Executive Editor*

LESLIE SOLOMON *Technical Director*

JOHN R. RIGGS *Managing Editor*

ROBERT LASCARO *Art Director*

JOSEPH DESPOSITO *Technical Editor*

TOM BADGETT *Technical Editor*

JOSEF BERNARD *Technical Editor*

PAUL BONNER *Technical Editor*

CHARLES A. MILLER *Staff Editor*

NORA GEORGAS *Staff Writer*

DANIEL GLADSTONE *Senior Copy Editor*

AMY MADWED *Assistant Art Director*

ANDRE DUZANT *Technical Illustrator*

L. PERRIN TOMICH *Editorial Assistant*

**Contributing Editors:** Sol Libes, Forrest M. Mims, III, Barbara E. McMullen, John F. McMullen

**Editorial and Executive Offices**  
One Park Avenue, New York, N.Y. 10016.  
212-503-3500

#### Advertising Sales Offices

Jean Anderson, Assistant to the Publisher  
Desirée Sample, Advertising Coordinator

#### Eastern

Ken Lipka, 1 Park Ave., New York, N.Y. 10016.  
212-503-5029

Linda M. Holbrook, 160 State St., Boston, MA  
02109. 617-367-7190

#### Midwestern

Robert Vanek, Suite 1400, 180 N. Michigan Ave.,  
Chicago, IL 60601. 312-346-2600

#### Western

Janet Bish, 11 Davis Dr., Belmont, CA 94002. 415-  
598-2290

Anne Abeln, 3460 Wilshire Blvd., Los Angeles, CA  
90010. 213-387-2100

#### Southeastern

Mark Browning, PO Box 81306, 2511 Carroll Ave.,  
Atlanta, GA 30366. 404-455-3430.

#### Computer Publications Division

Kenneth Koppel	General Manager
Eileen G. Markowitz	Senior Vice President
Jerry Schneider	Vice President, Licensing & Special Projects
Herbert Stern	Vice President, Creative Services
Jonathan D. Lazarus	Vice President, Editorial Director
Ernest F. Baxter	Editorial Director
Peter J. Blank	Creative Director
Gary A. Gustafson	Business Manager
Roni Sonnenberg	Marketing Manager

#### Ziff-Davis Publishing

**President** Richard P. Fries; **President Consumer Magazine Division** Albert S. Traina; **Executive Vice President, Marketing and Circulation** Paul H. Chook; **Senior Vice President** Phillip T. Heffernan; **Senior Vice President** Sidney Holtz; **Senior Vice President** Edward D. Muhlfield; **Senior Vice President** Philip Sine; **Vice President** Baird Davis; **Vice President** George Morrissey; **Vice President** Rory Parisi; **Vice President** William L. Phillips; **Treasurer** Selwyn Taubman; **Secretary** Bertram A. Abrams

**Editorial correspondence:** COMPUTERS & ELECTRONICS, 1 Park Ave., New York, NY 10016. Editorial contributions must be accompanied by return postage and will be handled with reasonable care; however, publisher assumes no responsibility for return or safety of manuscripts, art work, or models submitted.

The publisher has no knowledge of any proprietary rights which will be violated by the making or using of any items disclosed in this issue.

Member Audit Bureau  
of Circulations

# LETTERS

## Princeton Graphic SR-12 Monitor Review Correction

The December 1984 issue of COMPUTERS & ELECTRONICS contained a review of Princeton Graphic Systems' high-resolution color SR-12 Monitor and Scan Doubler. This monitor supports crisp displays of up to 690 × 480 pixels and 16 simultaneous colors. Our review was regrettably misleading on a number of points having to do with hardware and software compatibility and the additional equipment you will need to be able to make use of the SR-12. We would like to clear up an impression the review might have given, that it is difficult to take advantage of the monitor's capabilities.

The monitor itself is noninterlaced and needs compatible video output. Two approaches can be taken to obtain the required video output. First, PGS's Scan Doubler board can be added to a configuration including any IBM-compatible color graphics card. The Quadcolor boards mentioned in the review will work, as will many other products. The Quadcolor II board is good but not optimal for such a configuration, as the review stated. Using the Scan Doubler with an IBM-compatible color card maintains IBM software compatibility, but requires an extra slot and limits software addressability to the IBM standard 640 × 200 pixels.

A second approach would be to use a high-performance graphics board such as the Sigma Designs Color 400 or the Tseng Labs Colorpak Plus. Because such boards have built-in scan doubling capability, they can be used with the SR-12 without the PGS Scan Doubler. In addition to saving a slot, such boards also support addressability of 640 × 400, thus producing an even sharper display (which is particularly important for text) than a Scan Doubler based configuration.

We regret any confusion that our review may have caused.—Ed.

## The Bernoulli Box

I must take exception to a statement in the article "3M Stretches the Capacity of Floppy Disks" in your August issue, in which the author said that a compliant-medium equivalent of the hard disk didn't exist until 3M's development of stretched-surface media. IOMEGA has had such a disk drive on the market for over two years. These drives, available in

both 5¼" (5M bytes) and 8" (10M bytes) versions employ the Bernoulli effect to stabilize the spinning disk with respect to the head.

Every virtue of the stretched-surface disk is possessed by the Bernoulli disk, but the physical laws of moving air described by Bernoulli are used to stabilize the compliant medium rather than a plastic frame. Thus high-density plug-in cartridge disks are obtained without the fragility and expense characteristic of hard disk cartridges.

We are currently marketing a drive subsystem for the IBM PC known as the "Bernoulli Box," which contains two 10M-byte replaceable cartridge drives in a PC look-alike cabinet. The drives are also used by other manufacturers who offer IOMEGA-based drive systems for minicomputers, dedicated word processing systems, and S-100 and Apple micros.

—GARY CROWELL  
IOMEGA Corp.  
Ogden, UT

## Languages and Letters

The comments by Reid Neubert regarding the ease of reading various type fonts in your Letters column of November were very interesting. He is certainly correct about the recognition of words as *gestalts* formed by the grouped letters.

I learned to read German in black letter type and can read it about three times as fast as when the German is printed in roman. On the other hand, I read Swedish much more rapidly in roman. I read Yiddish also, but slowly because of the lack of distinctiveness in the Hebrew characters. Arabic scripts, especially Pharsee, share this fault.

The problem is also noticeable in modern Chinese and Japanese characters with uniform-width strokes. Characters learned in the old-style square method are very hard to recognize in the new style. I suspect even those who are native to the language have their problems too.

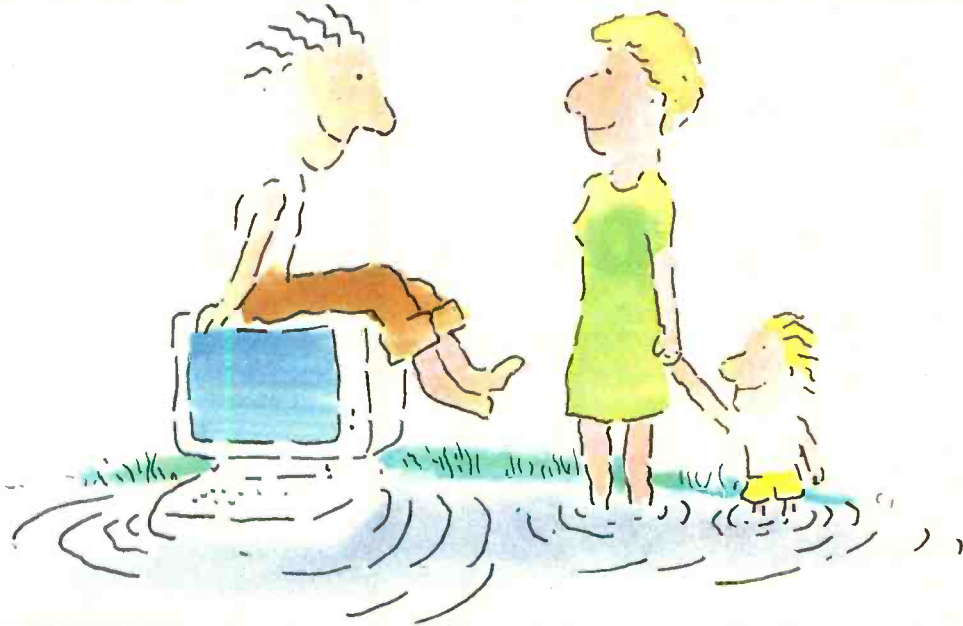
—BILLY R. POGUE  
Thatcher, AZ

## Errata

In the list of Manufacturers of "Real World Interfaces" in the November issue, the address for Lawson Labs should be Columbia Falls, MT 59912. The telephone number for Imaging Technology should be 617-938-8444.



# GET YOUR FEET WET...



**... IN THE INFORMATION AGE WITH THE DOW JONES NEWS/RETRIEVAL® MEMBERSHIP KIT. SAMPLE A CONTINUOUS STREAM OF KNOWLEDGE AT A PRICE YOU CAN AFFORD.**

Now you and your whole family can experience the information age without getting in over your head.

For just \$29.95, the new Dow Jones News/Retrieval Membership Kit leads you step-by-step into entertaining and informative data bases. With **five free hours** to sample and explore, you can find a fact, shop at

home, get the scores, plan a trip, review a movie, choose a stock, or check world and business news. There's a lot more, too. All you need to get started is a computer and modem:

The Membership Kit is a big value that entitles you to:

- FREE password (\$75 value)
- Easy, step-by-step User's Guide
- FIVE FREE HOURS of unrestricted usage to explore the magic of this comprehensive service

- FREE subscription to *Dowline*, the magazine of Dow Jones News/Retrieval
- A special introductory offer!

Get your feet wet in the information age with the Dow Jones News/Retrieval Membership Kit. At \$29.95, you'll enjoy the dip without getting soaked. Available at your local computer retailer, or call Dow Jones at:

**1-800-257-5114**  
In New Jersey, Canada,  
Hawaii and Alaska  
1-609-452-1511



*"Toss away any preconception that Dow Jones News/Retrieval is a stuffy, one dimensional data base service designed only for an elite corps of stock analysts and Wall Street wizards. Far from it—Dow Jones News/Retrieval also provides entertaining movie reviews, current weather and sports reports, convenient electronic shopping and inexpensive electronic mail... Dow Jones News/Retrieval is informative, entertaining and well worth the money."*  
-Brad Baldwin, *InfoWorld Magazine*

**DOW JONES NEWS/RETRIEVAL®**  
Copyright © 1984 Dow Jones and Company, Inc. All Rights Reserved. Dow Jones News/Retrieval® is a registered trademark of Dow Jones and Company, Inc.

*Train for the Fastest Growing Job Skill in America*

# **Only NRI teaches you to service and repair all computers as you build your own 16-bit IBM-compatible micro**

As computers move into offices and homes by the millions, the demand for trained computer service technicians surges forward. The Department of Labor estimates that computer service jobs will actually *double* in the next ten years—a faster growth than any other occupation.

## **Total System Training**

As an NRI student, you'll get total hands-on training as you actually build your own Sanyo MBC-550-2 computer from the keyboard up. Only a person who knows *all* the underlying fundamentals can cope with *all* the significant brands of computers. And as an NRI graduate, you'll possess the up-to-the-minute combination of theory and practical experience that will lead you to success on the job.

You learn at your own convenience, in your own home, at your own comfortable pace. Without classroom pressures, without rigid night-school schedules, without wasted time. Your own personal NRI instructor and NRI's complete technical staff will answer your questions, give you

**New from NRI—the only home study course that trains you as you assemble a top-brand computer!**



After you construct this digital logic probe, you'll install the "intelligent" Sanyo detached keyboard, with its dedicated microprocessor.

You next assemble the power supply into the main unit of the computer. Using the digital multimeter, you check all keyboard connections and circuits.

After you install the disk drive and monitor, you'll make a backup copy of the MS-DOS operating disk, explore the 8088 microchip and additional circuits.

guidance and special help whenever you may need it.

## **The Exciting Sanyo MBC-550-2—Yours To Keep**

Critics hail the new Sanyo as the "most intriguing" of all the IBM-PC compatible computers. It uses the same 8088 microprocessor as the IBM-PC and the MS/DOS operating system. So, you'll be able to choose thousands of off-the-shelf software programs to run on your completed Sanyo.

As you build the Sanyo from the keyboard up, you'll perform demonstrations and experiments that will give you a total mastery of computer operations and servicing techniques. You'll do programming in BASIC language. You'll prepare interfaces for peripherals such as printers and joysticks. Using utility programs, you'll check out 8088 functioning. NRI's easy step-by-step instructions will guide you all the way right into one of today's fastest growing fields as a computer



service technician. And the entire system, including all the bundled software and extensive data manuals, is yours to keep as part of your training.

**How the pro computer critics rate the Sanyo 550:**

*"Sanyo BASIC is definitely superior to IBM Microsoft... lets you use two or three keystrokes for entering BASIC commands."*

—MICROCOMPUTING Magazine

*"... compares favorably with the IBM PC, even surpassing it in computational speed..."*

—COMPUTERS & ELECTRONICS Magazine

**Your NRI Course Includes a Sanyo MBC-550 Computer with 128K RAM, Monitor, Disk Drive, and "Intelligent" Keyboard; The NRI Discovery Lab®, Teaching Circuit Design and Operations; a Digital Multimeter; Bundled Spread Sheet and Word Processing Software Worth \$1500 at Retail—and More.**

*"I went to have a look at the MBC-550... what I found made me an owner the next day!"*

—Bill Sudbrink,  
BYTE Magazine

**100-Page Free Catalog Tells More**

Send the postage-paid reply card today for NRI's big 100-page color catalog, which gives you all the facts about NRI training in Microcomputers, Robotics, Data

Communications, TV/Video/Audio Servicing, and other growing high-tech career fields. If the card is missing write to NRI at the address below.

**NRI SCHOOLS**

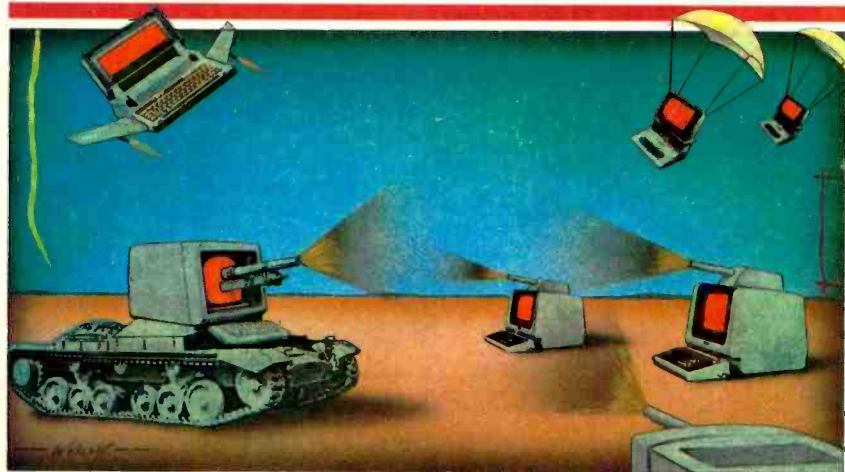
McGraw-Hill Continuing Education Center  
3939 Wisconsin Avenue, NW  
Washington, DC 20016

**We'll Give You Tomorrow.**



IBM is a Registered Trademark of International Business Machine Corporation. 1-025

# SOL LIBES BITS & BYTES



## Rumors & Gossip

► The Commodore-Atari price war is expected to escalate. Atari may drop the 800XL price to close to \$100, in which case Commodore is expected to sell the C-64 for just a few dollars more. The new Commodore Plus/4 machine, introduced in October with a list price of \$299, is already being discounted for under \$230 and the C-64 had pre-Christmas discounts to as low as \$185. The 800XL reportedly has 3% of the home market, compared to the 64's 32%. Commodore may sell its new 68000 machine (purchased from Amiga) in Europe by the end of next month and introduce it formally in the U.S. at the June Consumer Electronics Show. Some industry pundits are calling this machine "Mac with color." Meanwhile Atari is rumored to be negotiating with Mindset and at least one other company to acquire comparable graphics capabilities. Apple seems to be working hard to develop its color version of the Mac.

AT&T, we hear, is not happy with Digital Research's slow progress in porting Unix System V to the 80286 microprocessor and may finish the project in-house. . . . Apple is expected to announce shortly several networking products for the Macintosh that will allow business users to connect the machine to several different IBM systems, including those using the SNA LU 6.2 protocol and DCA/DIA. Apple is afraid that if it doesn't offer some IBM compatibility, it will be locked out of the business market.

Sinclair seems to be developing a new microprocessor chip with parallel processing and RAM on board that won't be introduced for at least 4 years. And we have been told Atari is investigating potential sales of home PBXs.

Texas Instruments is setting a new precedent in the personal computer field by offering a 5-year warranty and a 24-hr. customer support line. Since most PC makers still offer 90-day warranties, TI's move will put additional pressures on sellers. We wonder whether TI, like the auto makers, will return to 90-day warranties if, or when, business improves.

## Informal Blurbs & Morsels

► IBM, introducing its PC in August 1981, caught the industry by surprise. About a year passed before the first clones appeared. Not so with the AT, which was introduced in August 1984. AT-clone prototypes were already shown at the COMDEX show in November, and companies are expected to start shipping production units shortly. A few dealers are already offering discounts on the new AT even though IBM is still allocating shipments. The AT is reported to have garnered 9% of retail dollar sales in September, the first month it became available. That portion is even higher than what the Apple Mac captured in its first month. It is estimated that IBM sold 60,000 ATs by the end of last year.

Before long IBM will most likely introduce a tape backup system for the AT and a new operating system that is a subset of the VM operating system used on their larger computers. And there are rumors that IBM is working on a plug-in card for the AT that will allow the AT to emulate a System 36.

Industry prognosticators generally feel that IBM's recent price cuts for the PC, XT, and Portable are an attempt to clear inventory prior to the introduction of upgraded versions of the PC, XT and a lap portable. The last round of price

cuts in June together with increased production had a devastating effect on the clones, and these new products should have an even greater impact. IBM is known to have already contracted with Toshiba and Alps for 1.8 million microfloppy drives (at \$60 each) and with Verbatim for a half-million 3½" drives a month, which probably means that the new products might be out as soon as this month. Rumors are that the new desktop PC will have better ergonomics and will set a new, low, price standard for an entry-level system due to streamlined manufacturing and a greatly reduced parts count. The lap unit is also expected to contain 128K of bubble memory for file storage. IBM is believed to have contracted with Hi-Comp, which already makes a PC bubble card, for 500,000 bubble subassemblies for possible use in the lap unit.

IBM is understood to be developing a line of laser printers at its Boulder facility.

According to International Resource Development, a market research outfit, IBM is currently shipping about 10,000 ATs, about 25,000 PCjr's, about 35,000 XTs and about 50,000 PCs every month.

There have been accusations that IBM is dumping PCs by forcing dealers to purchase more units than they are able to sell. The result is that these dealers turn around and unload their excess inventories to unauthorized resellers (the "grey market"). Dealers carrying the IBM PC are coming under even greater pressures as they find that their biggest competitor in selling IBM systems is IBM itself. It has been estimated that 60% of all PC/XT machines are now sold directly by IBM. IBM is currently offering discounts to multisystem buyers of 30-37% and even more on large orders. Dealers find that they usually cannot compete with IBM on multisystem sales and are left with selling the meager and expensive single systems.

In Japan IBM has introduced a special version of the PCjr called the JX. The unit is being made for IBM by Matsushita and sells for \$676 to \$1378. The unit uses 3½" floppies and has a high-resolution graphics option of 720 × 512 pixels. Could this be a prelude of things to come from IBM in the U.S.? IBM is also known to be taking a serious look at the Microsoft MSX operating system, which is very popular in Japan

ILLUSTRATIONS BY CARL WESLEY

for low-cost home computers. It looks like IBM is seriously entering this mass-merchandise market.

It is estimated that software now accounts for 10% of IBM's business. Last year IBM sold about \$4 billion worth of software, which is probably more than all the other software vendors put together! IBM's software sales, increasing at about 40% a year, should account for one-third of its business within 10 years. Rises in software prices have been offsetting declining hardware prices.

### Apple Juice

► Analysts estimate that Apple shipped about 300,000 Macintosh computers last year, quite a respectable number for the first year of sales. Sales, however, leveled off toward the end of the year and fell far short of the 1 million PC/XT machines IBM shipped last year. Of course Apple is taking pains to protect its dealers and so far has limited its direct system sales to end users (as IBM is doing; see above). Expected shortly is a 20M-byte hard disk for the Mac. Apple is also known to be developing a lap version of the Mac.

Further, it appears that the fat Mac, with 512K of memory, has had a serious impact on sales of Lisa 2s. Apple is known to be developing a more powerful Mac, based on the Motorola 68020, that will probably replace the Lisa.

Meanwhile Apple's upgraded version of the II with 8/16-bit CPU capability and memory addressing of 16M bytes is expected out late this year and should extend the life of the Apple II even further. A more distant possibility is enhanced color graphics for the II, as Apple seeks to meet the challenge expected from Commodore/Amiga. Apple reports that by the end of last year it had sold over 2 million Apple IIs.

Apple has also stepped up its advertising efforts to \$200 million for the year, double what it spent in 1983 and 1984.

### The Integrated Software Glut

► VisiCorp announced the first "integrated software environment" called Visi On in November 1982. And Quarterdeck soon followed, with its Desq system. Now, according to Datapro Research, there are at least 102 integrated products available. Lotus (Symphony), Software Publishing (PFS), Ashton-Tate (Framework) and Peachtree lead the integrated market. IBM is promising to begin shipping its Topview integrat-



ing environment this quarter. Meanwhile Microsoft has pushed back release of Windows from June 1984, to November 1984, and now to June 1985. The published specs for Windows appear much more powerful than those of Topview or of any of the other integrated or integrating packages introduced so far.

There are increasing signs that "integrated environments" may be a product in search of a market. Visi On never got off the ground and Quarterdeck is reorganizing. And many users are complaining that integrating many applications makes the product slow and too hard to use and learn. Lotus's older and less comprehensive 1-2-3 appears now to be selling better than its more elaborate Symphony.

It will still be a few more months before we know if users really want such a high degree of integration. Most personal computer users run only one or two (at the most three) applications on their systems—for example, a spreadsheet or word processor—and still fewer need concurrency beyond a print spooler.

### OROM—The Next Hardware Breakthrough?

► IBM is known to be seriously evaluating the use of OROM (Optical Read-Only Memory) disks for use with its PCs. Speculation is that IBM will introduce an OROM drive option before the end of the year. Based on the technology used in audio and video laser disks, OROMs are expected to revolutionize the distribution of commercial software.

The disks are expected to be well under 4" in size and fit into drives that are significantly smaller than current half-height drives. IBM is known to be evaluating systems with disks as small as 2" in

diameter that can store 40M bytes. It is considering systems made by 3M Co. for media-mastering drives from Matsushita Electric as well as from several other vendors. Industry experts predict that premastered optical disks could cost less than \$3 in quantity and the drives should be made for well under \$150.

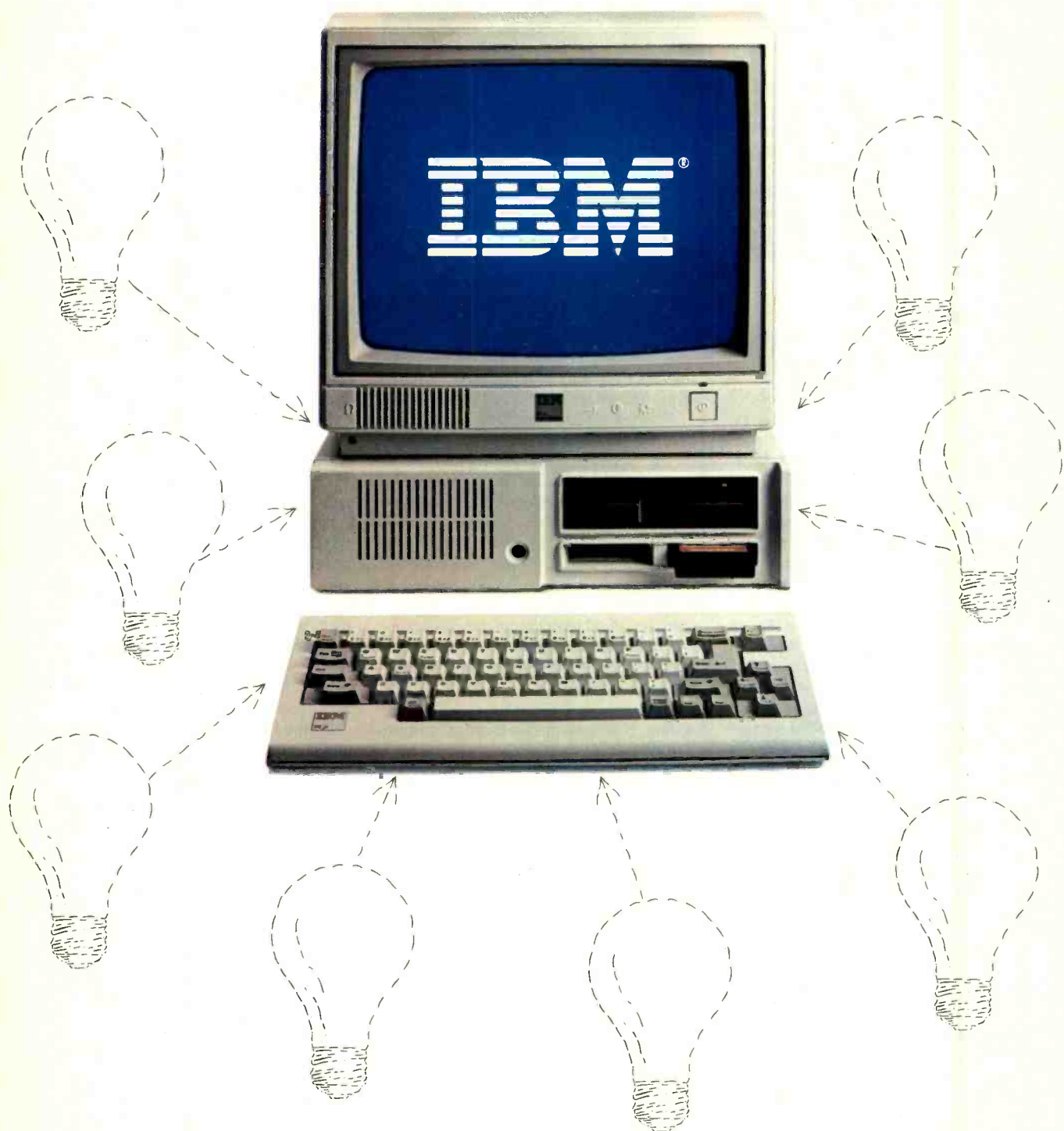
While other companies are sitting and watching, IBM is known to be soliciting bids for OROM systems that can access 40M to 500M bytes at Winchester speeds with drive costs comparable to floppies. The likelihood is that IBM will be the first company to introduce such a system for desktop computers, although Apple and AT&T are also known to be seriously investigating OROMs for their desktop systems.

OROMs would be the ideal mass-delivery method of proprietary system software. For example, instead of Lotus, with six floppy disks, there would be only one OROM disk. Furthermore, the disk is read-only and far more difficult to copy. OROMs are even more advantageous for integrated software packages and database applications where the database is provided by the software supplier, and IBM is the largest supplier of software for desktop machines. Additional research is being conducted into the manufacture of optical disks with both read-only and read-write.

At the Japan Electronics Show, in October, prototype re-recordable optical disk systems were demonstrated by Hitachi, Sanyo and Sony. Sony, creator of the 3½" drive, showed 3½" erasable 50M-byte optomagnetic disks. They can read and write both digital and analog data on the same disk. Thus, in addition to program and data, the vendor could supply documentation with full color graphics. ◇



# With PCjr, you can add options that haven't even been invented yet.



Circle No. 41 on Free Information Card

There's a big difference between a computer that accepts options and a computer that accepts the future.

PCjr does both.

IBM designed it with 13 ports for expansion — more than most any other computer at its price. So when you're ready, you can plug in all kinds of options.

Such as Memory Expansion Attachments.

**More computer for your money.**

See how PCjr compares with other computers at its price.

Memory	Software
User Memory (RAM): 128KB (expandable to 512KB)	Runs over 1,000 programs written for the IBM PC
Permanent Memory (ROM): 64KB	Runs both diskette and cartridge programs
Diskette Drive	Display
Double-sided, double density	40- and 80-column
Capacity: 360KB	Resolution:
	4-color: 640h x 200v
	16-color: 320h x 200v
Processor	Expandability
16-bit 8088	Open architecture
Keyboard	Optional 128KB
Typewriter-style	Memory Expansion Attachment(s)
Detached, cordless	13 ports for add-ons, including built-in serial interface
Warranty	
1-year limited warranty	

Mouses. Modems. Light pens. Printers. Plotters. Diskette drives. Joysticks. Speech synthesizers.

And with PCjr, you're not limited to what's available today. It's also designed to accept the bright ideas that are bound to come tomorrow.

written for the IBM PC. It costs less than \$1,000\*, without monitor. And it's ready to grow.

By leaps and bounds.



Check out all of your options at an authorized IBM PCjr dealer or IBM Product Center. For the name of the store nearest you, call 1-800-IBM-PCJR. In Alaska and Hawaii, call 1-800-447-0890.

The new PCjr Memory Expansion Attachment can give memory a quick lift to 256KB. Or, with a PCjr Power Expansion Attachment, all the way to a hefty 512KB.

It's an "open" computer. Unlike computers that are sealed shut, PCjr is open for innovation to a whole world of hardware and software manufacturers. IBM included.

Of course, PCjr is a lot of computer before it expands. With the power to run over 1,000 of the best programs

# IBM PCjr

Growing by leaps and bounds.

PCjr can grow as quickly as you can. It was designed with 13 ports for add-it-yourself options — from IBM and from other manufacturers as well.



Little Tramp character licensed by Bubbles Inc., s.a.  
\*IBM Product Center price, monitor not included.

LES SOLOMON ON

# COMPUTER HARDWARE

## HI THERE, CAN WE COMMUNICATE?

THE title of this column paraphrases the line Joan Rivers uses to start her programs. She wants to talk; I want to communicate about a "high-level" computer language.

Like so many others, I came into the microcomputer world speaking only BASIC—a high-level language that uses simple words in English (or any other vernacular that has a BASIC) to make the computer do its thing. Since I could read and write English, BASIC programs that I wrote and/or borrowed ran without error. And with slight adjustments from one BASIC dialect to another, BASIC programs copied from books and magazines also ran.

What made life so pleasant was that since much software was written using relatively simple and easily understood English words and grammar, I could read and follow these programs (even if I didn't quite understand them).

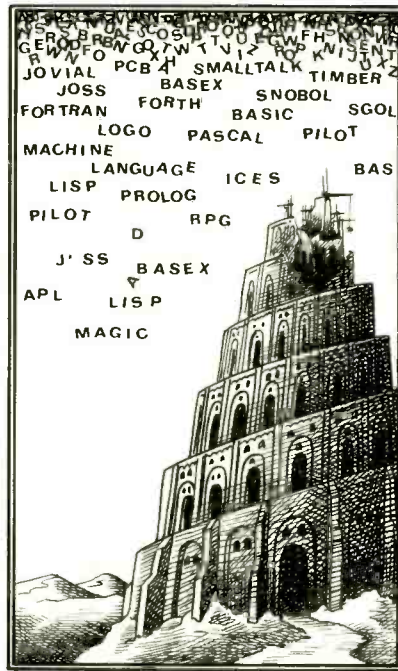
During the past several years, a number of specialized computer languages have come into use. I started to keep track of these languages, but stopped my list at almost 200! Then one day, I (for one) started to experience the same problem that occurred to the people who tried to build the Tower of Babel.

These "high-level" languages used what appeared to be English words, yet were not quite English, and used them in a complex syntax that I could not follow.

Moreover, software written in one of these "advanced" languages could not communicate with any other. They might as well have come from different and unrelated cultures. Not only couldn't they understand each other, but I couldn't understand what was going on.

When I tried to figure it out, I found that each language had a cult following that appeared ready to die rather than switch. When I asked the software sages about their particular languages, I was told that (fill in the name of the language) represented "mankind's greatest gift to software development." And, if I dared question this "truth," then I was not a true believer, and would be doomed to vaporization.

I started to read books and magazine articles about these improved and efficient languages. However, no sooner did



I start to get a handle on one language, when along came another whose gurus promised it to be "the one and true language."

At the same time it seemed that each new language got further and further away from easily understandable English. One, called APL, is so advanced that it doesn't even use language symbols as we know them on this planet, and can be read only by crew members of a passing UFO. (Don't write threatening letters, I know how powerful APL is, but I misplaced my intergalactic code book.)

I understand that BASIC (at least the interpreter) is slow and poorly constructed for most of the heavy work that a computer is designed for. Yes, I am aware of its memory requirements. Yes, I am aware that structure is important. I know that some languages can perform certain tasks with fantastic speed. I am not a software Luddite. I believe that both hardware and software are improving almost on a weekly basis.

Now to my gripe, which, simply, concerns the almost total lack of human interface in these advanced languages.

I am not against any new language. All I ask is why can't the syntax be writ-

ten so that an English-speaking person can follow it? Would it hurt anyone, if easily understood English words and structure were used? At least most of us could follow the reasoning of the program flow. Maybe we would even get to like, and use, the language.

One relatively easy solution would be to create two versions of a computer language. The first would be the actual language for use by adherents. The second (introductory?) version would have on-screen relatively easy-to-understand English commands, while the machine would perform the requested operations in the "real" language.

After all, compiled BASIC works that way. Maybe a little time will be wasted during the "interpretation," but, at least, a new user will be able to understand the new language without having to spend a lot of time trying to figure out whether it was useful. Then, someone who liked the simplified, English-command version would feel much better about going through the period of "learning the lingo" with an eye towards graduating to the full-blown language.

### Disk Cache

In conventional operation, when the computer requests data from the disk, only the requested data are retrieved. Since it takes a finite amount of time to search the disk for the particular track and sector containing the requested data—the drive must be started and brought up to speed and the head must be properly positioned—it would not take very many requests to "burn up" quite a bit of time.

Because the next piece of information required is likely to be on the same disk track as the preceding, and because it takes the same amount of time to download an entire disk track as it does for a few sectors, a disk cache memory can be useful.

However, when each track section of the cache memory is full and another request for data is made, a built-in special algorithm selects which portion of the cache memory will be purged so that the requested data can be stored in its place. Thus the data in the cache are continuously updated. ◇

ART BY FRANCOIS ALLAUX





## ALL AIRLINES DEPART FROM THIS TERMINAL.

Presenting **Travelshopper**<sup>SM</sup>  
... new from CompuServe  
and TWA.

Now you can save time and money by getting information and reservations on virtually any flight on any airline—worldwide—from one source. It's TWA's new Travelshopper, available now through CompuServe's Information Service.

With Travelshopper, you can scan flight availabilities, discover airfare bargains and order tickets...at home or in the office.

You also receive automatic membership in TWA's Frequent Flight Bonus<sup>SM</sup> program. And you can build bonus points by staying at Marriott and Hilton hotels and by using Hertz Rent-A-Car.

Besides Travelshopper, CompuServe offers an ever-growing list of other travel-oriented on-line services.

**The Official Airline Guide Electronic Edition** lists direct and connecting flight schedules for over 700 airlines worldwide plus over 500,000 North American fares.

**Firstworld Travel** offers worldwide travel advice and service.

**Discover Orlando** provides complete prices, hours and features on all of Central Florida's attractions and accommodations.

**West Coast Travel** offers travel information for the western states.

**Pan Am's Travel Guide** contains up-to-date information on immigration

and health requirements for most foreign countries.

And **TravelVision**<sup>®</sup> provides complete automotive information, including road maps and an expert, personalized routing service.

Let your travel plans really take off. Use Travelshopper and lots, lots more from CompuServe.

To buy a CompuServe Starter Kit, see your nearest computer dealer. To receive our informative brochure, or to order direct, call or write:

# CompuServe

P.O. Box 20212, 5000 Arlington Centre Blvd.,  
Columbus, Ohio 43220

**1-800-848-8199**

In Ohio, Call 1-614-457-0802

# At CIE, you get electronics career training from specialists.



**If you're interested in learning how to fix air conditioning, service cars or install heating systems— talk to some other school. But if you're serious about electronics... even earning an Associate Degree... come to CIE — The Electronics Specialists.**

## Why trust your education and career future to anything less than a specialist?

You shouldn't. And you certainly don't have to.

If you talked to some of our graduates, chances are you'd find a lot of them shopped around for their training. They pretty much knew what was available. And they picked CIE as number one.

Be sure to shop around. Because, frankly, CIE isn't for everyone.

There are other options for the hobbyist. If you're the ambitious type—with serious career goals in electronics—take a close look at what we've planned for you at CIE. **What you should look for first.**

Part of what makes electronics so interesting is it's based on scientific discoveries—on ideas! So the first thing to look for is a program that starts with ideas and builds on them!

That's what happens with CIE's Auto-Programmed® Lessons. Each lesson takes one or two principles and helps you master them—before you start using them!

### How practical is the training?

This is the next big important question. After all, your career will be built on what you can do—and on how well you do it.

Here are ways some of CIE's career courses help you get your "hands-on" training...

### With CIE's Personal Training Laboratory...

you learn and review the basics—perform dozens of experiments. Plus, you use a 3-in-1 precision Multimeter to learn testing, checking, analyzing!

**When you get your own 5MHz, solid-state oscilloscope**, you take some real professional steps. You use it as a doctor uses an X-ray machine—to "read" waveform patterns...lock them in...study, understand and interpret them!

**When you get your Digital Learning Laboratory**, you'll

be into digital theory—essential training today for anyone who wants to keep pace with the state of the art of electronics. With CIE's Digital Lab, you'll be applying in dozens of fascinating ways the theory you've learned. For example, you'll compare analog and digital devices. You'll learn to make binary to decimal conversions and to work with semiconductor devices and circuits. You'll see how digital equipment is vital to today's exciting, growing fields such as security... where digital theory provides the brains for space-age alarm and protective devices.

**You'll build your Microprocessor Training Laboratory**, a working microcomputer—from "scratch." You'll also learn how to program and interface it with displays, memories, switches, and more.

### Earn An Associate Degree from CIE.

One of the best credentials you can have in electronics—or any other career field—is a college degree. That's why CIE gives you the opportunity to earn an Associate in Applied Science

in Electronics Engineering Technology. Any CIE career course can offer you credit toward the degree...more than half of the number needed in some cases.

You can also prepare for the government-administered FCC (Federal Communications Commission) Radiotelephone License, General Class. It can be a real mark in your favor... government-certified proof of your specific knowledge and skills.

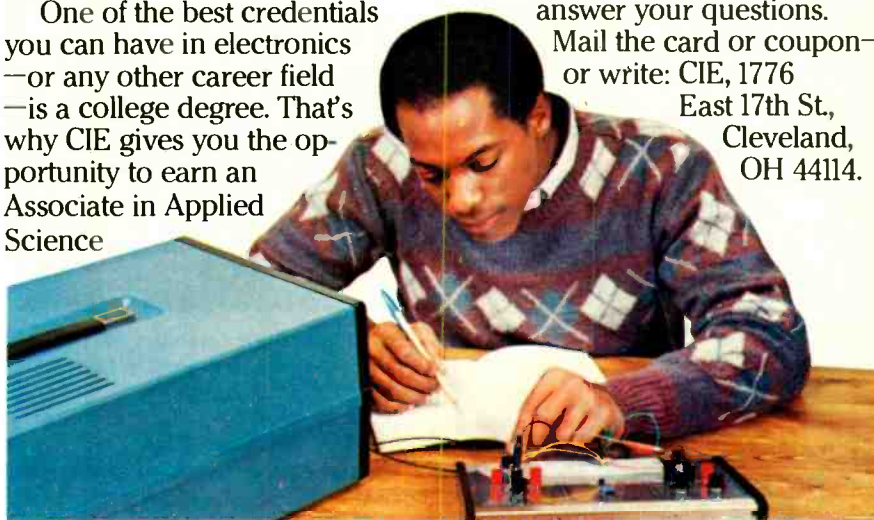
### Shop around...but send for CIE's free school catalog first!

Mail the card. If it's gone, cut out and mail the coupon. If you prefer to write, mention the name and date of this magazine. We'll send you a copy of CIE's FREE school catalog—plus a complete package of independent home study information! For your convenience, we'll try to have a representative contact you to

answer your questions.

Mail the card or coupon—

or write: CIE, 1776 East 17th St., Cleveland, OH 44114.



## CIE Cleveland Institute of Electronics, Inc.

1776 East 17th Street, Cleveland, Ohio 44114

Accredited Member National Home Study Council

YES... I'm shopping around for the right kind of career training in electronics—and CIE sounds well worth looking into. Please send me my FREE CIE school catalog—including details about the Associate Degree program—plus my FREE package of home study information!

Print Name \_\_\_\_\_

Address \_\_\_\_\_ Apt. \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Age \_\_\_\_\_ Area Code/Phone No. \_\_\_\_\_

Check box for G.I. Bill information:  Veteran  Active Duty

**MAIL TODAY!**

PE-29

FORREST M. MIMS III

# THE COMPUTER SCIENTIST

## PSYCHOLOGICAL TESTING

**M**ANY tests have been devised to measure virtually every conceivable physical and mental ability possessed by human subjects. They include tests of visual acuity using an eye chart, tests of intelligence and tests of coordination, like games, especially the electronic variety.

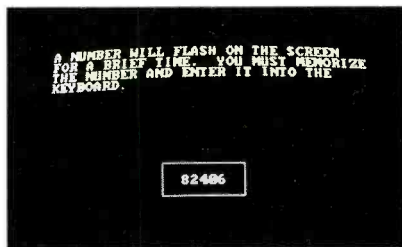
I've long been interested in using electronic circuitry to measure the responses of animal and human subjects to various situations and stimuli. When I was a development engineer at the Laser Division of the Air Force Weapons Laboratory, one of my assignments was to assist in a highly sophisticated experiment wherein trained rhesus monkeys responded to symbols flashed on a screen. Depending upon the shape of the symbol, which was called the stimulus, the animals pulled one of two levers. For each correct response, a food pellet was automatically dropped into a cup in front of the monkey.

The expensive, transistorized equipment required to monitor the performance of the hard-working monkeys filled part of an equipment rack stationed next to the animals' restraint

chair. After personal computers became available a few years later, I sometimes thought how convenient it would have been had such equipment been available for the monkey experiment. Not only could tests be quickly reprogrammed or modified, the stimulus could be presented by means of the computer's monitor screen.

Today anyone with access to a personal computer can design many kinds of psychological and physiological tests for both serious applications and recreation. I have designed several such tests and they are the subject of the remainder of this column. Though the programs are listed in PCjr BASIC, they can be modi-

Fig. 1. Screen display during the Memory Test program.



fied for most other machines, particularly those that use some form of Microsoft BASIC.

### Memory Test

Several devices have been invented to prevent an intoxicated person from starting an automobile. One of these devices incorporates a display that briefly presents the driver with a random number. The driver must then correctly enter the number into a keyboard within a given time interval for the car to start. If an incorrect number is entered or if the allotted time expires, the test is repeated. After three failures, the device automatically deactivates itself for several minutes or more.

Personal computers are ideally suited for this kind of memory test. Indeed, the internal cassette tape recorder control relay of a portable machine, such as the TRS-80 Model 100, could easily be connected in series with the ignition switch of a car.

Listing 1 shows one way to implement a memory test in PCjr BASIC. In opera-

### LISTING 2. AUDIO-VISUAL REACTION TIME TESTS

```
10 'AUDIO-VISUAL REACTION TIME TEST
20 'COPYRIGHT 1985 BY FORREST M. MIMS III
30 KEY OFF:CLS
40 SCREEN 1,0:COLOR 1
50 PRINT "STIMULUS SELECTION."
60 INPUT "PRESS V FOR VISUAL OR A FOR AUDIO: ",S$
70 CLS:T=0
80 RANDOMIZE TIMER
90 R=INT(RND*(1000+200))
100 FOR D=0 TO R
110 IF INKEY$=" " THEN 120 ELSE 240
120 NEXT D
130 IF S$="A" OR S$="a" THEN BEEP
140 IF S$="V" OR S$="v" THEN 150 ELSE 160
150 LOCATE 12,20:PRINT "X"
160 T=T+1
170 IF INKEY$="P" THEN 180 ELSE 160
180 N=N+1:Q=Q+T:AV=Q/N
190 PRINT T:PRINT " "
200 LOCATE 20,1:PRINT "AVERAGE =";AV
210 PRINT "PRESS P FOR ANOTHER TEST."
220 IF INKEY$ < > "P" THEN 220 ELSE 70
230 END
240 BEEP:PRINT "IMPROPER RESPONSE!"
250 GOTO 210
```

### LISTING 1. MEMORY TEST

```
10 'MEMORY TEST
20 'COPYRIGHT 1985 BY FORREST M. MIMS III
30 KEY OFF:CLS
40 SCREEN 1,0:COLOR 1
50 PRINT "A NUMBER WILL FLASH ON THE SCREEN"
60 PRINT "FOR A BRIEF TIME. YOU MUST MEMORIZE"
70 PRINT "THE NUMBER AND ENTER IT INTO THE"
80 PRINT "KEYBOARD."
85 LINE (103,87)-(175,111),B
90 FOR N=1 TO 1000:NEXT N
100 RANDOMIZE TIMER
110 R=INT(RND*(100000 # + 1))
120 LOCATE 13,15:PRINT R
130 FOR Z=1 TO 312:NEXT Z
140 CLS
150 INPUT "ENTER THE NUMBER NOW: ",N
155 PRINT " "
160 IF R=N THEN PRINT "CORRECT." ELSE PRINT "INCORRECT."
165 PRINT " "
170 GOTO 50
```

tion, a random number having up to six digits is flashed on the computer screen for a very brief interval. The screen then asks the user to enter the same number. The display notifies the user whether or not the entered number matches the one previously displayed and then recycles for another trial.

The program is straightforward and can be easily adapted for other computers. Lines 50-85 print instructions for the test on the monitor and draw a rectangle in the center of the screen. After a fixed delay with a duration determined by line 90, a random number between 0 and 100,000 is generated.

In PCjr BASIC, the RANDOMIZE TIMER statement in line 100 automatically reseeds the random number generator so that a new sequence of random numbers is produced each time the program is run. Line 120 prints the random number

the rectangle previously drawn on screen as shown in Fig. 1. Line 130 is a timer loop that determines how long the number is displayed in the box. When run on a PCjr, this loop requires about 0.0016 second per cycle. Therefore, the 312 cycles specified in line 130 provide a delay of approximately half a second. The delay can be modified by changing the number of cycles in the loop. For example, a value of 156 will give a delay of a quarter of a second.

Incidentally, if your computer is not a PCjr, you can determine the delay provided by a single cycle of a loop counter like the one in line 130 by entering a routine similar or identical to this:

```
10 'TIMER TEST
20 FOR N = 1 TO 100000:
   NEXT N
30 BEEP
```

If your machine doesn't have a BEEP statement, use one of its sound functions. After you enter the program, type RUN and then simultaneously press ENTER and start a stopwatch. When the loop has completed counting and the computer emits a beep or tone, stop the watch. Divide the number of seconds by 100,000 to find the time required for each cycle of the counting loop.

First-time users of this program are

### LISTING 3. HAND-EYE COORDINATION TEST

```
10 'HAND-EYE COORDINATION TEST
20 'COPYRIGHT 1985 BY FORREST M. MIMS III
30 KEY OFF:CLS:STRIG OFF
40 SCREEN 1,0:COLOR 1
50 SC=12
60 WINDOW (-60,-60)-(60,60)
70 FOR X=60 TO 0 STEP -5
80 A=STICK(0):B=STICK(1)
90 A=A-60:B=120-B:B=B-60
100 PSET (A,B)
110 A=ABS(A):B=ABS(B)
120 IF A > X OR B > X THEN BEEP:SC=SC-1
130 LINE (-X,-X)-(X,X),B
140 CLS
150 NEXT X
160 PRINT "SCORE =";SC
170 STRIG ON
180 Z=STRIG(0)
190 IF Z=-1 THEN 30 ELSE 180
```

surprised how fast the number displayed in the box vanishes. When line 130 is adjusted for a 0.25-second display time, the number appears as a quick flash on the screen. It's impossible for me to read a number in the standard fashion (from left to right in serial sequence) in such a brief instant. Therefore, I try to form a mental image of the digits by storing the

### LISTING 4. CENTERING ABILITY TEST

```
10 'CENTERING ABILITY TEST
20 'COPYRIGHT 1984 BY FORREST M. MIMS III
30 SCREEN 1,0:COLOR 1
40 KEY OFF; CLS
50 TIMES="00:00:00"
60 WINDOW (-60,-60)-(60,60)
70 CIRCLE (0,0),30
80 X=STICK(0):Y=STICK(1)
90 X=X-60:Y=120-Y:Y=Y-60
100 PSET (X,Y)
110 T=TIMER
120 IF X=0 AND Y=0 THEN BEEP:GOTO 150
130 PRESET (X,Y)
140 GOTO 80
150 LOCATE 24,7:PRINT "ELAPSED TIME (SECONDS)"; T
160 FOR N=1 TO 1000:NEXT N
170 STRIG ON
180 Z=STRIG(0)
190 IF Z=-1 THEN 40 ELSE 180
```

entire number at once and then reading it back a digit at a time while keying it into the computer.

This program can be easily modified to include additional features. For example, you can include a second timer loop that requires the user to enter the number within a specified time interval. Also, the program can be revised to repeat the cycle a maximum of, say, three times.

A particularly interesting modification would have the program present to a range of subjects a specific number of random numbers and then tally their scores. The numbers could be presented for various times to pinpoint the minimum response time for each subject.

### Audio-Visual Reaction Time Test

Reaction time, as aficionados of gun fights in western movies can quickly at-

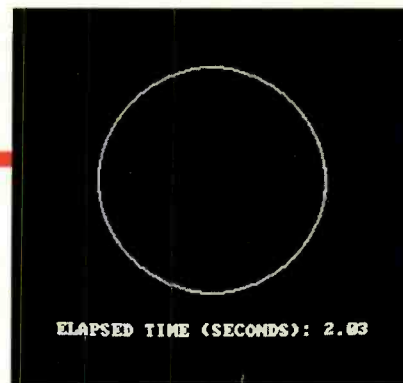


Fig. 2. Screen display after the movable dot has been placed at the center of a circle in the Centering Ability Test program.

test, has long been a part of folklore and games. The personal computer provides an excellent tool for measuring various kinds of reaction time.

Recently I developed a simple program that measures in relative units the time required for a person to strike the P key on a keyboard after a white X is flashed on the blue screen of a computer. The same program can also measure the time required to strike the P key after a beep is sounded. After my family and I tried this program, we were surprised to learn that we reacted more rapidly to one of these stimuli, and I'll reveal which below.

The reaction time program is shown in Listing 2. As will soon become evident, the program includes two procedures that help preclude fortuitous or improper responses. Lines 50-60 print instructions on the monitor that allow the user to select the program's visual or audio response mode. After the response has been made, line 70 clears the screen and sets the reaction timer (T) to 0.

The stimulus could be presented to the user a fixed time after the program is run. After a few runs, however, the user would quickly anticipate when to press the P key or any other designated key, thereby producing much faster than normal reaction times. To eliminate this problem, the program presents the stimulus at a random time after the program is run.

Look at lines 80-120 in Listing 2 to see how the random time intervals are produced. Line 80 reseeds the random number generator, and line 90 creates a random number between 100 and 1000 and assigns it to a variable designated R. The lower limit of 200 is needed to provide some delay after the program is run. Lines 100-120 form a timer loop that establishes the actual random delay before the stimulus is presented.

### LISTING 5. HI-LO GAME

```
5 CLS
10 N=INT(RND*(100+1))
15 T=0
20 INPUT "ENTER GUESS: ",G
30 T=T+1
40 IF G=N THEN 100
50 IF G>N THEN PRINT "TOO
HIGH.":GOTO 20
60 IF G<N THEN PRINT "TOO
LOW.":GOTO 20
70 PRINT "CORRECT. TOTAL
GUESSES=";T
80 GOTO 10
```

Line 110 within this loop traps cheaters, scoundrels, and jumpy-fingered individuals who press the P key *before* the stimulus has been presented. Should this occur, program control is transferred to line 240, which tells the computer to beep and announce IMPROPER RESPONSE! on its screen. The program then resumes execution from the top.

Assume the random delay timer runs its course. In accordance with the selection made back at line 60 (S\$), lines 130 and 140 select between audio (beep) or visual stimuli, while line 150 flashes an X on the screen. The program then enters the counting loop defined by lines 160–170. Each time the loop completes a cycle, T is increased. Only when the P key is pressed does the program exit the timing loop.

Line 180 takes care of the arithmetic by calculating the average reaction time for the tests made since the program was started. Finally, lines 190–200 print on the screen the reaction time for the current test and the average reaction time and instructions for how to proceed with still another test.

The program in Listing 2 can be improved and modified in many ways. For example, computers with built-in clocks can provide the actual elapsed reaction time rather than relative numbers. Additionally, both the audio and visual stimuli can be altered. For example, the white X on a blue background can be changed to any other character or special shape having other foreground and background color combinations. Also, the character can be randomly positioned on the screen.

Furthermore, specialized provisions can be added to make the test much more difficult. For instance, the screen might display a randomly selected character and require that the key for that character be pressed. Or the program might test left and right hand response by requiring each hand to respond to a particular symbol.

A simple but tricky test I plan to try will require a response only when a particular symbol is flashed on the screen. All other symbols must be ignored. In this test the user will need to think about the symbol before making a response, not just respond when the symbol first appears.

The audio mode also has many possible variations. For example, the beep can be replaced with a sound or tone function. Reaction time as a function of sound frequency can then be tested. A much more complicated variation would test both memory and reaction time by

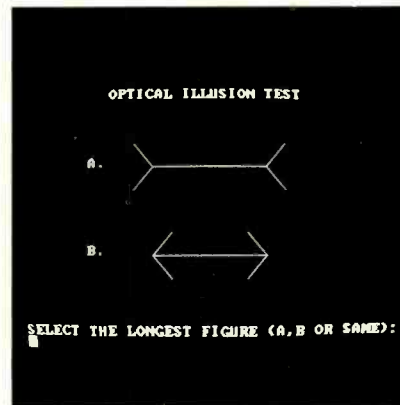


Fig. 3. The optical illusion test in Listing 6 produces this screen image.

having the program first present a tone having a randomly selected frequency. The user would then press a key only after a tone of the same frequency was repeated. Other tones would be ignored.

Oh yes, earlier I mentioned that my family and I were surprised to find a significant difference between visual and audio reaction times. I would have thought that the time required to react to a visual stimulus would be faster than that for a sound. It turns out that the members of my family react more quickly to sound. For example, my average response to a recent series of 10 visual reaction time tests was 45.6. My average response to a series of 10 beeps was a much faster 28.9.

The reaction times for the beeps, at least in my case, tend to be very uniform, while those for the visual stimulus usually include a few that are significantly slower than the remainder. Eye fatigue that comes from staring at the computer display plus an occasional untimely blink probably account for this anomaly.

#### Hand-Eye Coordination Test

To score well with most video games requires excellent hand-eye coordination. I have devised an ultra-simple vid-

eo game that provides a quick measurement of hand-eye coordination.

The program begins by presenting a large box on the screen that quickly becomes smaller and smaller. The object of the game is to manipulate a joystick to keep a dot on the screen within the borders of the shrinking box. Should the dot wander outside the borders of the box, the computer will beep and deduct 1 from the player's maximum possible score of 11.

Obviously, the easiest way to make the highest possible score is to move the dot to the exact center of the shrinking box. However, because the box shrinks very rapidly, first-time players tend to overcompensate and move the dot too far at a time. In other words, in this test, experience provides a major asset.

The program for the hand-eye coordination test is given in Listing 3. Though the program is straightforward, it does use some PCjr BASIC statements that might not be readily available in other dialects of BASIC.

Line 50 establishes the maximum possible score plus 1. The WINDOW statement in line 60, which will be familiar to users of xy plotters, is a powerful statement that allows the screen coordinates to be redefined. Since the PCjr joysticks produce values ranging from about 3 to

(Continued on page 84)

### LISTING 6. OPTICAL ILLUSION TEST

```
10 'OPTICAL ILLUSION TEST
20 'COPYRIGHT 1984 BY FORREST M.
MIMS III
30 KEY OFF:CLS
40 SCREEN 1,0: COLOR 1
50 LOCATE 2,10:PRINT "OPTICAL
ILLUSION TEST"
60 LOCATE 8,8: PRINT "A."
70 LINE (95,47)-(111,63)
80 LINE (95,79)-(111,63)
90 LINE (111,63)-(207,63)
100 LINE (207,63)-(223,47)
110 LINE (207,63)-(223,79)
120 LOCATE 16,8: PRINT "B."
130 LINE (127,111)-(111,127)
140 LINE (127,143)-(111,127)
150 LINE (111,127)-(207,127)
160 LINE (207,127)-(191,111)
170 LINE (207,127)-(191,143)
180 LOCATE 23,1
190 INPUT "SELECT THE LONGEST
FIGURE (A,B OR SAME):",S$
200 IF S$="A" OR S$="B" THEN
PRINT "INCORRECT":GOTO 230
210 IF S$="SAME" THEN PRINT
"CORRECT"
220 GOTO 220
230 BEEP:FOR N=1 TO 1000:NEXT N
240 GOTO 30
```

# LOOK WHAT'S ON TELEVISION TONIGHT.

6:00

## THE HULK

The first comic attraction in the QUESTPROBE™ Adventure Series. You become a super hero. A joint (ad)venture of Scott Adams, Inc. and Marvel Comics Group. (Diskette)



7:30

## SOLAR FOX

It's erase or be erased as you navigate spaceship over a grid of colorful pulsating entities, armed with laser. Unlimited levels. A BALLY MIDWAY original. (Cartridge)



9:00

## MAGIC DESK I



## MAGIC DESK I

The scene opens on an office desk, complete with digital clock, typewriter, wastebasket and file cabinet. Select functions (typing, filing, editing) by pointing animated finger (Cartridge)

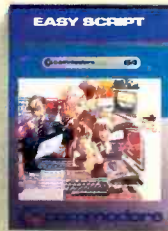
6:30

## MATH FACTS

(Ages 5 to 10) (Micro School) Educational TV Practice in basic math facts. Several levels. (Easy to hard) (Diskette)



8:00



## EASY SCRIPT

Our best wordprocessor. Displays 764 lines by 40 characters. Prints over 130 columns. Global/local search/replace/hunt/find. Super/subscripts. Insert/delete characters, lines, sentences, paragraphs. (Diskette)

9:30

## INTERNATIONAL SOCCER

(Gold Medallion Game) Sports highlight. With passing, kicking, diving goalies, even trophies! Great color. 3-D realism. No locker room interviews. (Cartridge)



7:00



## FRENZY/FLIP FLOP

(Ages 6 to 14) (Milliken Edufun) FRENZY (subtraction and division) The hungry gator arrives... save the fish... play the BONUS game FLIP FLOP (transformed geometry) look at the two figures... do they need to flip, turn or slide? (Diskette)

8:30

## THE MANAGER

A powerful database management system. For business, educational or personal files. Not for Rockford's files. With four built-in applications. Or design your own. (Diskette)



10:00

## SIMONS' BASIC

Rated PG. Expands Commodore BASIC by an additional 114 commands. Convenient programming commands such as RE-NUMBER and TRACE plus graphics plotting command. (Cartridge)



Announcing the most exciting variety show on television.

Featuring many of the stars of arcade games, education and the business world.

Produced by (and for) Commodore, the people who bring you the Commodore 64™ a 64K computer that would be a value at three times its price. In fact, many of its competitors are three times its price.

Produced in living high resolution graphics with 16 available colors and with eight 3-dimensional sprites.

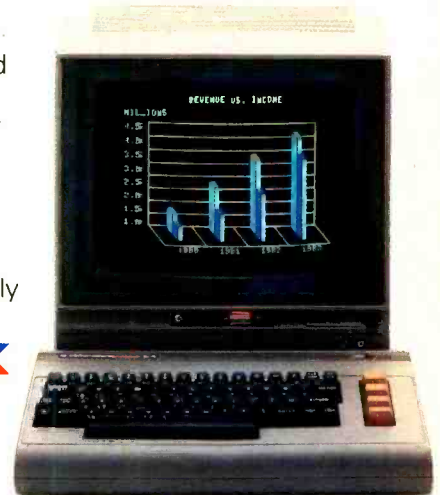
With a real high fidelity sound that covers a 9-octave range.

And a supporting cast of low-price, high capacity disk drives, printers, monitors (a better way to watch Commodore 64) and modems.

So, if you're not pleased with what's on your tv set tonight, simply turn on your Commodore 64.

## COMMODORE 64

IT'S NOT HOW LITTLE IT COSTS, IT'S HOW MUCH YOU GET.



OUR AD #CE14

THE WORLD'S LARGEST COMPUTER MAIL ORDER FIRM

CONVOY

ALL MAIL: Conroy-LaPointe, Inc. 12060 SW Garden Place, Portland, OR 97223

TOLL FREE (800) 547-1289

CASH-n-CARRY COMPUTER STORES, INC. — SAN FRANCISCO, PORTLAND, SEATTLE — SEE BELOW

HARDWARE for your APPLE

SOFTWARE for your APPLE

COMPUTERS. IN STOCK CALL. LIMITED WARRANTY—100% Parts & Labor for 90 days by us. CENTRAL PT. Filer, Utility & Apple DOS \$20 \$15. MICRO-SCI, A2, 143K Disk Drive \$345 \$199.

DISK DRIVES. LIST OUR. CORNIX 80 col. +64K RAM/IO II, 1 Yr. Wty. \$199 \$99. RAM Card, 1 Yr. Wty. (I+ + e) \$179 \$39.

RAM EXPANSION. CORNIX 80 col. +64K RAM/IO II, 1 Yr. Wty. \$199 \$99. RAM Card, 1 Yr. Wty. (I+ + e) \$179 \$39.

VIDEO CARDS. CORNIX 80 col. +64K RAM/IO II, 1 Yr. Wty. \$199 \$99. VideoTerm 80 col. (+ o + e) \$279 \$175.

MISCELLANEOUS. LIST OUR. Orange Micro, Grappier Plus (e + o) \$145 \$99. 16K Buffer Board for Grappier Plus \$179 \$99.



Macintosh. LIST OUR. Bluechip, Millionaire \$60 \$39. Central Point, Copy II MAC \$40 \$30.

BUSINESS & TRAINING. LIST OUR. ALS/Silicon Valley, Word Handler \$80 \$39. List Handler \$80 \$39.

UTILITY & SYSTEM. LIST OUR. Beagle, GPL or Alpha Plot, each \$35 \$27. Full Beagle line in stock CALL.

HOME & EDUCATIONAL. LIST OUR. Barrons, Study Program for SAT \$90 \$60. Beagle Bros., Full line in stock CALL.

GAMES. LIST OUR. Atari, Large Inventory in stock CALL. Broderbund, Full line in stock CALL.

DISKETTES. CONROY-LAPOINTE™ DISKETTES. We guarantee these top quality products with the Conroy-LaPointe name. 5 YEAR LIMITED WARRANTY.

CONROY-LAPOINTE™ IBM PRE-FORMATTED DISKETTES. 10 ea. DS/DD, 48 Track (IBM-PC Pre-formatted) NEW \$25.

CDC, 100 ea. SS/DD, 40T (Apple, IBM) \$550 \$195. 10 ea. SS/DD, 40T (Apple, IBM) \$55 \$21.

GENERIK™ DISKETTES AS LOW AS \$1. W/Jackets, no labels, top quality. 90 day warranty.

MODEMS. LIST OUR. ANCHOR, Signamax Mark XII \$399 \$269. HAYES, IBM-PC Smartmodem 1200B \$599 \$409.

KENNINGTON, Modem 1200 \$595 \$385. NOVIATION, 103/212 Smart Cat \$595 \$415.

MONITORS. AMDEK, Color Series. Color 300 Comp/Audio \$349 \$259. Color 500 Comp/VCR/RGB/Audio \$525 \$395.

PRINTERS. DOT MATRIX. LIST OUR. EPSON, iX80—Color Printer, 160 cps \$1355. LQ1500 200 & 67 cps \$1369.

LETTER QUALITY. LIST OUR. JUKEI, 6300—40cps, para \$995 \$795. JUKEI, 6100—18cps, para, 3 pitch \$599 \$449.

PRINTER INTERFACES & BUFFERS. LIST OUR. ARBO, IBM-PC to Para Printer Cable \$60 \$30. EPSON, Parallel Interface for LQ1500 \$100 \$79.

CABLES. LIST OUR. ARBO, IBM-PC to Modem Cable \$31 \$21. IBM-PC to Para Printer Cable \$60 \$30.

ACCESSORIES. LIST OUR. Curtis, Diamond, 6Outlet, switched \$50 \$29. Emerald, 6Outlet, 5C cord \$50 \$35.

CREDIT CARD APPLICATION FORM. Please send me a Conroy-LaPointe credit card application form. I understand there is no 3% charge on Conroy-LaPointe credit card purchases. Minimum initial purchase is \$400.

ORDERING INFORMATION & TERMS: MAIL TO: 12060 SW Garden Place, Portland, OR 97223. NO C.O.D. Cashiers checks, money orders, Fortune 1000 checks and government checks—we immediately honor.



# -LA POINTE<sup>SM</sup>

OUR AD  
#CE14

DEALERS  
WE BUY  
EXCESS  
INVENTORIES

LOW PRICES TO PROFESSIONALS WHO KNOW WHAT THEY WANT AND KNOW HOW TO USE IT!

## FOR YOUR IBM-PC or XT

© 1984 by Conroy-LaPointe, Inc.  
All Rights Reserved

### COMPUTER SYSTEMS

— Call for Details —

#### 256K IBM-PC

360K Disk Drives by CDC  
90 Day Limited Warranty By Us



**COMPAQ** Portable, 256K, 2 360K Disk Drives

**SANYO** 555-2, 256K, 2 320K Disk Drives

**TeleVideo** PC, 256K, 2 360K Disk Drives, 8088 Chip


**ZENITH** 2150, 256K, 2 320K Disk Drives, MS DOS 2.1, 8088 Chip, 2 S/P

AST	LIST	OUR	CALL
ADVANTAGE Multi. Bd for AT			
SrPakPlus, 64K, S/P/CC+S/W	\$395	\$245	\$395
SrPakPlus, 256K, S/P/CC+S/W	\$695	\$465	\$695
SrPakPlus, 384K, S/P/CC+S/W	\$995	\$50	\$39
Game Port for SrPak	\$50	\$150	\$185
I/O Plus II, S/P/CC	\$215	\$265	\$315
I/O Plus II, S/P/CC/G	\$265	\$315	\$495
I/O Plus II, 2S/P/CC/G	\$315	\$495	\$1490
MonoGraphPlus™ P/CC (for Lotus)	\$495	\$795	\$695
PCNet, Starter Kit, PC002	\$1490	\$365	\$39
PCNet, Quick Start, PC001	\$695		
ComboPlus Products			
MegaPlus Products			
UNI-1 Monitor tilt & swivel base	\$50	\$30	\$30
3 to 9 Keyboard Exten Cable	\$40	\$30	\$19
Verbal CPU "System Stand"	\$25	\$35	
Monochrome Ext. Cable Pair	\$50		
8087 Chip	\$175	\$159	
8087 Math Pak	\$295	\$235	
8087 Software Pak	\$180	\$138	
8087 Macro Pak	\$245	\$195	
Color Card w/Para Graphics Card, Mono	\$245	\$169	
External Power Supply	\$499	\$329	
Masterpiece PC Saver™ Line Cord w/Filter	\$140	\$95	
KB5150, Std. keyboard	\$209	\$159	
KB5151, Std. keyboard	\$265	\$199	
KB5151, keyboard	\$255	\$199	
Koala Fad™ w/PC Design Programmer's Guide	\$150	\$89	
MultiFunction (MFC) MFC	\$85	\$14	
Memory Card no RAM	\$199	\$169	
Memory Card 256K	\$495	\$395	
HardDisk I/F Module (HDM)	\$499	\$399	
HardDisk Cable	\$30	\$27	
Para Port Module (PPM)	\$59	\$49	
Senal Port Module (SPM)	\$55	\$48	
Clock Cal. Module (CCM)	\$55	\$48	
Game Adapter Module (GPM)	\$49	\$43	
Memory Module "DTK" (MM0)	\$122	\$99	
Memory Module 256K (MM256)	\$422	\$357	
XT10 meg Hard Disk & I/F WST	\$1395	\$1150	

MICROSOFT	LIST	OUR
System Card 256K	\$625	\$450
Mouse	\$195	\$139
PC w/ Booster with Mouse	\$485	\$329
System Card, 64K	\$395	\$275
MOUSE SYSTEMS, PC Mouse w/PC Paint	\$295	\$189
PARADISE, Modular Graphics Card	\$395	\$285
Color Board & Colormagic, 16 color, w/Para	\$559	\$395
Color Board & Draftsmen, 16 color, w/Para	\$559	\$395
QUADRAM		
Quadboard, no RAM, expand to 384K	\$295	\$225
Quadboard 64K, expand to 384K/S/P/CC	\$395	\$245
Quadboard 256K, expand to 384K/S/P/CC	\$675	\$475
Quadboard, 384K, S/P/CC/G	\$795	\$525
Quadboard II, no RAM, expand to 256K	\$295	\$215
Quadboard II, 64K, expand to 256K/2S/CC	\$395	\$265
Quadboard II, 256K, 2S/CC	\$595	\$395
Quad 512 + 64K plus serial port	\$325	\$265
Quad 512 + 256K plus serial port	\$550	\$420
Quad 512 + 512K plus serial port	\$895	\$625
Quadcolor I, board, 16 colors	\$295	\$195
Upgrade Quadcolor I to II kit	\$275	\$199
Quadcolor board, Mono/S/P/CC		
Quadchrome, 12" RGB Color Monitor	\$795	\$495
Quadchrome II, 14" RGB Color Monitor	\$650	\$450
Amberchrome, 12" Amber Monitor	\$250	\$165
Quad 3278	\$1195	\$1090
Quadnet VI	\$2295	\$1545
Quadnet IX	\$1995	\$1745
Quadlink	\$680	\$449
TG PRODUCTS, Joystick	\$45	\$29
Titan Accelerator PC (8086+ 128K)	\$995	\$750

### CHIP & MEMORY SPECIALS

Memory Chip Kit \$35  
9 Each, 4164, 200 ns  
90 Day Warranty by us



Call for Larger Quantity Prices

© 1983 Conroy-LaPointe, Inc.

ComX

### EconoRAM™ 384K BOARD

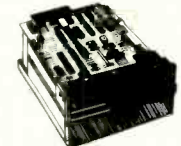
\$350

With Fastrak™ RAM Disk Emulator and Spooler Software Fully Compatible, 1 Year Limited Warranty by ComX Works on DOS 1.1, 2.0 or 2.1 Prices and availability subject to change. Call.

### DRIVES AND ACCESSORIES

for the IBM-PC or XT

AMDEK	LIST PRICE	OUR PRICE
Amdisk V, 1/2 height, internal, 320/360K	\$658	\$498
Amdisk III, 3" Dual Floppies, 500K	\$299	\$249



Call for Larger Quantity Prices

**\$169 FULL HEIGHT**  
**\$149 HALF HEIGHT**

30 Day Limited Warranty by Factory Authorized Distributor

CDC, 1/2 H Dual Drive Installation Kit \$30 \$16

MAYNARD, Floppy Cont. (w/Para Port) \$300 \$239  
Interface w/Para Port \$300 \$185  
Interface w/Ser. Port \$310 \$195

PERFECT DATA, Head Cleaning Kit \$16 \$12

QUADRAM  
Quaddisk Internal Hard Disks w/Controller IN STOCK

## SOFTWARE for IBM-PC or XT

BUSINESS & TRAINING	BUSINESS & TRAINING	UTILITY & SYSTEM
APPLIED SOFT., Versaform \$389 \$249	*MICROPRO, CorrectStar \$145 \$77	DIGITAL RES., CBASIC 85™ (CP/M86) \$200 \$135
ARKTRONICS, Jerni \$295 \$189	InfoStar Plus (+ Starburst) \$595 \$315	CBASIC Computer (CP/M-86 or PC/DOS) ea \$600 \$395
*ASHTON-TATE, Framework \$695 \$349	MailMerge, Spell Star or Starindex, ea \$99 \$54	PL/1 (PC DOS) \$750 \$525
dBase III \$695 \$369	ProPrint Pak (MM/SS/SS) \$195 \$105	PL/1 (CP/M-86) \$750 \$479
*dBase II, (req. PC-DOS & 128K) \$495 \$289	*MICROIM, RBase Series 4000 \$495 \$269	Speed Prog. Pkg. (CP/M-86) \$200 \$135
*dBase II to III upgrade \$200 \$119	Extended Report Writer \$150 \$95	DR LOGO-86 (CP/M-86) \$100 \$69
Everyman's DB Primer (Book) \$15 \$12	RBase Clout \$195 \$125	FUNK SOFTWARE, Sideways \$60 \$40
ATI, Training Programs—Large Inventory \$75 \$50	MICROSOFT, Spell NEW \$50 \$32	HAYES, Smartcom II (Data Com.) \$149 \$99
BPI, Job Cost Accounting \$79 \$50	Chart or Project, each \$195 \$125	*INSOFT, GrafORTH (animated 3D graph) \$125 \$85
Gen'l Acctg, AR, AP or PR, each \$595 \$375	Word \$250 \$159	LIFEBOAT, Lattice C. NEW \$500 \$295
Personal Accounting \$195 \$125	Word with mouse \$475 \$235	MICROSTUFF, CrossTalk XVI (Data Com.) \$195 \$129
*BORERBUND, Bank Street Writer \$80 \$50	MONOGRAM, Dollars & Sense w/Forecast \$180 \$105	MICROSOFT, muMath/muSim \$300 \$199
CEDEX, Training Programs—Large Inventory \$70 \$45	MULTIMATE, Multimate \$495 \$295	Business BASIC Compiler \$600 \$399
*CONTINENTAL, Ultrafile \$195 \$125	OPEN SYS, GLARAP, PR, INV or PD, each \$695 \$429	Pascal Compiler \$300 \$199
Tax Advantage \$70 \$45	*OSBORNE/COMX, Book & Busin., Stat & Math Programs on (DS/D0) Disks \$100 \$69	C Compiler \$500 \$329
Home Accountant Plus \$150 \$90	Some Common Basic Programs (70 ea.) \$100 \$69	BASIC Compiler \$395 \$259
FCM (Filing, Cataloging, Mailing) \$125 \$79	Practical Basic Programs \$100 \$69	FORTRAN Compiler \$350 \$229
Property Management \$495 \$329	PEACHTREE, Peach Pak \$395 \$239	COBOL Compiler \$700 \$459
DILITHUM PRESS, PC to MAC & Back \$100 \$65	Peach Test 5000 \$395 \$239	MOUSE SYSTEMS, PC Paint NEW \$99 \$69
Market Manager \$300 \$189	PERFECT/THORN, Perfect Writer \$349 \$199	NORTON, Utilities 2.0, 14 programs \$80 \$54
Market Analyzer \$350 \$219	Perfect Writer & Speller Combo \$399 \$199	OPEN SYS, BASIC Interpreter NEW \$195 \$145
Market Microscope \$350 \$219	PROFESSIONAL, Trivia Fever \$40 \$25	ROSESOFT, Prokey \$130 \$87
FOX & GELLER, d/UMS-DOS or CP/M86 \$99 \$65	QUADRAM, Tax Strategy \$395 \$295	
Quickcode or d/Graph, each \$295 \$165	QUE, Using 1-2-3 or 1-2-3 for Business (Books) \$15 \$12	
HARVARD, Total Project Manager NEW \$495 \$315	ROSESOFT, Prokey \$130 \$87	
Harvard Project Manager \$395 \$250	SOFTWARE ARTS, TK Solver (MS DOS or PC DOS, spec.) \$399 \$269	
HAYDEN, Pre Writer \$200 \$125	SOFTWARE DINA, Accounting Plus \$495 \$295	
Pre Speller or Sargon III, each \$50 \$30	SOFTWARE INT'L, Open Access \$695 \$395	
HOWARDSON, Tax Preparer \$250 \$200	SOFTWARE PUBLISHING, PFS Report \$125 \$79	
Real Estate Analyst \$195 \$170	PFS File, PFS Writer, PFS Graph, PFS Plan \$140 \$89	
HUMAN EDGE, Communications Edge NEW \$195 \$119	PFS Prof \$95 \$59	
Mind Prober NEW \$50 \$32	SORCIM, SuperCalc III \$395 \$245	
MANAGEMENT, Sales or Negotiation Edge ea \$250 \$159	SSI/SATELLITE, WordPerfect \$495 \$235	
IUS, EasyWriter II System \$85 \$50	Personal WordPerfect \$195 \$99	
EasySpeller II \$85 \$50	STONEWARE, Advanced D.B. Master \$595 \$395	
GL, AR, AP, OE or INV, each \$595 \$375	SUNIMA, Trader's Forecast \$250 \$159	
Business System: GL-AR+AP \$465 \$395	Trader's Data Manager \$200 \$129	
*INSOFT, GrafORTH (animated 3D graphics) \$125 \$85	Trader's Accountant \$350 \$219	
*KENSINGTON, Easy Link Mail Managers \$95 \$65	Complete System \$700 \$445	
KNOWARE, Knoware (reg. graphics) \$95 \$64	VISKOOP, VisCalc 4 \$250 \$159	
LIFETREE, Volkswriter Deluxe \$395 \$169		
Volkswriter \$195 \$105		
LIVING VIDEO TELT, Think Tank \$195 \$105		
LOTUS, 1-2-3 \$495 \$309		
Symphony \$695 \$465		
MDBS, KnowledgeMan \$500 \$300		
MECA, Managing Your Money \$195 \$125		
MICROPRO, WordStar® \$350 \$189		
WordStar 2000 \$495 \$295		
WordStar 2000 Plus \$595 \$325		
WordStar Professional Plus \$695 \$395		
WordStar Professional, 4 Pak \$495 \$265		

### HARD DISKS

Convert your PC to 10 meg and to be XT compatible with one of the following INTERNAL HARD DISK SYSTEMS. Kits are quality engineered to work with DOS 2.0/2.1. Completely XT compatible. All you need is your DOS manual. Easy to install. Includes 10 Megabyte Hard Disk, Controller Card and Instructions.

Kammerman Labs  
Megalight 100, 10 mbyte Hard Disk Kit \$799

MAYNARD  
10 meg hard Disk Kit, WS1 Sandstar Controller will accept 3 Sandstar modules \$1395 \$1150

★ MEANS A BEST BUY

### OUR REFERENCES:

We have been in computers and electronics since 1978 and in computer mail order since 1980. Banks: 1st Interstate Bank, (503) 643-4678. We belong to the Chamber of Commerce (503) 228-9411 and Direct Marketing Association, or Call Dunn and Bradstreet if you are a subscriber.

MasterCard VISA

AMERICAN EXPRESS CARD

CDWRDY-LAPOINTE CARD

National Order Desk, TOLL FREE (800) 547-1289  
OREGON ONLY (800) 451-5151

Foreign & Portland (503) 620-9877

HOT LINE (503) 620-9878 WEEKDAYS ONLY

ORDER DESK HOURS Mon-Fri—9AM to 6PM PST Sat—10AM to 4PM PST (SAT here is 9AM in New York)

# HARDWARE REVIEWS



## ITT XTRA

*Another giant enters the IBM compatible fray*

**BY ROBIN WEBSTER**

**T**HOUGH there's hardly any standing room left in the IBM-compatible club, giant ITT has decided to wedge its way in. ITT has been working hard (through major newspaper and television advertising) to stress that its new ITT Xtra personal computer has everything a user might need—and then

some. Given this approach, and the fact that such companies as Compaq, Panasonic, Leasing Edge and Texas Instruments have all found ways of adding features to the standard IBM PC (portability, internal printers, faster central processors, and so on), I expected that ITT's "Xtra" tag was meant seriously. However, as we'll see, the ITT Xtra offers only a few minor benefits over the IBM PC.

### Hardware Overview

The ITT Xtra's hardware is quite straightforward. It comes with a system unit, a keyboard, and a monochrome or color monitor—and uses an IBM-standard Intel 8088 microprocessor

The standard Model 1 Xtra system costs \$2495 and comes equipped with

128K RAM, one 360K floppy drive, a video adapter card, and parallel and serial ports. The review system was a Model 2, which features 256K of main memory, two floppy disk drives, both I/O ports, and a color monitor. This configuration sells for \$3425.

The Xtra's system unit is quite compact, measuring only 15<sup>3</sup>/<sub>4</sub>" × 14" × 5<sup>1</sup>/<sub>2</sub>"; this is about 3" narrower than the IBM PC. It is two-tone beige, has rounded edges, and is fabricated out of aluminum sheeting with a molded plastic front.

Set just off center in the front of the system unit are two half-height floppy disk drives (360K each). These drives use flip-down latches to retain disks rather than spring-loaded catches that hold and eject disks automatically. The Xtra's

PHOTOS BY BOB LORENZ

# FREE

# high tech catalog

## More than just a catalog, a trustworthy guide to what's new in computers and electronics.

Ever since radio grew into electronics, the illustrated Heathkit catalog has been a guide to new and exciting kit products for people like you to build. To enjoy and learn from, while saving money in the process.

What sets the Heathkit catalog apart is its range of high quality products and accurate information on every product offered. And that's a lot of products – over 450 separate items, including:

- Computer hardware and software
- Robots
- Precision test instruments
- Computerized weather instruments
- Solar hot water systems
- Automotive and home energy products
- Security devices
- Color TVs and video accessories
- Quality stereo components
- Amateur radio gear
- Educational courses that lead from the basics of electronics all the way to high tech.



Metal Detector



Triple-Trace Oscilloscope/Time-Voltage Display



Ham Radio Transceiver



Real Time Spectrum Analyzer



Computerized Weather Station



Microprocessor Trainer & Course



Most Accurate Clock



HERO® 1 Robot



IBM-PC Compatible Computers



40-Channel Scanner



### Discover the pride.

With Heathkit, you'll discover the pride of accomplishment that comes with creating handbuilt quality that is uniquely yours.

And you'll develop skills and abilities in many technologies as you follow the step-by-step directions through the building process.

You work confidently, always backed by our simple promise, "We won't let you fail."

If you don't have the latest Heathkit Catalog, you're missing something great, so mail the coupon now, while you're thinking about it.

Send NOW for your **FREE Heathkit Catalog**  
It's the beginning of something great for the whole family.

Circle No. 26 on Free Information Card

Heath Company  
Dept. 010-264  
Benton Harbor, Michigan 49022  
Please send me the latest Heathkit Catalog Free.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

Zip \_\_\_\_\_

CL-774A

# Heathkit®

Heath Company

A subsidiary of Zenith Electronics Corporation

drives operate quietly and reliably.

Thinking ahead, ITT included a 128-watt power supply in the Xtra, which is sufficient to support the half-height 10M-byte hard disk available as an option.

For those who have used the IBM PC keyboard long enough to become familiar with its rather awkward key placements, the Xtra's 84-key "corrected" keyboard will present some initial difficulties. For example, the return key is arranged horizontally, and the tilde/apostrophe key has been moved above and to the right of it; the left-hand shift key is to the right of the reverse slash/vertical rule key; and the plus key on the numeric pad has been made small to make way for a dedicated enter key. All this may not seem like much, but it will certainly prove disconcerting for an hour or so, until you get used to it.

One of the games IBM PC users have to play is determining whether or not the CAPS LOCK and NUM LOCK keys are on or off. Thankfully, the Xtra's equivalents remove this guesswork. Green light-emitting diodes indicate whether they are active or inactive. This is a nice touch that doesn't really cost much to include.

Although they included these conveniences, the designers unfortunately didn't pay as much attention to the "feel" of the keyboard. Whereas the IBM keyboard provides tactile feedback so that you know when you've pressed a key correctly, the Xtra's keyboard feels quite lifeless and the key tops wobble around a bit too much. The net result is that typing errors are easier to make. Overall, I prefer the IBM keyboard.

### I/O Connectors

All input/output connectors, as well as the ac power socket, are arranged along the back of the Xtra's system unit. Don't bother to look for a reset switch, because there isn't one. Instead, there is only a single on/off switch placed at the top-left corner (looking from the rear). A set of I/O ports—*independent of the five internal expansion slots*—are arranged along the bottom edge of the rear; the review machine featured one parallel printer port, an RS-232 serial port, and a blanked-off interface slot. According to an ITT spokesperson, the third slot is left over from an earlier design, and the system unit template has not yet been updated. A color monitor card occupied one of the five expansion slots inside the machine.

Removing the outside casing of the system unit is very easy since only two small screws have to be removed from the rear before the top cover can be lifted away. The Xtra's internal layout is very neat.

For starters, there are no massive ribbon cables snaking all over the place. Also, the two main motherboard configuration switches and the motherboard RAM chips are easily accessible.

Surprisingly, the noisiest part of the Xtra is the 4½" cooling fan, which is mounted horizontally over the motherboard like the fan in the IBM PC. I say "surprisingly" because the ITT spokesperson stressed that the design team had paid special attention to using a quiet fan system. Maybe the review machine was a bad example, but I never did get used to the whine it produced.

Since the Xtra is based on the Intel 8088 microprocessor, it should theoretically provide the same computing power as the IBM PC. However, after I ran a few simple performance tests, it became clear that there are differences.

### Performance

In preparing to run the tests, I decided to see how the Xtra would react to an attempt to run IBM's BASICA system. First, I booted the Xtra off a PC-DOS 2.1 disk and made sure that everything was working correctly. Then I typed "BASICA" and waited to see what would happen. Naturally enough, the Xtra system couldn't cope with the true-IBM code and simply generated a "Divide Overflow" error message before redisplaying the A > prompt. Although it didn't recognize the IBM BASICA program, the Xtra did not seize up like some other IBM compatibles put through the same test.

Looking at a directory listing of the ITT-DOS disk, I noticed that there were in fact two BASIC files—one was called BASICA and was 644 bytes; the other was called XBASIC and was about 57K. Clearly the ITT BASICA file passes control to the "true" BASIC program—XBASIC—whenever the former is invoked.

Running a simple BASIC program (do a FOR/NEXT loop 10,000 times) on the Xtra took 11 seconds, while it took an IBM PC 13 seconds. At this point the Xtra was clearly ahead. Curiously, in running some other tests the Xtra fell marginally behind: Running a small BASIC program that calculated all prime

numbers up to the number 50 took 85 seconds on the Xtra and only 67 seconds on the IBM PC; and sorting a 100-record database in dBase II took 77 seconds on the Xtra and 74 seconds on the IBM; using the DOS Find filter to search three files for a particular section of text took 34 seconds on the Xtra and 32 seconds on the IBM PC. There is nothing startling about these differences, but they do show that the IBM PC has somewhat of a performance edge.

### Software Compatibility

Since the ITT Xtra is supposed to be IBM compatible, I decided to try a wide range of popular IBM software products on the machine. I booted the ITT DOS and then tried to run the first application, version 2.4 of dBase II. Everything seemed to go well up to the point where dBase II asked if I wanted to input data into my newly created file. Once I responded "Yes," an error message appeared, stating "End Of File Found Unexpectedly." No matter what I tried, I couldn't get dBase version 2.4 to budge beyond this point so long as I used ITT DOS. However, I could use dBase 2.4 on the Xtra when I booted the system off a PC-DOS 2.1 system disk.

As it turned out, the problem was due to an error in the way dBase 2.4 interfaces with MS-DOS 2.11. By using the DOS Debug program to "patch" the 2.4 version according to a sequence provided

*(Continued on page 84)*

### Connectors on the back of the Xtra.



# ULTRATERM

*The ultimate display board for Apple II computers*

**BY JAINE SAFFIR**

**S**ELECTING an 80-column card for the Apple II+ microcomputer is a confusing business since everybody but your local grocer seems to be making one. Until recently, the best advice to follow was to go with the standard, Videoterm by Videx.

That is no longer true.

Videx has a new, extended display card called Ultraterm. But describing Ultraterm as just another 80-column card is like calling the palace at Versailles housing. The range of displays it can produce is awesome—no other card on the market even comes close to it.

Ultraterm, which has a suggested retail price of \$379, has a built-in soft switch and two distinct character sets. It can produce seven different displays featuring any two of four attributes, all by keyboard control.

## Character Sets

The standard character set, which is built in a  $9 \times 12$  dot matrix, is an improvement over the standard  $7 \times 9$  Videoterm set. The result is that the descenders on letters such as "y" and "g" are better formed and the middle bar of an "m" is clearer. The full 96-character ASCII set is available as well as 32 graphic elements that can be generated from the keyboard by using certain control key sequences.

The enhanced character set, formed in a  $9 \times 16$  dot matrix, is a full serif font similar to the monochrome display on the IBM PC. It also contains all 96 ASCII characters and 32 block graphic elements that can be used to design forms and charts. The characters resemble those you are reading now, which are in the Times Roman style. They are so easy to read that they are a real eye opener to those of us used to staring at the normal Apple character set. How Ultraterm produces this set involves an interesting bit of hardware hocus pocus.

Ultraterm uses a familiar video technique, called interlacing, to produce its characters. It produces twice the vertical resolution of the normal Apple display. And double the resolution means a

tighter-looking display with more clearly drawn characters. Your monitor, however, may not be able to handle it adequately.

Since the display is updated at half the usual speed, you need a monitor with a high-persistence tube. Otherwise, the display may start to fade before it can be refreshed. A bit of research has convinced me that most amber screens work fine, but the standard green screen monitor with a P-4 or P-31 phosphor will flicker when the Ultraterm display is produced. Turning down the brightness helps a lot, but if you're hooked on green, you'll need a monitor with longer persistence, like Apple's Monitor III, that uses a slow P-39 phosphor.

## Display Sizes

The size of the Ultraterm display depends on the character set in use. A usual  $80 \times 24$  display, which can be produced with either the standard or the enhanced character set, can be extended to 96 and 160 characters across using the standard font. The enhanced set can be called up in four other screen sizes— $80 \times 32$ ,  $80 \times 48$ ,  $132 \times 24$ , and  $128 \times 32$ . Using a word processor with 48 lines of displayed text or a spreadsheet with 160 characters across is simply fantastic.

Ultraterm produces the extended screen widths by outputting characters at twice-normal rates. As a result, you will need a monitor with a bandwidth of at least 18 MHz to avoid smeared characters. Most modern monitors can, in fact, handle this sort of display, but low-quality monitors are out of the question. Ultraterm is an extremely sophisticated display device, and you can't reasonably expect to use it with a bargain basement monitor.

Even if your monitor has the neces-

sary bandwidth, you may still find that some of the characters in the wider display modes run off the edges of the screen. A bit of tweaking on the horizontal linearity pot will eliminate the overscan. If you imagine that it's difficult to stare at a 160-character line, you're quite right, but choosing the right combination of display attributes will make the line much more legible than you might expect.

## Display Attributes

No matter which display mode you decide to use, Ultraterm allows you to utilize two active screen attributes. These are low light and high light for normal white on black characters and low intensity and high intensity for inverse characters. You can software-select any combination you want at any one time and even switch attributes in the middle of a program, which is a neat way to call out error messages, for example, in home-made software. A screen made up of low- and high-intensity inverse characters looks a lot like the displays you see on the Macintosh and Lisa and makes a line 160 characters wide surprisingly readable.

## Software Support

Hardware like Ultraterm isn't worth anything if it's not supported by mainstream software. Videx had this bit of basic wisdom in mind when it designed Ultraterm: The card's firmware has an operating mode that allows it to emulate Videoterm. And since Videoterm is supported by 99.99% of all the canned software that can work in an 80-column mode, Ultraterm is right at home in the large orchard of Apple software. Not only that, but most newer software and

*(Continued on page 98)*

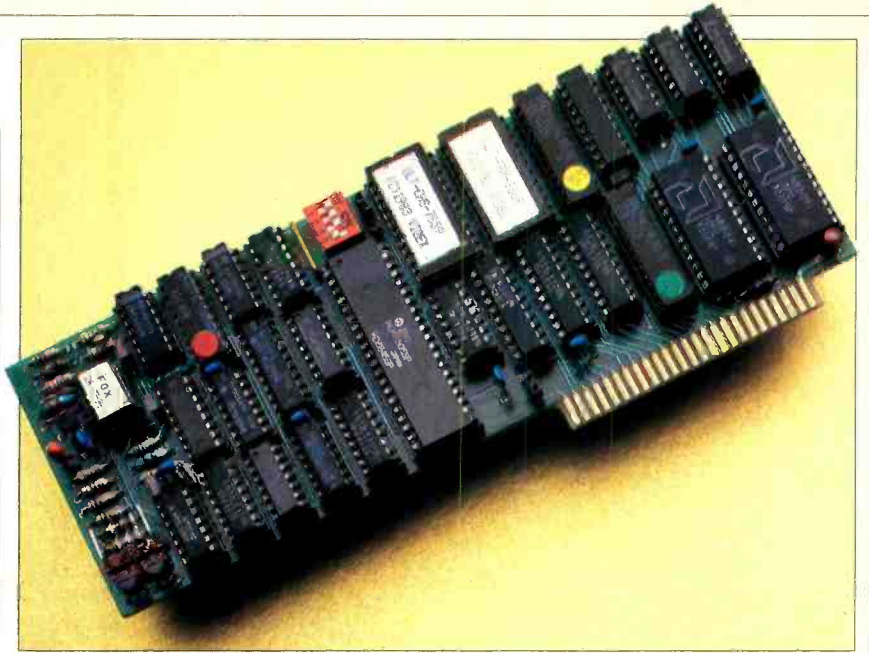


PHOTO BY BOB LORENZ

# Big business accounting for

IBM's new Business Management Series for Personal Computers.

IBM's Business Management Series (BMS) can improve your accounting in so many ways, they're almost uncountable.

It's derived from accounting software big IBM machines are famous for, but for not so big an investment.

(If you don't have a PC already, keep

reading. BMS is a terrific reason for buying one.)

There are six easy-to-learn programs in BMS, and they can work alone or with each other:

For example:

*Inventory Accounting* helps you maintain more responsive, and therefore more profitable, levels of stock by taking its information directly from....

*Order Entry and Invoicing*, which offers flexible methods of pricing, discounting and taxing while it helps you automatically update....

*Accounts Receivable* for a clear picture of your open accounts to improve



The BMS programs work alone or as a team. You can start with one, such as General Ledger or Payroll, and add others later. Or, buy all at once. If you plan to own several, consider an IBM computer.



## companies with smaller numbers.

cash flow and reduce bad debt.

*Payroll* keeps records, writes paychecks and W-2 forms, easily tackles multiple pay rates and frequencies, and much more.

*Accounts Payable* not only writes

checks, it helps you decide to whom and when. And, like other BMS programs, it feeds into....

*General Ledger*, a "big picture" program that gives you something all the green notebooks and #2 pencils in the

world never will:

The ability to see more quickly and clearly not only where you are, but where you're going.

To learn more, see an IBM Product Center or authorized IBM PC dealer.

For their number, and a free brochure, call this one—800-447-4700. (In Alaska and Hawaii, 800-447-0890.)



like the PC/XT. It lets you store them, permanently, inside your machine. Very handy. Here's another tip. IBM's new Personal Decision Series (for spreadsheets, writing, graphing, etc.) can

take information directly from BMS. Very, very handy. And ask about IBM Extended Support, a way to get software updates and telephone assistance, direct from IBM.

Personal Computer Software

# SOFTWARE REVIEWS

## PROKEY

*Keyboard customizer improves quality of life for micro users*

BY JOHN SMITH-RICHARDSON

**P**ROKEY is a software package from a company called RoseSoft that can customize any key or combination of keys on an IBM PC or compatible to represent other keys and functions. It is also a macro definer for individual keys—"macro" meaning a string of characters of any length.

The program, positioned in RAM between the keyboard interpreter and the applications program being run, is transparent to the user. It intercepts keyboard entries before they reach the applications program and redefines the keys' functions, or it converts keystrokes to macros.

Almost every key or combination of keys can be customized to represent any other key(s)—up to 300 individual functions. Alternately, a key can be preloaded

with a macro that can represent program commands or even a complete document of 2000 words (or 12,000 characters). Simply touching one or two keys will output the macro.

One of ProKey's major strengths is that it lets you define any of the PC's graphics characters by entering its ASCII code. For example, if you are preparing a document that makes frequent use of the infinity symbol ( $\infty$ ), which is accessed on the PC as ASCII code 236, you can define a normally unused key or a supershifted one to represent that symbol. (CTRL-A and ALT-A are the supershifted modes for the A key.)

Unlike most other keyboard redefiners, ProKey does not require the user to exit the applications program to define a key. Keys can be defined "on the fly"—they can be redefined and then switched in and out while an applications program such as WordStar or dBase III is being run. Alternatively, just one, or all, keys can be predefined, or the macros can be assigned to their keys by a definition file created with a word processor.

Whether prepared on the fly or with a word processor, a customized keyboard can be saved to a "definition file" that can be manually or automatically loaded

### Specifications

**Product:** ProKey  
**Mfr:** RoseSoft  
4710 University Way N.E.  
Suite 601  
Seattle, WA 98105  
**Price:** \$129.95  
**Requirements:** IBM PC or compatible, one disk drive, 64K RAM minimum, 96K preferred

by ProKey. You can save to disk directly after you've finished using the applications program or, if you need several different versions of a customized keyboard, you can prepare them in advance and save them to disk, recalling them as necessary.

Although it is loaded into RAM, ProKey itself, as well as the key definitions it uses, can be switched in and out to conserve memory. When ProKey is switched out, the RAM it uses to define keys is released for use by the applications program. Since ProKey can lie dormant, it is not necessary to load it back into memory when it is again needed: You can simply switch it back in and call up a definition file while the applications program is running.

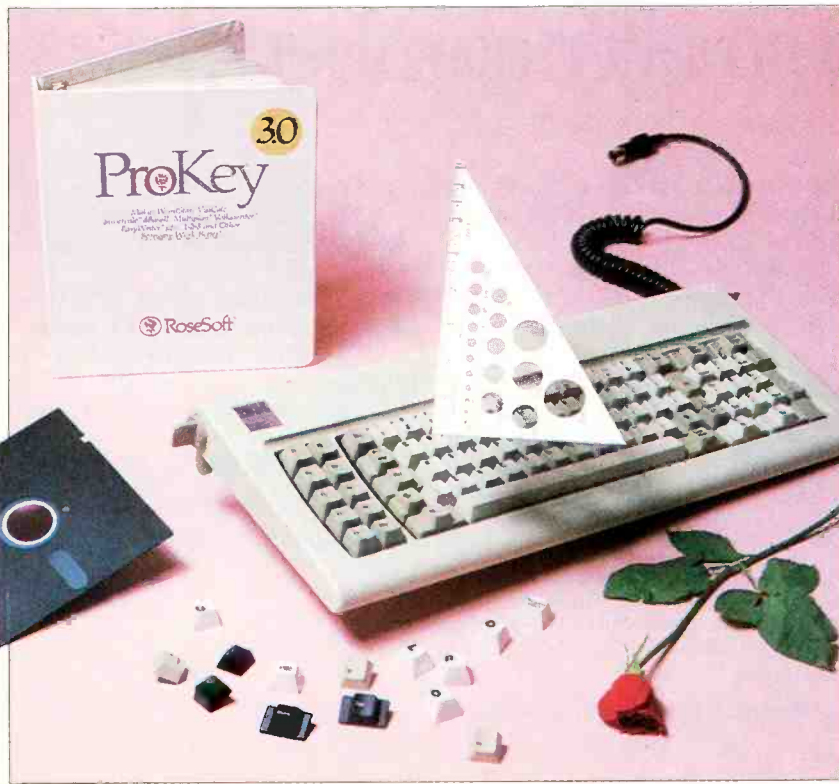
In addition to conventional macros, which consist of strings of characters, ProKey's macros can be programmed with "fill-in-the-blank" fields, which can be of fixed or variable length. The macros can even be nested to refer to each other so that a "master" macro can call up or define other macros. For example, the same macro that might contain the heading for an accountant's spreadsheet might also redefine the PC's keypad to function only in the numeric mode, moving the cursor positioning to four alpha keys. In this way the accountant would not have to switch back and forth continually between the keypad's numeric and cursor positioning modes.

### Let Me Count the Ways

Almost every key can be defined in four different modes: the normal character, the shifted character, the ALT (alternate) character, and the CTRL (control) character. As an example, the macro for ALT-K would be different from the one for CTRL-K, with SHIFT-K containing yet another macro or key definition. Even the normal K itself could be defined as a different key or as a macro.

If, while running an applications program, you find that it would be conve-

*(Continued on page 96)*



PHOTOS BY STEVE BORNIS



# JANE

Integrated software for Apple II computers

BY GORDON McCOMB

IT'S no wonder integrated software programs have become popular. By lumping similar command structures together, it is easier to jump from one application to another. You don't have to relearn the basic commands of each, which is especially helpful if you forget key commands for functions you don't use often. It's also handy to have an application available without having to stop a current program to boot another. But it's too bad they're so expensive. The widely publicized Lotus Symphony and Ashton-Tate programs, for instance, cost \$695—no small change. What's more, most integrated packages are available only for the IBM PC and its various clones. What's a user of a Commodore 64 or Apple IIe/IIc to do?

Start by trying Jane, a novel and inexpensive integrated package from Arktronics. The basic Jane package costs \$125; that's less than \$42 for each of Jane's three built-in programs: Janewrite (a word processor), Janecalc (an electronic spreadsheet), and Janelist (a list manager). For \$195, you can get Jane with a sturdy mechanical mouse. Either way, not a bad deal.

## How To Use Jane

Jane departs from the other integrated packages in its heavy use of graphics symbols—otherwise known as icons—that represent everyday objects. These icons include scissors, paste jars, cameras, and stop signs. Rather than type in a long (and often confusing) command, you point a mouse or other input device at a symbol. Point at the stop sign, for example, and Jane knows you want to stop what you're currently doing.

But take note: Jane is not a Lotus Symphony or an Ashton-Tate Framework. For example, where a Symphony spreadsheet can be up to 256 columns by 8192 rows in size, the maximum Janecalc worksheet is only 20 columns by 24 rows.

In doing this review, I used Jane on my Apple IIc. The same program also

works, without modification, on the IIe. The package I got didn't come with a mouse, so I had to add one of my own (some type of pointing device is required for Jane because there's no way to select the program's icons from the keyboard). I used the AppleMouse with more than acceptable results. I also tried Jane using a KoalaPad touch tablet and a Kraft joystick.

The joystick didn't do as well as I expected, and the Koala touch tablet wasn't very accurate without the use of the plastic stylus that comes with it. Most important, when I used the stylus, working with Jane became a chore. I found myself picking up the stylus every few seconds to move Jane's on-screen pointer.

Starting Jane is easy. Just turn the computer on and insert the program disk. If you have a two-disk system, you can put the program disk into one drive and the data disk into the other. After a few moments, Jane's opening menu pops into view. On the top of the screen is a gang of icons—hand, arrow, scissors, camera, paste jar, and more. This, the main menu bar, appears in all of Jane's applications.

Work begins by pointing to one of the three application icons (typewriter, calculator, or filing cabinet) and clicking the button on the mouse. For example, to go to Janewrite, I moved the pointer to the typewriter and tapped the mouse button. A directory window appeared showing me the Janewrite documents

currently stored on the data disk.

One Janewrite file was already there (a sample thoughtfully placed there by Arktronics), so I pointed to it and clicked. Once again, the disk drives whirred into action and another window appeared on the screen. Inside the window was a sample personal letter. Keep in mind that I hadn't yet touched the keyboard; everything had been done with the mouse.

To test Jane's ease of use, I cut and pasted the first paragraph of text and placed it at the bottom of the page. I purposely didn't look at the manual to find out how to do it—I let my intuition be my guide.

I first "grabbed" the camera by pointing at the camera icon, then tapped the mouse button. I then selected the text I wanted to move—the entire first paragraph—by dragging the camera over it. The text went away—but not forever. I went back to the top of the screen, grabbed the paste jar, and positioned it at the bottom of the document. I clicked the mouse button. Within a matter of seconds, the text was moved.

To be fair, I should mention that I'm a seasoned Apple Macintosh user and using mice and icons has become second nature to me. Since Jane is very Mac-like in its operation, I found that I could do 75% of my work without referring to the manual. If mice and icons are new to you, you may need a period of adjustment and a reading of the manual.

(Continued on page 94)



# TURBO PASCAL

*A superb Pascal system for only \$49.95*

**BY DAVID FRANKEL & MICHAEL K. GUTTMAN**

**T**URBO Pascal from Borland International burst upon the micro-computer world last year, selling more than 120,000 copies and winning praise from micro users. Although Turbo, at \$49.95, is not the first low-cost edition of Pascal, it is the first to offer so many convenient features for both new and experienced Pascal programmers.

## Beating the Traditional Tradeoff

One of the things that makes Turbo Pascal so interesting is its solution to the painful dilemma programmers once faced in deciding between compiled and interpreted languages. Interpreted languages allow the programmer to develop software interactively, but generally produce code that executes slowly and makes poor use of memory and other system resources. On the other hand, compiled languages produce tighter, faster code, but force the user through a relatively lengthy and clumsy process for writing, compiling, linking and debugging programs.

As a result, most programmers begin by learning an interpreted language, such as BASIC or Logo, whose interactive features make learning quicker. Eventually, however, the need for more efficient program execution forces most to switch to a compiled language, such as Pascal or C. The programmer must not only learn the new language, but also must give up the convenience of programming interactively.

Turbo frees programmers from the horns of this dilemma, making it possible for them to enjoy the benefits of interactive development along with the advantage of producing efficient compiled code. A new programmer can both learn the language quickly and, once experienced, perhaps never outgrow it at all.

## The Turbo Environment

Turbo Pascal achieves its magic by cleverly integrating a fast compiler and a

full-featured editor. The user writes code using the editor, which mimics most of the functions (and key sequences) of standard WordStar. A three-keystroke command invokes the compiler, which can process a 200-line program in about 10 seconds.

If compilation is successful, the program immediately executes; no linking is required. If a compilation error is found, the compiler prints out an error message. After the user presses another key, the compiler exits to the editor and positions the cursor at the offending line of code.

For those accustomed to other compilers, such performance borders on the astounding. The secret is that the edit-compile-run cycle takes place in memory: It requires no disk accesses other than those performed by the program code itself. Options allow saving the source and compiled code on disk.

## Who Benefits?

Serious software developers will certainly appreciate the interactive nature of Turbo Pascal. Less experienced programmers, who have learned an interpretive language, usually BASIC, might be even happier. Now they will have an opportunity to migrate to Pascal with considerably less trauma.

In particular, educational institutions can benefit. Instructors can teach students a computer language right from

the start without having to explain the complicated mechanics associated with most compilers.

## Other Advantages of Pascal

Another major advantage of Pascal is that it is a "structured" language. Instead of subroutines, it uses constructs called "procedures" and "functions," which can declare their own local variables. If a variable is declared local to a procedure—even if the same variable name is used in another procedure or in the main program—the language treats the two variables as separate entities. Using this technique wisely, the programmer need not worry about accidentally using the same variable name for separate items.

Another advantage is that there are no line numbers in Pascal, a decided convenience. A corollary benefit is that a programmer can fit into any program a procedure designed to be used in several programs without having to coordinate its line numbers with the line numbers of the main program. Procedures are called by meaningful names assigned by the programmer rather than by line numbers.

## A Few Drawbacks

One of Turbo's biggest advantages can also be a drawback. Turbo has no linker. Although this lack increases the interac-

*(Continued on page 96)*



PHOTO BY STEVE BORNS

MASTER THE NEW ELECTRONICS WITH MCGRAW-HILL'S

# Contemporary Electronics Series

The fast, easy and low cost way to meet the challenges of today's electronic innovations. A unique learning series that's as innovative as the circuitry it explains, as fascinating as the experiments you build and explore.

From digital logic to the latest 32-bit microprocessor, the McGraw-Hill Contemporary Electronics Series puts you into the electronic picture one easy step at a time. Fifteen unique Concept Modules, sent to you one every 4-6 weeks, give you a handle on subjects like optoelectronics, robotics, integrated circuits, lasers, fiber optics and more.

Each Concept Module goes right to the heart of the matter. You waste no time on extraneous material or outdated history. It's a fast, efficient, and lively learning experience... a non-traditional approach to the most modern of subject matter.

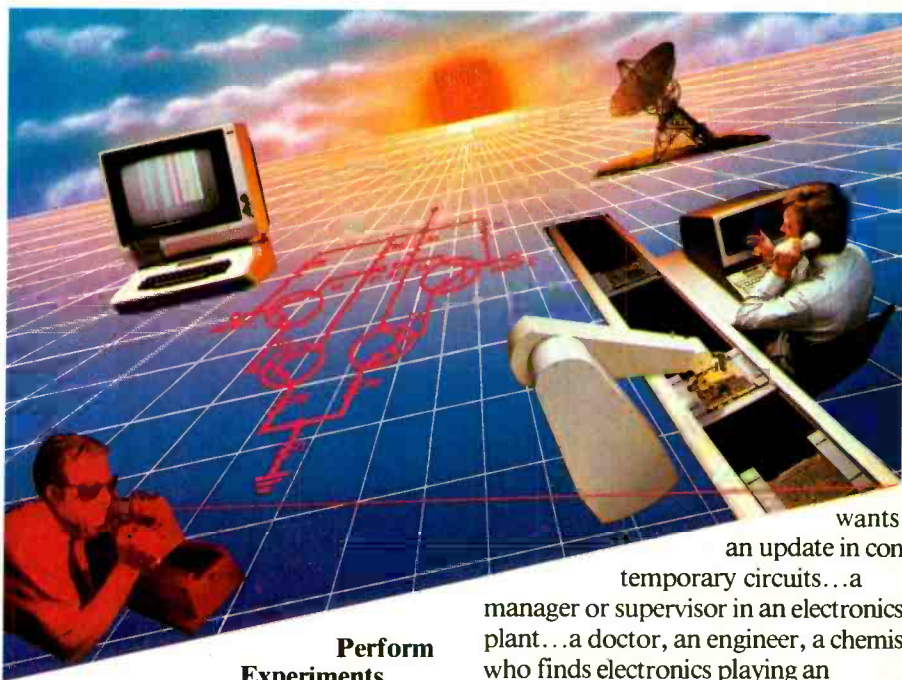
### Unique Interactive Instruction

With each module, you receive a McGraw-Hill Action Audio Cassette. Each tape is a dynamic discussion that drives home the key facts about the subject. Your learning

With your first module, you get this solderless breadboarding system. You'll use it throughout the series to build electronic circuits and bring concepts to life.



experience is reinforced through interaction with vividly illustrated text, audio cassettes, and actual electronic experiments. Indexed binders preserve backup material, notes, and tapes for convenient referral.



### Perform Experiments in Contemporary Electronics

Throughout your series, laboratory experiments reinforce every significant point. This essential experience... dynamic, hands-on demonstrations of theory in practice... will help you master principles that apply all the way up to tomorrow's latest VLSI (Very Large Scale Integrated) circuitry.

In your very first module, you'll use integrated circuits to build a digital oscillator, verifying its operation with a light emitting diode (LED). You'll learn to identify passive and active components, understand concepts common to all electronic circuits.

### For Anyone Interested in Electronics

The Contemporary Electronics Series is designed for anyone from hobbyist to professional. It's for you if you're looking for new fields of interest... if you're a teacher who

wants an update in contemporary circuits... a manager or supervisor in an electronics plant... a doctor, an engineer, a chemist who finds electronics playing an increasingly important role in your work. It's even for electronics engineers or technicians who feel their training needs freshening up. It's the quickest, most convenient, probably least expensive way to do it. And the only one that gives you hands-on experience.

### 15-Day No-Risk Trial

To order your first module without risk, send the postage-paid card today. Examine it for 15 days under the terms of the order form and see how the Contemporary Electronics Series gets you into today's electronics. If card has been used, write us for ordering information.



McGraw-Hill  
Continuing Education Center  
3939 Wisconsin Ave.  
Washington, D.C. 20016  
2000-025



# HP INTRODUCES FIRST UNIX TRANSPORTABLE

*Motorola 68000-based machine has gas plasma display, 512K or user RAM, Unix in ROM, and built-in ThinkJet printer*

**BY MARK ROLLINS**

**W**ITH so many new personal computers appearing on the market at low or moderate prices, it is difficult—if not dangerous—to identify one as significantly superior. It's even riskier to herald one as a technological breakthrough. Yet that is exactly what I propose to do with the new Hewlett-Packard Integral Personal Computer (HP-IPC).

Although, as a system developer, my experience is different from applica-

tions-oriented end-users who might buy this machine, all of us share two primary goals for selecting a good system: saving time and protecting our software investments. In the new HP-IPC, Hewlett-Packard has successfully achieved its primary design goal: to give applications-oriented end-users access to Unix-

*Mark Rollins is the former editor of Microsystems and currently a free-lance author and system developer.*

based capabilities and software. Meeting this objective, in turn, Hewlett Packard satisfies our selection criteria because of the multitasking and portability of Unix.

HP has achieved its technological breakthrough by meeting its objective in a machine that is light, self-contained, and transportable. The IPC has a very fast microprocessor and graphics coprocessor; built-in disk drive, printer, and expansion connectors; and a lot of mem-

PHOTOS BY DAVID ARKY



**Above, left: HP-IPC in profile. Detachable keyboard is clamped to front of case (below, left) to protect unit while in transit. Right: Flat panel display pops out at a convenient viewing angle at the touch of a lever. Disk drive is at right of display.**

ory, including 256K bytes of ROM, containing both Unix and an end-user interface. All of this for a price that is almost unbelievable, especially to those familiar with previous HP pricing strategies. The quality is typical Hewlett-Packard; the price is not.

Unix multitasking allows this machine to run *several* programs at once without the end-user noticing any slowdown. The way it is implemented as multiple windows is particularly impressive. Don't be fooled—this window system is very different from other current window systems and far superior. In most window systems, the only program that is actually running is the one being viewed; the rest of the programs must be temporarily stopped. On the HP-IPC, all the programs run continuously, providing a powerful time-saving capability.

#### The Standard Machine

The HP-IPC is a 25-lb transportable that includes the following standard features: 10-MHz MC68000 CPU; separate 16-bit display processor with high-speed

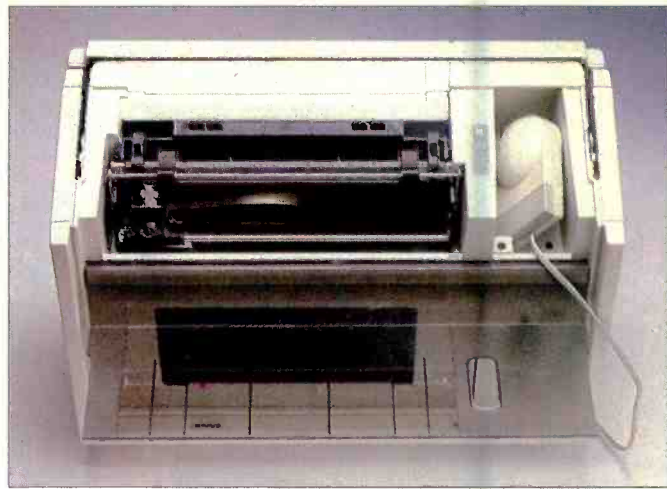
window management; 800K bytes of memory (256K bytes of ROM, 512K bytes of RAM, 32K bytes of display RAM); built-in 32-line by 80-column high-resolution electroluminescent display; built-in 150-cps ink-jet printer; detachable keyboard; real-time clock; speaker; built-in 710K-byte 3½" microfloppy disk drive; HP-UX (Hewlett-Packard's System III Unix implementation) and PAM (the HP Personal Applications Manager) in ROM; and built-in automatic RAM disk. It also has the following expansion facilities: built-in HP-IB interface; two expansion ports; bus expander for an additional five bus slots; two HP-HILCs (for connecting a mouse, digitizer, etc.). The price for all of this is \$4995.

Options include: 15M-, 24M-, and 55M-byte hard disks with and without either floppy or tape backup; separate 710K-byte 3½" microfloppy single and two-drive units; HP's LaserJet printer (RS-232); daisy-wheel printer (RS-232 or HP-IB); dot matrix printers with various graphics and multiple typefont capabilities (RS-232); two-, six-, and eight-

pen color plotters (RS-232 or HP-IB); all the other peripherals HP manufactures for the HP-IB interface.

The system software bundled with the machine includes many of the standard Unix System III utilities and such other tools as the *vi* text editor, as well as the HP-UX kernel and the HP Personal Applications Manager. In addition, there is an optional C development package. The first offering of application software includes: *word processing*: Memomaker (HP); *spreadsheet*: Multiplan (Microsoft); *graphics*: Picture Perfect (CSC); *project management*: Microtrak (Softtrak); *communications*: Data Communications (HP); *math/statistics*: Calculator (HP), TK!Solver (Software Arts); *database*: Unify (Unify), Informix (Relational Database Systems); *real estate*: REMS Software (REMS); *CAD*: Chemical Engineering (Kelix), Structural Engineering (ECOM), Surveying (Land Innovation), Topography (Pac Soft).

Hewlett-Packard, reviewing its overall networking strategies for PC and desktop computers, claims that the HP-IPC will definitely be included in its



planning. The company *does* have a shared-resource manager that links the HP-IPC to the Series 80, 200, and 500 workstations.

### Evaluation

I ran tests on a pre-release system, and it ran flawlessly. Setting up the system was simplicity itself. The computer stands upright, like a sewing machine, with a cushioned handle attached to the top, covered by a cloth sheath. You simply pull the cover off, open two catches, swing back the top to reveal the printer, connect the keyboard (built into a panel that protects the display when it is in transit), plug the system in, insert a boot

disk, and press the ON button.

The first thing you see are some HP messages on an electroluminescent display that reveals black characters on a yellow-orange background. Unlike most of the lap portables that use the still-developing LCD technology, the HP-IPC has a very readable display. In addition, by pressing a two-key sequence, you can invert the display to orange letters on a black background.

Actually, the first software you'll want to run is the Tutor program, which you accomplish by booting the system with the Tutor disk inserted. This is a well-organized, easy-to-follow, step-by-step tutorial on using the system and

PAM, the Personal Applications Manager. PAM allows you to perform most system operations, including creating, editing, saving, copying, and printing files; creating and managing windows; and running programs. There is an optional mouse, which was provided for us with the system, that makes the cursor movement and selection features of PAM quite simple to operate.

If you wish to run the HP-IPC as a Unix system, you simply insert the Unix disk, run one of the shell command interpreter programs, hide the PAM window, and reconfigure the size of the shell window to fill the display area. This is a particularly convenient feature if you

## UNIX?

**D**URING the past year, "Unix" has been the buzz word that swarmed around microcomputer users. Computer magazines have published hundreds of articles about Unix; in fact, two monthlies are entirely devoted to it. At the January 1984 UniForum conference, more than 100 vendors demonstrated hardware running Unix and software to go with it. The April issue of *Microsystems* carried a directory of more than 300 software packages to run under Unix from 118 vendors.

In spite of the uproar created by marketeers, Unix is not the leading microcomputer operating system. At the Spring 1984 COMDEX, Mark Ursino (operating systems product manager for Microsoft) commented "... Unix, if you add up all 50 flavors, does dominate the market for multiuser general-purpose micro-based business computers ... and that market is only about 10% of the general-purpose microcomputer market." He also pointed out that AT&T's claim, that 70,000 computers of 75 types are running Unix, sounds less

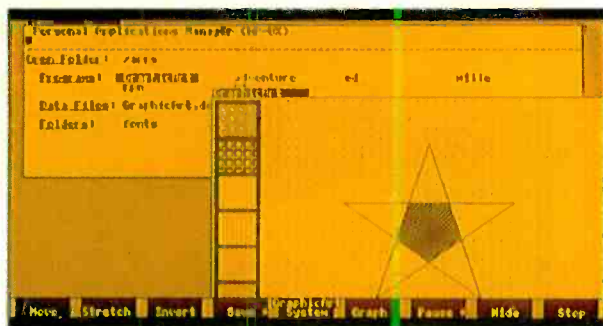
grand when you realize that the average is only 933 systems per type. In reality, about 25,000 of these are Tandy model 16s, 15,000 are Fortunes, and 20,000 are Altos, all running Xenix or one of its derivatives. With at least 5000 or more PDP-11s or VAXs, about 10,000 systems are left, shared between the remaining 68 types. The average falls to 147 Unix systems per type.

At present, then, Unix can hardly be thought of as dominating the market, particularly when you consider that IBM sells more than two million PCs, all of which run MS-DOS. AT&T, however, is trying to capture more of the market with its 3B line of minis and supermicros, and even IBM is supplying PC/IX for the PC and is offering or evaluating at least four other versions of Unix on machines ranging from mainframes down to the Series 1. With one giant actively pushing Unix, and the other at least keeping an open mind about it, this year we may see Unix growing more popular, if not becoming a universal operating system. So let's look at some of

the factors that may help or hinder the emergence of Unix.

First, and perhaps most important, is that Unix was designed from the very start to be machine independent. The kernel, which contains all the logic for file management and multitasking, takes no account of the architecture of the machine on which it is running. All the portions that are machine-dependent, such as control of and communication with the disk drives and other peripherals, are segregated in modules that have a standard and predictable interface with the kernel. Unix is therefore *potentially* capable of running on any machine from an IBM mainframe to a 16-bit PC. This is not to say that porting Unix from one machine to another is easy—it is not—but at least it is possible, which is more than can be said for any other operating system. IBM and DEC operating systems are heavily dependent upon IBM and DEC hardware. MS-DOS, while it has Unix-like features, is transportable only between different configurations of machines using the Intel 8086/80186/

BY CHRISTOPHER TERRY



**Far left: ROM compartment and two expansion slots are accessible from rear. Near left: printer unit and storage compartment on top of unit. Above: A simple example of the HP-IPC's windowing capabilities.**



have as great a distaste for forced menu-driven systems as I do. On the other hand, for the relative novice, the menu and help facilities that HP provides greatly reduce the potential anxiety of running the system.

The documentation HP provided with the HP-IPC is comprehensive and well-written, and especially commendable considering it was reviewed pre-release. The tutorial was provided in hard copy as well as machine-readable form, and the rest of the documentation on specific features and facilities was every bit as clear and easy to follow as the tutorial. In addition, summary and reference documentation were provided for quick re-

mindings for a user who has learned the system.

I took a brief look at two of the application packages provided, Microsoft's Multiplan spreadsheet, and HP's graphics drawing package, GraphicArt. I used *vi* to write the benchmark program mentioned below. Multiplan performed as expected, with the added enhancement of very fast screen handling.

GraphicArt was a joy. It includes a multitude of features, including all the shape, fill, and pattern options you could want and various type style and size options. A question often asked is, "The drawing features of this or that system

are nice and fancy, but what can you really do with them?" The answer is, store the pictures you create in a file for later recall as part of a presentation or for printing or making slides. I didn't find this facility to store files, but after talking with the HP technicians, I suspect that it will be forthcoming soon.

What HP *does* provide at the moment is a built-in print screen function (it's a single dedicated key on the keyboard) that prints to the built-in ink-jet printer in full graphics. Very nice.

*(Continued on page 88)*

80286 family of CPU chips. CP/M has indeed been transported from the original 8080/8085/Z80-based machines to 8086- and 68000-based machines, but other considerations have prevented it from making much impact in those areas. So we can see that for its portability, Unix is the favored candidate for an operating system. It will not only allow third-party vendors to write software that can run on any machine, but will also protect buyers' investments in software should they upgrade their hardware. It is these potentialities that predominate in the mass market's excitement about Unix.

But the Unix universe is not without its problems. The "50 flavors" mentioned by Mark Ursino still provoke lively discussion as to whether they are all "Unix," and cause dismay among those who want a completely standard software development environment. Fortunately, the standards committee of \usr\group, representing commercial Unix users, has done a great deal toward defining the generally accepted compo-

nents and practices. Its recommendations for future enhancement are accepted by AT&T and will be incorporated into System V. Nevertheless, Andy Hall, AT&T's director of System V development, has admitted that there is still much to be done before Unix becomes a completely viable transportable operating system in the commercial market. One has to remember that Unix was designed to serve specific needs in a research environment and that many of its techniques are 15 years old—a lifetime in the fast-moving computer industry. Where most work needs to be done (and is already in progress) is in system security, to meet the needs of commercial databases; networking; real-time processing; and the development of intelligent virtual device interfaces that will relieve the applications programmer of the need to know and take into account the characteristics of modern display screens and printers—especially since graphics are becoming of greater and greater importance to business users.

However, Andy Hall also pointed out

that the potential Unix markets have grown. The reason is that the steadily increasing amount of computing power that can be crammed into a VLSI chip and the steadily decreasing prices for electronic (though not electromechanical) components have lowered the corporate level at which approval is required for purchase of a computer. He foresees within a few years a moderately priced portable machine running the Unix kernel in 128K or 256K with a user-friendly shell and a set of Unix tools tailored to the declared purpose of the machine. We can already hear Unix purists screaming: "If it isn't the full set, you just can't call it Unix!"

Hall's prediction may have been too conservative. The HP-IPC is just such a machine, in the \$5000 price range. If it does everything claimed for it and really serves the commercial needs, this machine may be the first of a multitude of other enhanced and less expensive machines. These will provide the market penetration that Unix enthusiasts have been eagerly awaiting. ◇







# WHAT YOU CAN GET ONLINE

*Online database services have become powerful  
business and research tools*

**BY JEFF HECHT**

**I**t took a diligent reporter to find out that Mehmet Ali Agca, the man who shot Pope John Paul II in 1981, was an escaped murderer who two years earlier had written a letter threatening to kill the Pope when he visited Turkey. But it was no ordinary journalistic detective work of the kind that relies on meeting anonymous sources in back alleys or rummaging through moldering heaps of newspaper clippings. Instead, the reporter searched Mead Data Central's Nexis online database for the assassin's name and found reports of the two earlier incidents.

That's just one example of how online information services can find the right straw in an immense haystack of raw data.

Originated for links to remote terminals, such services have become popular with users of personal computers, who can tap into them with a standard 300- or 1200-baud modem and a telephone line. Online services now offer an impressive variety of information. The databases they make available include job listings and airline schedules, properties of plastics and architectural specifications, bibliographies of mathematical research and lists of stolen rare books, and so on, seemingly without end.

The variety of databases is large enough to require directories to keep track, but depending on how "database" is defined, counts of available databases differ. Over 2400 have been counted around the world by Carlos A. Cuadra, whose firm, Cuadra Associates, of Santa Monica, CA, compiles quarterly editions of its directory. In one three-month period last year, he said, over 180 new

*Jeff Hecht is a free-lance author who has written frequently for this magazine on computer systems.*

PHOTO BY BARRY BLACKMAN

THE DAWN OF A NEW ERA

# Computers

& ELECTRONICS

**NEW EPSON  
NOTEBOOK**  
WITH WORDSTAR  
AND SPREADSHEET  
SOFTWARE IN ROM!

TELECOMMUNICATIONS  
BREAKTHROUGH:  
DIAL-UP 56 KBAUD

SYMPHONY: EASY-TO-USE  
INTEGRATED SOFTWARE  
FOR OFFICE  
PRODUCTIVITY

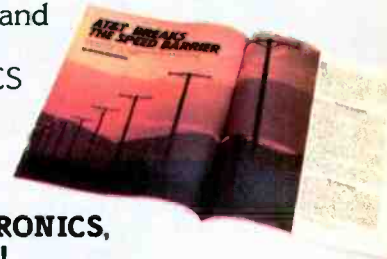
LINK YOUR MICRO  
TO ALMOST  
ANYTHING



# ENTER NEW WORLDS... EXPLORE NEW POSSIBILITIES... DISCOVER NEW INNOVATIONS... WITH **Computers** & ELECTRONICS

Access the present—and future—of microcomputing with COMPUTERS & ELECTRONICS. Every issue brings you the newest innovations in micro technology—telling you what's coming, how it works and what it means to you! Stay on top of the new breakthroughs as they happen and open a monthly forum with the developers and designers who are shaping the industry!

If you're an experienced micro-user who wants a monthly magazine that provides you with the depth of a technical journal, you need COMPUTERS & ELECTRONICS! You'll read about the newest releases in hardware, software and applications as they burst upon the scene! Step into the future as COMPUTERS & ELECTRONICS dives below the surface to bring you the facts and figures of the latest technological developments!



**TUNE INTO THE FUTURE TODAY WITH COMPUTERS & ELECTRONICS,  
YOUR GUIDE TO MICROCOMPUTING—SAVE UP TO 32%!**

**Computers**  
& ELECTRONICS

P.O. BOX 2774 • BOULDER, COLORADO 80322

# YES!

I WANT TO BE  
A PART OF  
THE FUTURE!

Please enter my subscription to COMPUTERS & ELECTRONICS for:

- 8 issues for \$8.97. I SAVE 21%!       One year for \$12.97. I SAVE 24%!       Two years for \$22.97. I SAVE 32%!

Savings based on full one-year (12 issue) subscription price of \$16.97.

Mr./Mrs./Ms. \_\_\_\_\_ please print full name

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

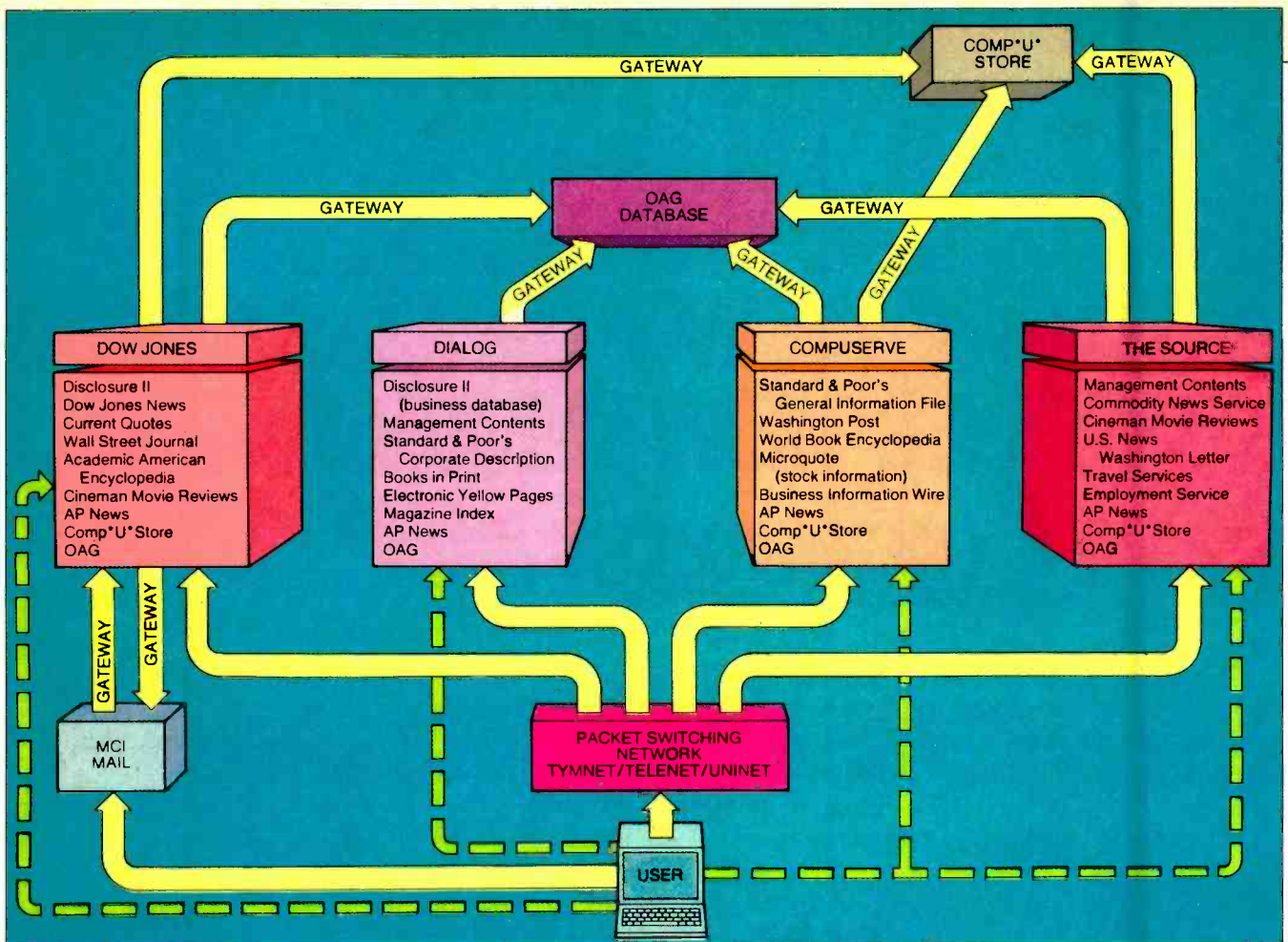
Check one:  Payment enclosed     Bill me later

Charge my:  American Express     Master Card     Visa    CE4Z098

Card No. \_\_\_\_\_ Exp. Date \_\_\_\_\_

Add 40¢ per issue in Canada; 70¢ per issue in all other countries. Please allow 30 to 60 days for delivery of first issue.





## GETTING INFORMATION FROM ONLINE DATABASES

Information from online databases can be accessed in a number of ways. Probably the most common is from a database provider (databank) such as Dialog. Database producers (AP News, Books in Print) send information to the databank's computers. Users access the information from providers.

Another method is via a "gateway," an online system that acts as a link to another service. A popular gateway service is the Official Airline Guide. Information in OAG is changed at the rate of 30,000 records daily, which makes the task of transferring information to other databanks impractical. Comp\*U\*Store, an online shopping service that provides items of just about every kind for home and business, is accessed via several gateways.

Some services, such as Dow Jones, may be accessed directly (dashed lines). They may, in turn, act as gateways to other services. Dow Jones and MCI Mail symbiotically serve as gateways to each other.

The same service may be available on several databanks, but in different forms. The AP videotex service, for example, provides Dow Jones, The Source, and CompuServe subscribers with foreign and national news, sports and weather, but on a current basis only. Stories older than one week are removed from the system.

Dialog offers the full AP news service, 48 hours old. Once on the system, it remains indefinitely, to provide an excellent source of historical information on breaking news.

databases went online, while 72 old ones were dropped. Cuadra classifies databases finely; for example, his directory considers each of the roughly 225 newsletter databases on the NewsNet service (Bryn Mawr, PA) as separate. On the other hand, the *Omni Online Database Directory*, which lists only about half as many databases, lumps all the newsletters together as a single NewsNet database.

The United States, Canada, and Western Europe are leaders in databases, with Japan following, perhaps because of its complex *Kanji* script. English is by far the most common language; some European databases are in French or German, and a handful are in other languages. Some information services are international. The French Questel and

the European Space Agency's Information Retrieval Service (ESA-IRS) are at least nominally available in the United States via trans-Atlantic tie-lines. The British Pergamon's InfoLine is available via Tymnet and Telenet.

### Bibliographic Databases

Bibliographic databases were among the first to develop and are still prevalent. Many started out as printed publications listing research papers, including brief abstracts of them, published in a particular field; for example, Britain's Royal Society of Chemistry offers both online and printed versions of its *Chemical Engineering Abstracts*. The printed versions remain useful for keeping up with new research, but it's far easier to search for specific references online.

To help users extract the information they want, online services have developed database-searching software that is almost as varied as the data. Some software is written for the casual user, such as a person browsing through a job-listing database. Other services write software to improve the efficiency of searches by such specialists as lawyers and legal aides in files of patent and legal data. The specialized software may even include auxiliary databases, such as IFI/Plenum's Claims/Class database, which indexes classification codes used in the company's patent databases. Lately some third-party software vendors have started to offer programs to aid database searches (see the article on page 58).

Most online services deliver starkly

functional text to the screen, without the graphics or color of videotex displays on television sets (see "Whatever Happened to Videotex?" sidebar). Many databases intended for casual use are menu-driven but allow experienced users to bypass the menu. However, search routines for professional use typically require knowledge of specialized commands listed in a manual or user's guide. It takes time to learn the commands, but they make searches more efficient.

There are two ways to access information from database providers and information services: a direct telephone call to one of the nodes maintained by the service or a call to an intermediary network. The most common of these "packet switching networks" are Telnet, Tymnet, and Uninet. They provide local numbers so a user can branch out to the database or information service wanted.

Like any computer program, database text searches can be painfully literal. A search for "Richard Nixon" will not uncover "Richard M. Nixon." If the program is looking for "Richard" and "Nixon," however, it could bring to light an article on Richard Jones and Frank Nixon. Nor will the computer

consider "embezzlement" to be a "crime." But these are minor problems offset many times over by the ease of the search.

### Searching a Database

Remember the last time you searched through a library for articles on a particular topic? The job started with a search through a few years of the *Reader's Guide to Periodical Literature*. If you were lucky, the topic was listed in the way you expected, but more likely you had to look up several variations in the wording to find the desired articles, repeating the process for each year. Then you had to dig into the stacks and hunt for the publications—all too often, futilely. And the most recent articles, typically the most important in science and technology, were inaccessible because of the time it took to compile and print the *Reader's Guide* volumes.

You could do the job quicker and better by searching a bibliographic online database. You could search for your topic by entering a word or words to describe it, either selected from a set of standardized indexing terms or specified for your custom needs. Each individual

term would probably give you more potential leads than you wanted. For example, a sample search found that 12,126 entries in the BRS mention "computers." However, this set can be narrowed down by specifying that entries include all of a set of terms, which, in this example, would limit the number of "hits" to 34. Then you could print out references to the articles on the desired topics. Many databases give a short descriptive abstract of the article as well as the author and title, making it easier for you to decide if the article is worth examining. Some information services will produce copies of the entire article offline and mail it, for an extra fee.

That isn't all a good database search routine can do. Specific authors or institutions can be searched as well as topics. For example, scientists can follow the activities of other research groups. There also are special-purpose bibliographic databases designed to retrieve hard-to-get information. Because many important scientific results are described only at conferences or appear there before they appear in technical journals, special databases exist that cover only meetings. One is the Conference Papers

## THE BIG FOUR

BY D.J. HERDA

**O**F the hundreds of database services available to modem owners in the U.S., four account for more than an estimated 70% of electronic information business: The Source, CompuServe, Dow Jones, and Dialog. Although you can search the offerings of hundred of database suppliers until your micro fries, chances are you'll find precisely what you're looking for in one of the Big Four.

*The Source*, 1616 Anderson Rd., McLean, VA 22102; 800-336-3330. In August 1983, this Readers Digest-owned subsidiary cut initial membership fees by more than 50%. Since then new memberships have increased about 3000 per month, to reach more than 65,000.

One of the most useful and innovative services of *The Source* is Compact Conferencing. This feature, popular with businesses, permits several people to communicate from different locations at the same time. Electronic Mail is also widely used. You log on, type the command MAIL S, enter the identification numbers of the recipients you wish to contact, type in the text, and end with the command SEND. Seconds later recipients pull your correspondence, typos

and all, out of their electronic mailboxes.

One of the newest features from *The Source* is real-time Investor Services that provides up-to-the-second stock quotations. After checking the price of a stock, bond, or option, you can buy or sell online (if you have established a brokerage account with Spear Securities) and receive instantaneous confirmation. The service keeps a running tab of your portfolio and may save you up to 30% on full-cost brokers' commissions.

*CompuServe Information Service*, PO Box 20212, Columbus, OH 43220; 800-848-8199. CompuServe, a division of H&R Block, is one of the largest general-interest information services in the country. It provides hundreds of data services in several categories. Its original feature, Consumer Information Service (CIS), recently added Executive Information Service (EIS), a separate business-oriented subscriber network. Subscriber membership for CIS alone is 150,000. (CompuServe says figures on EIS membership aren't presently available.)

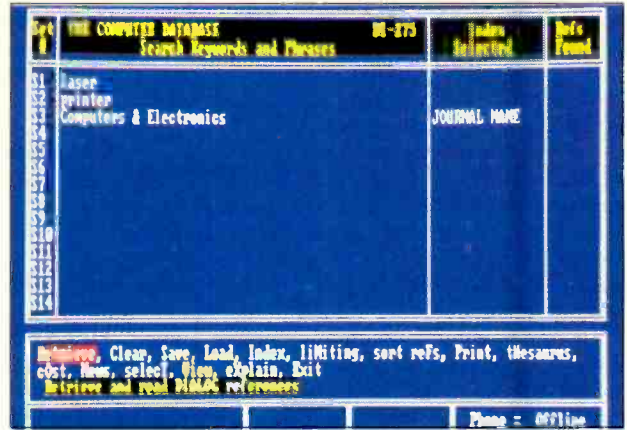
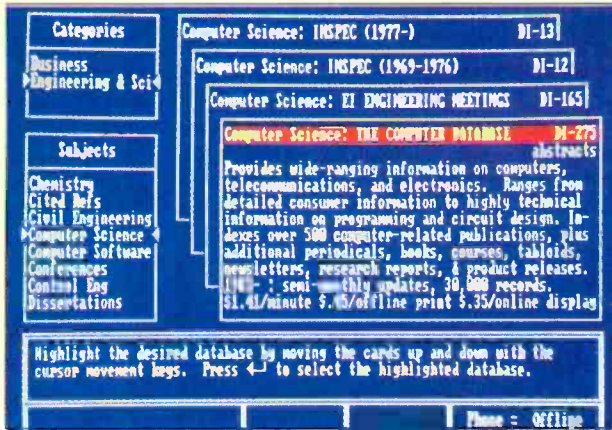
Among CompuServe's most innovative features are its User Forums, electronic bulletin boards of over 100 different categories, Electronic Mail, and a

nationally available shop-by-computer service offering products from Sears, Bloomingdale's, American Express, and over 70 other stores.

Although CompuServe has plenty of head-to-head competition in *The Source* and *Dow Jones*, it offers a few things not currently available from most other online information networks. One is the new T.W.A. Travel Shopper Service. Like Dialogs, it enables customers to book airline flights and choose their own seats through their home micros. Another is Citizen Band Simulator, a live, interactive dialogue service on which hundreds of people congregate electronically to confer as over a citizen band radio.

*Dow Jones News/Retrieval*, PO Box 300, Princeton, NJ 08540; 800-257-5114. More than 70,000 members, mostly people in business and well-heeled investors, currently subscribe. Although it offers some general-interest reporting on news, weather, sports, and movies, its emphasis is to provide people with news they need to make smart business and investment decisions—hard news stories from *The Wall Street Journal* and *Barron's*, for example, plus Financial

(Continued on page 90)



**Using Dialog to find laser printer articles in COMPUTERS & ELECTRONICS.**  
**Above: In-search menus for database choice (left) and input screen for search criteria (right).**  
**Below: Manual search procedure and sample database record.**

Tell Dialog to leave current database and enter No. 275 (Computer Database) ► **BEGIN 275**

Summary of charges for prior database ► 21NOV84 9:43:15 USER25018 :  
\$0.23 0.009 HRS FILE 1# :  
\$0.07 UNINET :  
\$0.30 ESTIMATED TOTAL COST:

Description of selected database ► FILE 275:COMPUTER DATABASE 83-84/1ss22  
(COPR. MANAGEMENT CONTENTS 1984)

Tell Dialog to find all articles that have the words *laser* and *printer* adjacent, only from *Computers & Electronics* ► **SELECT LASER (W) PRINTER AND JN = COMPUTERS & ELECTRONICS**

Dialog set header ► SET ITEMS DESCRIPTION  
 Articles with laser and printer ► 119 LASER (W) PRINTER  
 Total articles found from C&E ► 343 JN=COMPUTERS & ELECTRONICS  
 Set #1 has 3 articles that meet all criteria ► 1 3 LASER (W) PRINTER AND JN=COMPUTERS & ELECTRONICS

Tell Dialog to show the first record from set #1 in format 5 (include abstract) ► **DISPLAY 1/5/1**

Dialog record header ► DISPLAY 1/5/1  
 Dialog accession number ► 168225 CEL8460036  
 Article title ► LASERJET PRINTER—SOONER THAN ANYONE EXPECTED—AN AFFORDABLE PRINTER  
 Author ► BERNARD, J.  
 Bibliographic listing ► COMPUTERS & ELECTRONICS VOL.22 NO.7, JULY 1984, P. 36-38,87, 4 PAGES  
 COUNTRY OF PUBLICATION: U.S.A. LANGUAGE: ENGLISH

Universal journal identifiers ► CODEN: CMELDS ISSN: 0032-4485

Where to get full text prints ► AVAILABILITY: AVAILABLE FROM MANAGEMENT CONTENTS

Record identifiers ► DOCUMENT TYPE: JOURNAL ARTICLE TYPE: TECHNOLOGY; HARDWARE; PRODUCT EVALUATION  
 SPECIAL FEATURES: INCLUDES PHOTOGRAPHS; DIAGRAMS; OUTPUT

Abstract ► THE HEWLETT-PACKARD LASERJET PRINTER WAS DESIGNED TO BE THE LEADER IN AFFORDABLE LASER PRINTERS. THE PRINTER USES ELECTROPHOTOGRAPHIC DRUM ASSEMBLY CARTRIDGES DEVELOPED BY CANNON FOR ITS LOW-PRICED COPIERS WHICH USE PLASTIC INSTEAD OF THE TRADITIONAL PHOTSENSITIVE SELENIUM. A SEMICONDUCTOR LASER IS USED TO PLACE A NEGATIVE CHARGE ON THE DRUM TO WHICH THE POSITIVELY CHARGED TONER ADHERES. LEDS BENEATH THE MAIN CONSOLE KEYS INDICATE THE OPERATION OF THE PRINTER. IT CAN OPERATE IN A "PRINT" MODE FOR TEXT, AND EITHER "PORTRAIT" OR "LANDSCAPE" MODE FOR GRAPHICS. THE RESOLUTION CAN BE SET TO 100, 150, OR 300 DOTS PER INCH AND IS UNDER SOFTWARE CONTROL. ANY MATERIAL THAT CAN RUN THROUGH A COPIER CAN BE USED FOR PRINTING. THE ESCAPE SEQUENCES ARE INCOMPATIBLE WITH STANDARD PRINTERS AND DRIVERS ARE REQUIRED FOR WORD PROCESSING.  
 THE PRINTER, PRICED AT \$3500, IS "FAST, CLEAN, EXTREMELY QUIET," SUITABLE FOR ANY BUSINESS APPLICATION. INCLUDED ARE PHOTOGRAPHS OF THE PRINTER, DIAGRAMS OF THE PRINTER SYSTEM, AND OUTPUT COPY.

More record identifiers ► PRODUCT NAME: LASERJET, HEWLETT-PACKARD, PRINTERS  
 to help with search strategy ► DESCRIPTORS: LASER PRINTERS; PRINTERS; NEW PRODUCTS; HARDWARE

Index, offered by Cambridge Scientific Abstracts and available over Dialog and other services. A careful search of such databases can help an absent-minded professor find a paper remembered only dimly as something about quasars presented by someone from Stanford University at a 1979 conference.

Bibliographic databases come in many shapes and sizes. The 2,000,000-entry Inspec database, compiled by Britain's Institute of Electrical Engineers, covers the whole range of electronics and electrical engineering. In contrast, the more specialized Cold Regions database compiled by the Army Corps of Engineers contains only 74,000 entries, all limited to research on the Antarctic and on civil engineering in cold regions. And a few databases, covering topics as narrow as construction regulations in West Germany, may contain only a few thousand entries.

### Full-Text Services

Bibliographic databases can be very valuable, but they have their limitations. The compression that generates the abstract inevitably loses some of the detailed information of the full text. Some material, such as newspaper articles and newsletters, is difficult or impractical to abstract. Full-text databases offer an alternative. With the widespread use of computerized typesetting, the full text is often available readily and inexpensively from publishers.

Some full-text databases are intended

specifically for professional users. For lawyers, Mead Data Central offers Lexis, which contains the full texts of federal court decisions and many state court rulings. The 25,000 searches performed each day for several dollars each, save untold hours of painstaking scanning of legal tomes.

Mead also offers Nexis, which contains texts of 50 magazines and newspapers, an equal number of newsletters, and about a dozen wire services. New competition in that field comes from the Information Access Co. of Belmont, CA, which last year introduced two full-text databases on Dialog. Magazine ASAP includes texts from 50 major general-interest magazines, including COMPUTERS & ELECTRONICS, the *Saturday Evening Post*, and *Playboy* (without its graphics). Trade & Industry ASAP serves a more specialized audience with texts of major industry-specific magazines, such as *Automotive News*, *Electronic Design*, and *Progressive Grocer*.

Full-text searches are great for uncovering what doesn't show up in the headline, but they have their limitations. The bulk of material can be expensive to store and time-consuming to search. Thus, only major magazines and newspapers generally are stored in full-text format.

The situation is different for newsletters because they are short and very timely—and often very expensive. Annual subscriptions reach a few hundred dollars. One service, NewsNet, puts 225

newsletters on line, including *Africa News*, *Banking Regulator*, *Interactive Video Technology* and *High Tech Patents: Laser Technology*. Many publishers transmit the text before it's available in print for access at prices from \$0.40 to \$2.00 per minute. Back issues of the newsletter remain online, where they can serve as a database. And a Newsflash service alerts subscribers by electronic mail of news involving subjects of special interest, such as reports involving their company or major competitors.

### Reference Databases

Databases can also be loaded with reference information to serve as online encyclopedias or handbooks. Some of these databases are merely online versions of such reference standards as *American Men and Women of Science*. That isn't a great advantage if all you want can be found in ordinary indexes, in alphabetical order—but information needs often go beyond that. A search of the online version could quickly identify astrophysicists who received doctorates from Caltech during the 1950s, for example, an extremely tedious task to compile by hand from the print version.

Many reference databases compile business, financial, and stock data, with emphasis on hard numbers. Although some are intended for casual investors, most are intended for financial professionals and carry prices to match. Sub-

(Continued on page 89)

## WHATEVER HAPPENED TO VIDEOTEX?

AT the start of the decade, it was predicted that in 5 years videotex systems would deliver graphics and text from computer files to over a million television screens in U.S. homes. The cold light of reality reveals an embarrassing shortfall. By late last year, only a few thousand people subscribed to only three such systems. Moreover, the oldest, Miami's Viewtron, had just laid off about 20% of its work force a year after the start of service.

What happened? Videotex developers found themselves hampered by high costs, incompatibility with personal computers, a lack of services appealing to consumers, and an uncertainty in marketing direction. Online consumer-oriented information services aren't dying; but they do seem headed in a different direction, more oriented toward personal computers and businesses and

probably less dependent on graphics and unsophisticated users than was the original idea of videotex.

When videotex was conceived over a decade ago, the goal was to build a system anybody could use to retrieve information from computerized databases through home television sets and telephones. Inexpensive adapters would convert transmitted data into eye-catching color graphics and would let the user control the two-way interaction. To simplify use, access would rely on a menu shown on the screen.

### The Systems

Telecommunications specialists were excited when the British Post Office's telecommunications division (now British Telecom) introduced the first videotex system, Prestel, in the late 1970s. Some businesses signed up, particularly travel agents needing access to online

airline information. But consumers didn't. Even consumer-oriented databases and services, including teleshopping, telebanking, and restaurant reviews, failed to draw them. Though Prestel has gained some subscribers by adding the ability to download personal-computer software, most customers remain businesses.

The Viewdata Corporation of America began offering Viewtron, the first U.S. videotex service, on October 30, 1983, in the Miami, FL, metropolitan area. Services are mostly local: teleshopping, telebanking, restaurant guides, educational games, horoscopes, subscriber bulletin boards, want ads, and a horse-racing index. But after a year, this subsidiary of the Knight-Ridder newspaper chain had lured only 2800 subscribers out of a total population over 1.6 million.

(Continued on page 90)

# MAKING ONLINE DATABASES USEFUL

*Microcomputer software is making it easier to find your way around large online databases*

**BY KERRY LEICHTMAN**

**T**HERE is now enough computer-accessible information to satisfy almost any research need. And that's one of the problems: so much information from such an abundance of sources that using it efficiently is difficult. Thankfully, this awesome data pool includes information on how to use it. And the online help is supplemented by a variety of books, magazines, software, and other training aids.

## **Database Producers**

The database producers are the best resource for fledgling online researchers. These hi-tech vendors seem to provide universally good documentation, at a level of complexity tied to the database audience. Indeed, data providers are so confident of their own search resources, they rarely recommend outside help to their clients.

"Our users don't ask for extra aid," said Bill Van Orden, marketing communications specialist for NewsNet. "We tried to design NewsNet so help isn't necessary. I think we've succeeded. For instance, to read, you type READ. To scan, you type SCAN, and to search, you type SEARCH.

NewsNet gives new users one free hour to master these "difficult" commands. The NewsNet manual explains the details of conducting specific searches, with AND and OR qualifiers, and organizes NewsNet's databases alphabetically, three ways: by industry category, by service code, and by title.

NewsNet offers the least offline support, but the service is easy to use. Dialog, Mead Data Central, Orbit and BRS—other major databanks—offer

varying amounts of lecture/hands-on training. All of the companies are more accommodating than you'd expect.

Mead Data, for example, has training centers in 30 cities. And under some circumstances, Mead trainers will come to you. Mead's personal touch continues beyond initial training. All users are assigned an account representative. When you get into trouble your rep is a toll-free

## **The database producers are the best resource for fledgling online researchers**

call away. Kathy Judy, a training and development specialist with the company, says Mead is unique in its approach to follow-up training, which she says is extensive: "We assign a warm body to each user. We are self-contained."

BRS and Dialog also offer frequent training sessions. Much of their non-classroom training is free access time, better known as hands-on experience. Dialog offers free access to one or two of its databases every month. Although you might not need to peruse World Aluminum Abstracts, if you're a Dialog subscriber and free access is offered, take it.

"People ought to use this time to get



more familiar, more fluent with databases," says Jean-Paul Emard, Vice President of Online, publishers of *Online* and *Database* magazines. "Free access time is one of the best training methods."

BRS and Dialog also offer less flexible, yet still extremely capable, versions of their services to home computerists. These scaled-down versions, BRS/After Dark and Knowledge Index, cost less than the full-featured versions, and offer menus and other, more friendly, methods for finding information.

The casual researcher may need no more help than what the database producers offer. But database use, and the volume of information available, increase daily. Ken Duzy, database specialist and co-editor of the *Directory of Online Databases*, says his organization lists about two new databases every day. The first directory was published in 1979 and included 400 databases. The spring 1984 edition listed 2225 separate databases.

If you need more help, it's available.

## **Books**

There are, all of a sudden, a number of excellent books for databasers. Kieffer and Hansen's book *Get Connected* (see table) is an excellent guide for the beginner. It begins with an historical perspective and well-paced introductions to the various database services. *Get Connected* and Glossbrenner's *The Complete Handbook*... focus on the personal computer user rather than the professional researcher. Therefore they deal with more of the databases a personal computerist will want to use.

*The Online Micro User's Guide*, by Hansen, also describes differing systems

PHOTOS BY STEVE BORNIS





**Dialog is one of the database producers that offers training sessions for its subscribers.**



and styles of information services, but its main strength is in what it doesn't have. It glosses over history and other fodder and gets right to the information. While the presentation is drier than in the other books, the information is fairly similar.

Big-league databasers will be more comfortable with a book like *Online Bibliographic Searching: A Learner's Manual*, by Chen and Schweizer. It is a detailed guide to implementing search strategies. The tips and lessons in this book can help you reduce online expenses and access more of the data you need.

#### **Magazines**

Two extremely helpful sources for all researchers are *Online* and *Database* magazines. As with most trade journals, subscription rates are substantially higher than those for consumer periodicals. It is possible prices will fall as the numbers of subscribers grow. The magazines look at databases the way computer magazines look at computers: They review them, discuss how to use them, and generally keep subscribers informed about developments in databases.

Many computer magazines of a more general nature also cover database use. Their subscription rates are lower, and, of course, they cover broader subject matter.

*Online Review* and *Electronic Publishing Review* are for experienced researchers. The articles are scholarly and full of references. The material probably is very useful to the professional database researcher. Others may be intimidated by the methods and tenor of the magazines.

CompuServe publishes *Online Today*. It focuses on CompuServe, without

treating it as the only form of telecommunications. CompuServe users will find this well-produced product invaluable. It is marketed both as a stand-alone magazine and a publication for CompuServe users. (Also of special interest to the CompuServe user is the book, *How to Get the Most Out of CompuServe*. It isn't much help as a bibliographic database aid, but it does a good job of covering

## **An abundance of help, piled on top of my computer monitor, was there to assist me**

CompuServe.)

Probably the most useful of all publications is Cuadra Associates' *Directory of Online Databases*, published quarterly. The spring and fall editions are thick compilations of all databases and database producers known to Cuadra. The summer and winter editions are supplements that update the previous volumes.

#### **Software**

Dialog, the largest database collection available, is supported by a good deal of third-party software. Of all this support, the most successful and the best known is In-Search. Although In-Search per-

forms a fairly complex service, its strength lies in its simplicity.

With In-Search you can make all of your search decisions offline. When you get online, In-Search communicates with Dialog for you. Because the program speaks the same language as Dialog's computer, the transaction occurs faster than you could manage it, and without a single typing mistake (thus no time spent re-entering commands). In-Search saves you time. And since time (especially online time) costs money, it saves you plenty of that, too. It also helps narrow your search down to its essential components. The more areas of Dialog you poke your computer's nose into, the more it will cost. In-Search will avoid "hits" (search finds) in areas outside your field of interest, saving time by searching smaller areas.

In-Search covers the entire Dialog database, but you can get more specific. Information Access Company (IAC) offers its own Search Helper for IAC's databases: Magazine Index, National Newspaper Index, Trade & Industry Index, Legal Resource Index, and Newsearch. All of these offerings are available via Dialog. Then why not use In-Search? For occasional use, why not indeed. But if these databases are important to you, software with a narrower scope may be more helpful. Because many databases have unique commands, a search aid made specifically for one database may be more economical.

IAC also offers a package plan for

*Kerry Leichtman writes for several computer magazines on computers and their applications.*

# a plus for your apple...

**Are you depending more on your Apple? Are you already using an Apple in your business or home, but want to get more out of it? When upgrading your system, do you rely entirely on the retailer's claims? Do you find that other magazines don't go beyond simplistic programming ideas?**

**LOOK NO FURTHER!  
A+ IS HERE!**

A+ will teach you how to maximize the functions of your Apple. It brings to life new and innovative program applications for the Apple II series and the *new* Macintosh microcomputers . . . features you won't find anywhere else! You'll find reviews of new software packages and in-depth evaluations of new hardware and peripherals for the Apple.

A+ is a useful tool to help you get the most out of your Apple in both the office and the home!

A+ is not written for computer technicians, nor is it a simple magazine written for new users...A+ is written for *you*, covering...the programs *you* can adapt for your office and home...the products *you* can purchase to expand your Apple II series or Macintosh microcomputer...the applications you can implement to increase your productivity...the topics *you* want *and* need, month after month!

**SUBSCRIBE TODAY  
AND SAVE UP TO 26%!**

## **A+ IS THE BUSINESS GUIDE FOR APPLE COMPUTING!**

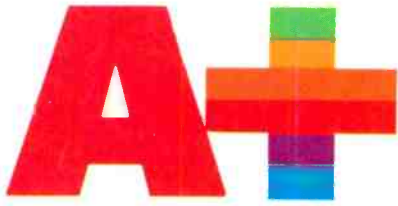
Get the reviews and evaluations of the newest releases for business and finance... which of the three leading Dow Jones Market analyzers is right for you...how to use the Apple as a crystal ball to predict the future of your company...financial forecasting and analysis programs to meet your needs...inventory control programs that aren't losers...patient- and client-profile packages that tell a story...and ways to increase the efficiency of your word processor, in the office or at home!



Tablets for IIs—new relief for the creative professional and student.

## **A+ IS THE CONSUMER'S GUIDE TO NEW SOFTWARE!**

Each issue of A+ gives you unbiased evaluations of the



THE  
INDEPENDENT  
GUIDE  
FOR **apple**  
COMPUTING



latest software releases for home and office...programs that teach you how to use video games to help children learn...which modems will make your Apple a great communicator...the software solution to combine graphics, animation and text...problem solving with artificial intuition...software that gives you *all* of your money's worth ...and games that challenge your mental faculties and *not* your good nature!

**A+ IS YOUR MONTHLY "FACT SHEET" ON NEW HARDWARE AND PERIPHERALS!**

A+ covers what you need to expand your Macintosh or Apple II series...current advances in telecommunications and networking...new ways to augment memory...how to



**Modem Magic—Reach out and access an information service.**

access a wider variety of peripherals with greater ease ...what debugging aids *really* work...how to expand your RAM...ink-jet printers or dot-matrix printers...and the

hardware you'll need to accomplish the jobs in your business and home!

You'll get this and so much more in each monthly issue of A+! Regular columns and features covering Graphics, Programming, Education, Games and Entertainment make A+ the source for new applications and ideas...and Rescue Squad, Thoughtware and Product News round out all the facts you need for your Apple!

A+ is the complete guide for Apple computing, *the* magazine you can't do without!

**A+** THE INDEPENDENT GUIDE FOR **apple** COMPUTING  
P.O. Box 2964 • Boulder, Colorado 80322

**YES!** I don't have to look any further, A+ is here! Please enter my subscription to A+ for:

- 8 issues for only \$13.97—SAVE 16%!  
 One year for only \$19.97—SAVE 20%!  
 Two years for only \$36.97. —SAVE 26%!  
Savings based on full one-year subscription price of \$24.97. CE8Z128

Mr./Mrs./Ms. \_\_\_\_\_ please print name in full

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**Check one:**  Payment enclosed  Bill me later  
Charge my:  American Express  Visa  MasterCard

Card No. \_\_\_\_\_ Exp. Date \_\_\_\_\_

Add \$1 per issue in Canada and all other foreign countries. Please allow 30 to 60 days for delivery of first issue.



**Dictionary Disk—It's new, it's hot and makes word processing a snap.**



**Books, periodicals, and software can help make online databases more useful.**

database use. You can prepay IAC for a certain number of searches; and the more searches you prepay, the less each search costs. Of course if you don't use all of your prepaid searches, it becomes your write-off, not IAC's.

The communications program called SuperScout from the Business Computer Network (BCN) is bundled with *Information Online*. BCN has a unique approach to distributing information. For \$5 per month, BCN subscribers have access to 15 databases and online services, including CompuServe, Dialog, BRS, and NewsNet without paying sign-up fees or monthly minimums. The Superscout communications software, which automatically accesses the selected service, is supplied free. To access Dialog, for example, members can call BCN, using SuperScout, and it signs them onto Dialog with BCN's own password and membership identification.

The book *Get Connected* identifies a major drawback you suffer with such an

intermediary: You don't have a personal identity on the databases, which is useful when you request nonelectronic information from the producer or database provider. As a result you don't get the support information or books or newsletters—or electronic mail—that most database providers send to their subscribers.

Also, with BCN, you can't use all the database's functions. On the other hand are economic advantages. You don't have to pay initial membership charges when applicable, nor must you meet the minimum use requirements of some databases. Unfortunately, the SuperScout documentation was indecipherable. I got the gist, that using the program involved more than booting the disk and dialing a number, but no more.

#### Conclusions

Database searching is not a difficult procedure to learn. Like anything new to you, it has its moments of depressing

complexity and times of triumph. I remember my first minutes online with NewsNet. To test the system I tried a full-database search for "Union Maine Chemical." The Union Chemical toxic waste site is a heavily debated local issue here in Maine, and since I noticed a few newsletters on the service that dealt with toxic waste and environmental matters, I thought this search a good test. Lo and behold, it came up with one occurrence meeting my search criteria, a report in *Nuclear Waste News* about the allocation of superfund money to the problem here. That early success helped ease later disappointments.

But there weren't many disappointments. And when I did have trouble, an abundance of help, piled on top of my computer monitor, was there to assist me. ♦

A list of periodicals, books, and software, with producers' addresses, is on page 80.

# GUIDE TO ONLINE INFORMATION SERVICES

**T**HE chart on the next two pages lists major online services available to computer users in the United States and Canada.

The connect charges, the cost to the end-user for linking with the service over a modem line, usually vary according to the speed of the modem. Some services, however, charge a flat hourly fee regardless of the equipment in use.

Additional charges often depend on the database you access. Some services charge for items of information (hits), in addition to connect charges; others charge a premium for entry into their databases; still others do both. Some services pass on the communication

charges—through Tymnet, Telenet, etc.—to the end user; others absorb the cost, or at least hide it in the connect charges.

Many services also offer offline printing of the information you display on the screen. The option is useful if you don't have a printer or if yours is too slow or busy to run off a lengthy list of periodical titles, abstracts, or other information.

Many of the services require that you learn a unique command structure, although some can be run from a menu. The menu-driven services tend to require you to spend more time online to obtain information. Using them, however, you don't have to go through the ar-

duous task of figuring out sometimes cryptic codes.

Fortunately, many services offer customers training in the use of their services, usually seminars that are as in major cities.

The column headed "Partial List of Features" can only suggest what information is available. In some cases the enormous amount of information obtainable from any one service would fill a book. The best source of available features is the services themselves. Because new features are being added all the time, only the companies will be able to tell you whether something you want is currently online. ◇

## ADDRESSES FOR ONLINE SERVICES

### ADP Network Services

ADP  
175 Jackson Plaza  
Ann Arbor, MI 48106  
313-769-6800  
or 800-521-3166

### BRS Search Service

BRS  
1200 Route 7  
Latham, NY 12110  
518-783-1161  
or 800-553-5566

### Can/OLE

CISTI  
National Research Council of  
Canada  
Ottawa, Canada K1A 0S2  
613-993-1210

### Chase Econometrics

Chase Econometrics  
150 Monument Rd.  
Bala Cynwyd, PA 19904  
215-667-6000

### CompuServe Information Service

CompuServe  
PO Box 20212  
Columbus, OH 43220  
614-457-8600  
or 800-848-8199

### DRI Database

Data Resources  
1750 K St. NW, 9th Floor  
Washington, DC 20006  
202-862-3700

### Delphi

General Videotext Corp.  
3 Blackstone St.  
Cambridge, MA 02139  
617-491-3393  
or 800-544-4005

### Dialog Informational Service

Dialog Information Services  
3460 Hillview Ave.  
Palo Alto, CA 94304  
415-858-2700  
or 800-227-1927

### Dow Jones News/Retrieval

Dow Jones & Co.  
PO Box 300  
Princeton, NJ 08540  
609-452-1511  
or 800-257-5114

### I.P. Sharp Public Database

I.P. Sharp  
2 First Canadian Place  
Suite 1900  
Toronto, Ont. Canada M5X 1E3  
416-364-5361

### NewsNet

NewsNet  
945 Haverford Rd.  
Bryn Mawr, PA 19010  
215-527-8030  
or 800-345-1301

### Nexis

Mead Data Central  
PO Box 1830

Dayton, OH 45401  
800-227-4908

### Orbit

SDC  
2500 Colorado Ave.  
Santa Monica, CA 90406-9988  
800-421-7229

### Pergamon Infoline

Pergamon International Information  
Corp.  
1340 Old Chain Bridge Rd.  
McLean, VA 22101  
703-442-0900  
or 800-336-7575

### QL/Search

QL Systems  
112 Kent St.  
Suite 205  
Tower B  
Ottawa, Ont. K1P 5P2  
Canada  
613-238-3499

### Questel

Questel  
1625 Eye St.  
Suite 719  
Washington, DC 20006  
202-296-1604

### The Source

Source Telecomputing Corp.  
1616 Anderson Rd.  
McLean, VA 22102  
703-734-7500  
or 800-336-3330

# GUIDE TO ONLINE INFORMATION SERVICES

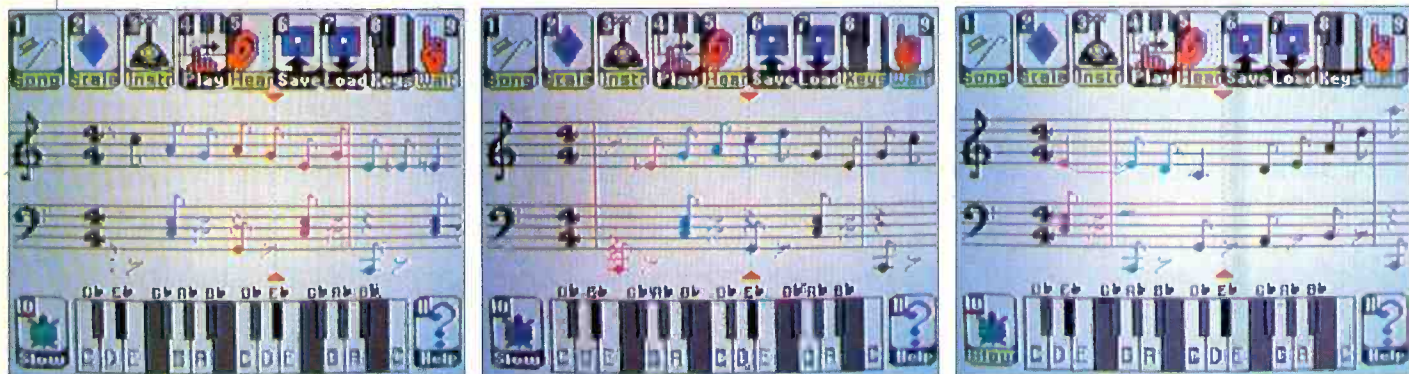
Services	Connect Charges/Hr	Other Charges	Communications Networks	Training Available?
ADP Network Service	300 baud \$15 1200 baud \$30	Price of transaction varies by data item. \$500/month minimum	Autonet Telenet Tymnet	Yes
BRS Search Service	Prime time \$16-\$35 Nonprime \$6-\$25	Database royalty \$0-\$90. Telecommunications charge \$8-\$14. Open access service \$50/year. Startup \$75	Telenet Tymnet Uninet	Yes
CAN/OLE	\$40-\$100 (Can.)	Online hits (terminal display of data) up to \$0.22 (Can.) each	Datapac	Yes
Chase Econometrics	Not available	Not available	Telenet Tymnet Uninet	Yes
CompuServe Information Service	300 baud: prime time (8 a.m.-6 p.m. M-F) \$12.50; nonprime \$6 1200 baud: prime time \$15; nonprime \$12	Sign-up fee: consumer service \$39.95 executive service \$69.95	CompuServe Net Telenet Tymnet Datapac	No
DRI Database	\$28	\$2200/year Up to \$1.50/series search	Drinet Tymnet Uninet	Yes
Delphi	Prime time (7 a.m.-6 p.m. M-F EST) \$16 Nonprime \$6	OAG, NEW premium: prime time \$35/hr; nonprime \$25/hr. Lifetime membership with handbook \$49.95	Tymnet	No
Dialog Informational Service	\$25-\$100 (average \$65-\$70)	Telecommunications charge: Dialnet \$6/hr others \$8/hr	Dialnet Telenet Tymnet, Uninet	Yes
Dow Jones News/Retrieval	Prime time \$24-\$72 (by minute)	Standard membership \$75	Telenet Tymnet Uninet	Yes
I.P. Sharp Public Database	Infomagic rate: 300 baud \$60 1200 baud \$120	None	Telenet Tymnet Datapac	Yes
NewsNet	300 baud: prime time (8 a.m.-8 p.m. EST) \$24; nonprime \$18. 1200 baud at double 300-baud rate	\$15/month. Premium read rate (selected publications) is typically double base rate	Telenet Tymnet Uninet Datapac	No
Nexis	\$20	\$50/month. Telecommunications \$8/hr (\$12/hr WATTS). Session charge: peak time (7:30 a.m.-7:30 p.m.) \$9-\$18/search; off-peak 50% off	Meadnet Telenet	Yes
Orbit	\$40-\$165	Telecommunications: Tymnet \$8/hr Telenet \$10/hr	Telenet Tymnet	Yes
Pergamon Infoline	\$65-\$125	Telecommunications \$10/hr	Telenet Tymnet	Yes
QL/Search	Prime time \$75-\$85 Nonprime \$30-\$40	None	Teleglobe Telenet, Tymnet Datapac	Yes
Questel	\$58-\$107	Telecommunications \$20/hr; \$0.16 per hit (displayed information)	Telenet Tymnet Uninet	Yes
The Source	Prime time (7 a.m.-6 p.m. EST) \$20.75 nonprime \$7.75	Sign-up \$49.95. \$10/month minimum	Sourcenet Telenet Uninet	No

Hours of Operation (EST)	Offline Printing?	Customer Support Hours (EST)	Command or Menu Driven?	Partial List of Features
24 hr/day 7 days	Yes	8 a.m.-5 p.m. M-F	Command	FX (tracks 35 currencies), USEcon (economic database since 1947), SCAN (200 economic indicators), M&A (mergers and acquisitions since 1979), PROMT (article abstracts from 1500 journals), Townsend-Greenspan projections
24 hr/day M-F 6 a.m.-4 a.m. Sat. 6 a.m.-2 p.m. and 7 p.m.-4 a.m. Sun.	Yes	8 a.m.-1 a.m. M-F 8 a.m.-5 p.m. Sat. 8 a.m.-2 p.m. Sun.	Prime time: command After dark: menu	Prime service: 80 databases, mostly bibliographic, some full text, including <i>Harvard Business Review</i> , <i>Medical Letter</i> , <i>Lancet</i> and <i>NE Jour. of Medicine</i> ; nonprime: science and medical databases and <i>Academic American Encyclopedia</i>
6:30 a.m.-9:30 p.m. M-F	Yes	8:30 a.m.-4:30 p.m. M-F	Command	30 Canadian databases, document-ordering service, Alberta Oil Sands Info, <i>Chemical Abstracts</i> , engineering index and meeting schedule, COALPRO Research in Progress
24 hr/day 7 days	Yes	24 hr/day 7 days	Both, depending on service	75 national, regional, international, industrial (agricultural, automotive), demographic, historical and economic databases
24 hr/day 7 days	Yes	24 hr/day 7 days	Menu	Electronic mail, bulletin boards, games, CB simulator, OAG, travel planning (PARS)
24 hr/day 7 days	No	8 a.m.-6 p.m. M-F	Both, depending on service	Economic databases including U.S. Central (economic and demographic), U.S. Prices, Flow of Funds (from Federal Reserve data)
24 hr/day 7 days	Type-setting	3:30 a.m.-10:30 p.m. M-F	Menu	Conferencing, bulletin boards, electronic mail, delayed stock quotes, OAG, UPI News, encyclopedia
Mid.-10 p.m. M-Th Mid.-8 p.m. F 8 a.m.-8 p.m. Sat.	Yes	9 a.m.-8 p.m. M-F	Command	200 databases, including <i>Predicast</i> , <i>Chemical Abstracts</i> , NTIS, Medline, Dun & Bradstreet, Electronic Yellow Pages, ASAP, Newsearch, Legal Resource Index
6 a.m.-4 a.m. 7 days	No	8 a.m.-Mid. M-F	Menu	Realtime and delayed quotes, <i>Wall Street Journal</i> (full text); MCI Mail, AP News, Medx, Petersen College Selection Service, portfolio tracking, OAG
24 hr/day 7 days	Yes	9 a.m.-5 p.m. M-F	Menu	120 databases with international information on finance, MCI Mail, AP News, Medx, Petersen College Selection Service, portfolio tracking, OAG
24 hr/day 7 days	No	9 a.m.-8 p.m. M-F	Command	250 newsletters; <i>Low-Price Stock Alert</i> , <i>Wellington Letter</i> , <i>Stranger Report</i> , <i>High-Tech Patents</i> , UPI News, OAG, Investext Series
24 hr/day 7 days	Yes	24 hr/day 7 days	Both, depending on service	Full text of 123 periodicals; <i>Federal Register</i> and <i>Code of Federal Regulations</i> , AP Political Service, <i>Encyclopedia Britannica</i> , Lexpat (U.S. patents), Forensic Services Directory
24 hr/day M-Th PST 5 a.m.-4 p.m. Sat. 4 p.m.-12 a.m. Sun.	Yes	8 a.m.-6 p.m. M-F	Command	Science and technology databases: patents, chemicals, engineering, energy, and government regulations; electronic mail
8:30 a.m.-9 p.m. M-F	Yes	8 a.m.-6 p.m. M-F	Command	SDI (update notice), international patents, rubber and plastics databases, <i>World Surface Coating Abstracts</i> , electronic publishing abstracts, Patsearch, computer patents, online document ordering, statistical analysis
24 hr/day 7 days local time	Yes	9 a.m.-5 p.m.	Command	80 databases, mostly legal, also mining, coal, and environmental; Canadian Press Newswire; electronic mail; Westlaw; Eurolex
22 hr/day M-F	Yes	8 a.m.-6 p.m. M-F	Command	Graphic match of chemical structures; 50 bibliographic databases, including patterns and textiles, notices of scientific meetings, French legal database
24 hr/day 7 days	Yes	8 a.m.-1 a.m.	Menu	Electronic mail, OAG, Investment Service (including trading through Spear), UPI and AP News, Accuweather, Compact Conferencing

# SSS PRITES GGG AND GRAPHICS

*Sprite graphics enable even relatively low-powered micros to do animation*

**BY TJ BYERS**



Icons and notes in Waveform Corporation's *Colortone Keyboard* music program are generated by sprites. As music is played, notes move along the staff. The use of sprites makes animating this type of display relatively simple.

**D**RAWING even a simple picture on a raster-scanned display is like creating an electronic mosaic. Before you get an image you must lay every single tile separately, that is, you have to plot each component pixel. Generating animated images can be a chore because every image must be plotted and stored separately.

Bit mapping is the traditional way raster screen graphic information is plotted and stored. Now there is something new. It works like a template or stencil. Its called the sprite.

### Sprites

A sprite is a shape stored within a computer's memory and formed, like

any other video graphic, by defining pixels on a grid. The difference is that a sprite needs to be defined only once. Afterwards, it is given a name and becomes resident on a single plane (see below). We could, for instance, call the pattern in Fig. 1 "butterfly" and store it in memory under that name, much as programs are stored on disks using file names. When we want to use the butterfly again, we simply call it up by name, and the computer puts it on the screen for us. No more laborious plotting pixel by pixel. The image is always in memory, imme-

*TJ Byers has written numerous books and articles on electronics and computers.*

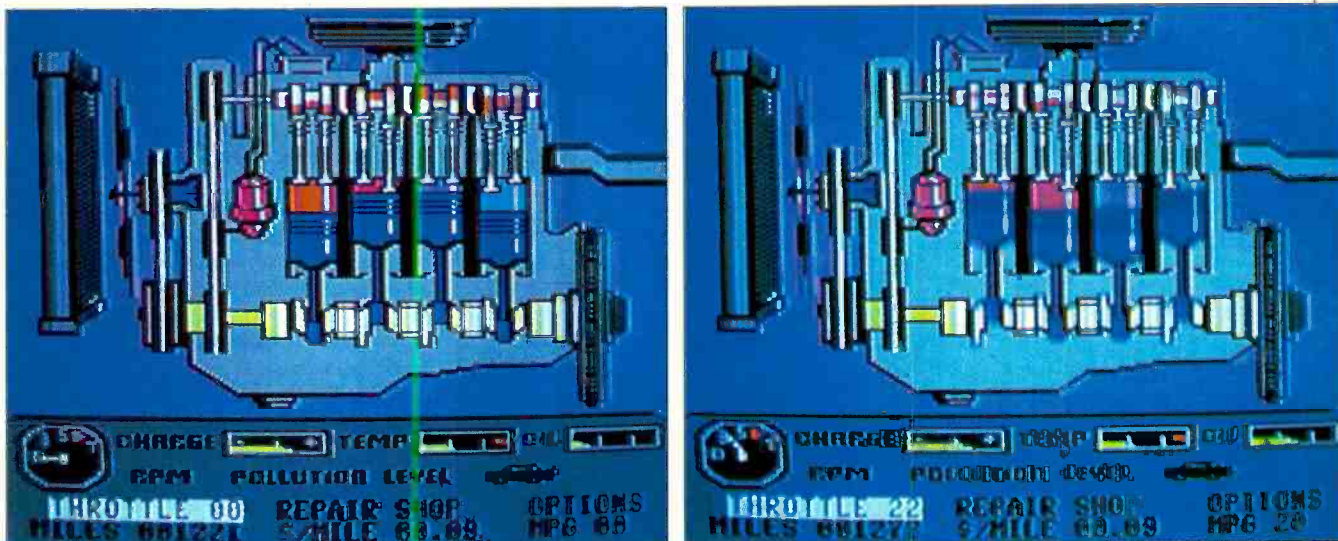
diately available.

Of course it is possible to store more than one sprite in memory. The actual number depends upon the computer itself. The Commodore 64, for example, allows up to eight sprites to be defined within a single program. Only one sprite, however, can be assigned to any plane. Eight sprites require eight planes.

The sprite planes can then be stacked one on top of another (Fig. 2). The planes and undefined pixels within the sprite pattern being transparent, all that will be seen on the screen will be the sprite images. Actually, the process resembles cartoon animation, in which cartoon figures are painted on transparent sheets of acetate that are superim-

VIDEO DISPLAY COURTESY QUADRAM CORP.





**Both sprites and bit-mapped graphics are used in Imagic's *Injured Engine*. Non- or slow-moving parts are generated using conventional bit-mapped techniques. The smooth movement of the pistons, piston rods and gases in the cylinders, though, is due to animation techniques making use of sprite characteristics.**

posed over still backgrounds.

To make an image appear on the screen, you recall one of the sprite patterns. It doesn't make any difference which plane the sprite resides on, because it will show through the transparent planes that lie above it. When you execute a program, the sprites are called up one at a time or all at once—or in any combination.

#### Sizing a Sprite

Generally, sprite patterns are quite small. A Commodore 64 sprite grid, in which the butterfly in Fig. 1 was plotted, measures 24 by 21 pixels, while the now defunct TI 99/4A sprite is a mere 8 by 8. However, sprites are expandable.

You can take a defined pattern and make it two, or even four, times larger simply by issuing an EXPAND command. It's very much like enlarging a figure painted on a balloon by pumping more air into it. The shape or resolution of the pattern doesn't change, only its size. A small junky picture becomes a large junky picture. In many cases, however, the limited resolution that results can be a problem. Especially with intricate patterns, the grid just doesn't contain enough pixels to do the job properly.

A simple way to overcome this limitation is to combine sprites and planes. Let's say you want to build a house, but the number of squares you have to work with isn't enough to give you the detail

you desire. What you do is divide the house into two parts and construct each within its own sprite.

By butting the two sprites up against each other, you have a complete house. You can use this ploy with as many sprites as necessary to achieve the detail and size you require.

Another way to make large graphics with sprites is to assemble them from pieces. The country road scene in Fig. 2, for example, uses ten sprites. Each sprite occupies a plane. The sprites are then positioned on their planes so that when the screen is viewed as a whole, they align to form a composite picture.

Notice that the "plane sandwich" also includes a background plane. The background plane can contain the usual solid colors, text, or graphics. Although most backgrounds are rough and chunky, it's not hard to create a backdrop resembling a New York or Chicago skyline.

#### Sprites in Motion

Sprites can be placed anywhere on the screen. All you need to do is state the x and y coordinates of the desired location. Once you have established the coordinates, the computer constructs the sprite around that starting point.

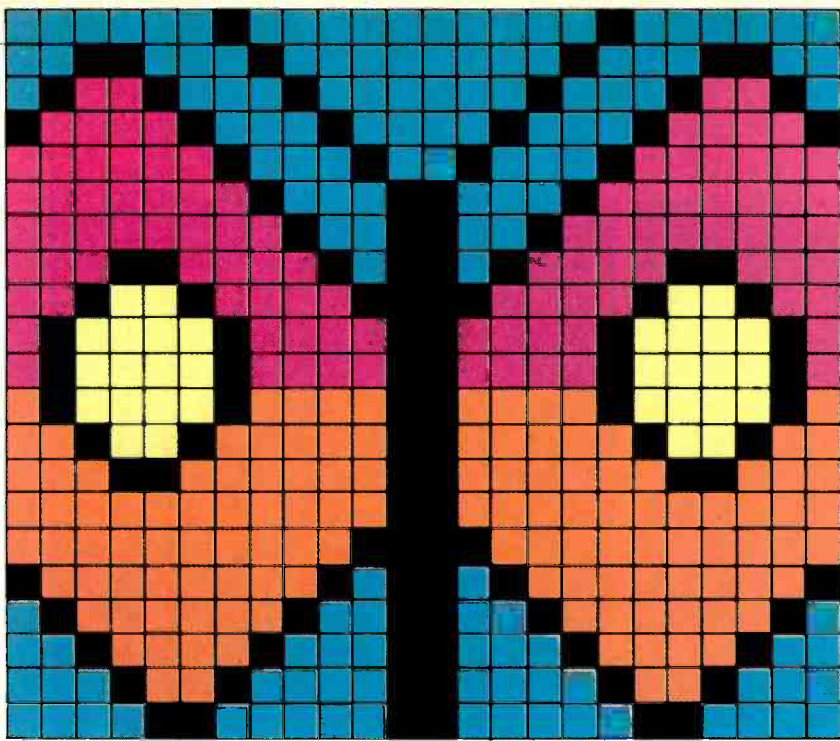
That brings up an interesting possibility. Since a sprite can be put wherever you wish whenever you wish, why can't you have it move around to simulate motion? You can!

Motion is achieved by stepping the sprite through the coordinate values. By moving the starting point—either up or down, from side to side, or both—in consecutive steps, you can create the illusion of motion on the screen. The motion will be smooth because sprite coordinates can be restated a single pixel at a time. And since the pixel is normally quite small, so is the incremental movement.

The motion of a sprite is limited to a single plane; the plane to which it is assigned. This restriction has interesting consequences, especially when more than one sprite is assigned to the same location on the screen.

Suppose that a sprite on plane 1 represents a tree and you have assigned the butterfly sprite to plane 2. If you activate just the butterfly, it will have free rein of the screen, and you can move it about as you wish using coordinate stepping. However, if you add the tree, what happens when the butterfly crosses the tree?

In the world of sprites, a lower-numbered plane dominates, that is, it is foreground to higher-numbered planes. In other words, the tree on plane 1 has priority over the butterfly on plane 2. When both planes are activated and both sprites are defined to occupy the same space at the same time, the sprite closer to the viewer takes precedence over anything behind it. Consequently, you will see only the tree, not the butterfly. The butterfly appears to fly behind the tree.



**Fig. 1. A simple sprite is plotted on a grid. The bit pattern representing this sprite can then be stored in memory under the name "butterfly."**

screen and credit your score with the appropriate number of points.

The collision signal can also be handy if you are designing your own software. Placing a sprite-generated pointer in collision with a sprite-generated icon on a menu screen can generate a signal to select that menu choice. Unlike icon programs in which the graphic must occupy a rigidly defined position on the screen for proper identification, a sprite icon can be moved anywhere at any time with the same accurate results.

### Animation

Sprite dynamics can be manipulated to give the illusion of motion by rapidly displaying different versions of the same sprite. Take the example of a bird in flight. For the sake of argument, let's say that we must use no fewer than five different versions of the bird, each with its

**This "spritely" figure shows that the seemingly more complex can actually prove more economical.**

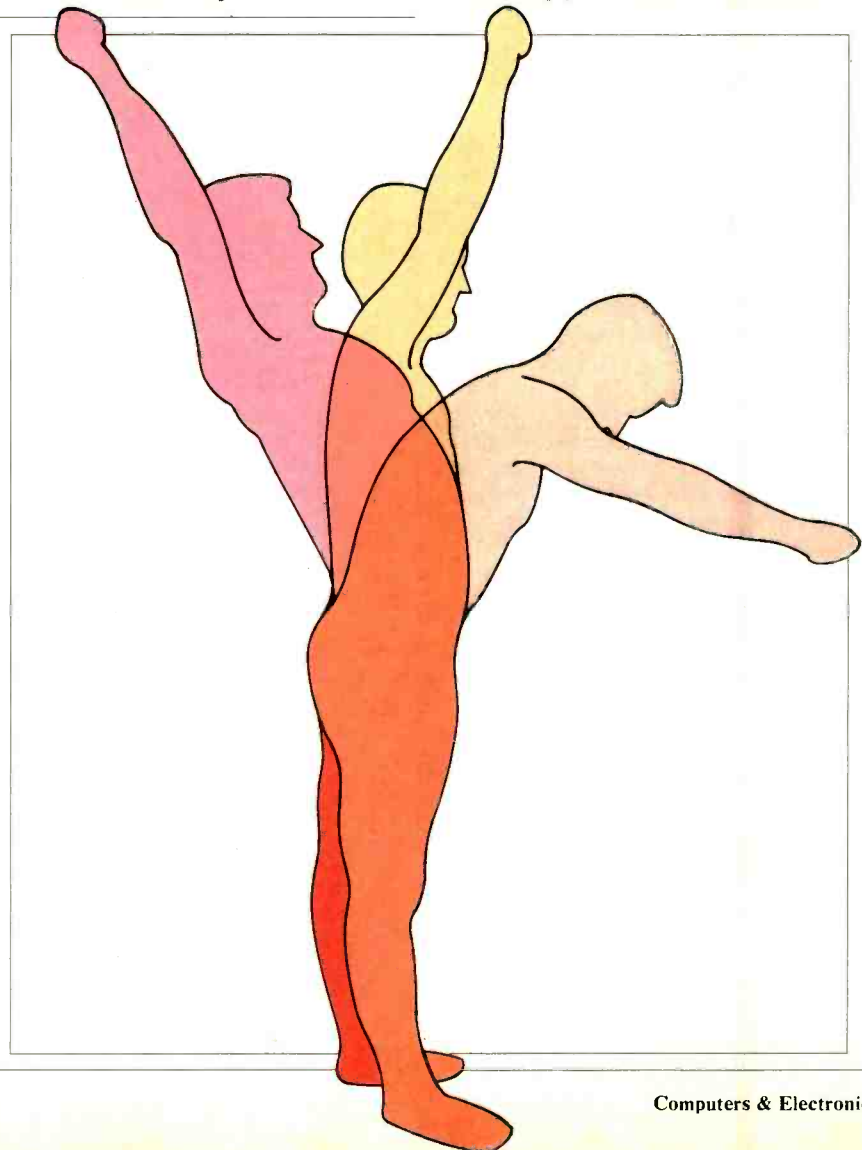
And the picture has a wonderful three-dimensional effect. This effect is enhanced when background colors, which have the lowest priority, appear through transparent holes in a sprite. Imagine, if you will, the possibilities of having several sprites in motion at the same time, such as a swarm of butterflies fluttering through a forest.

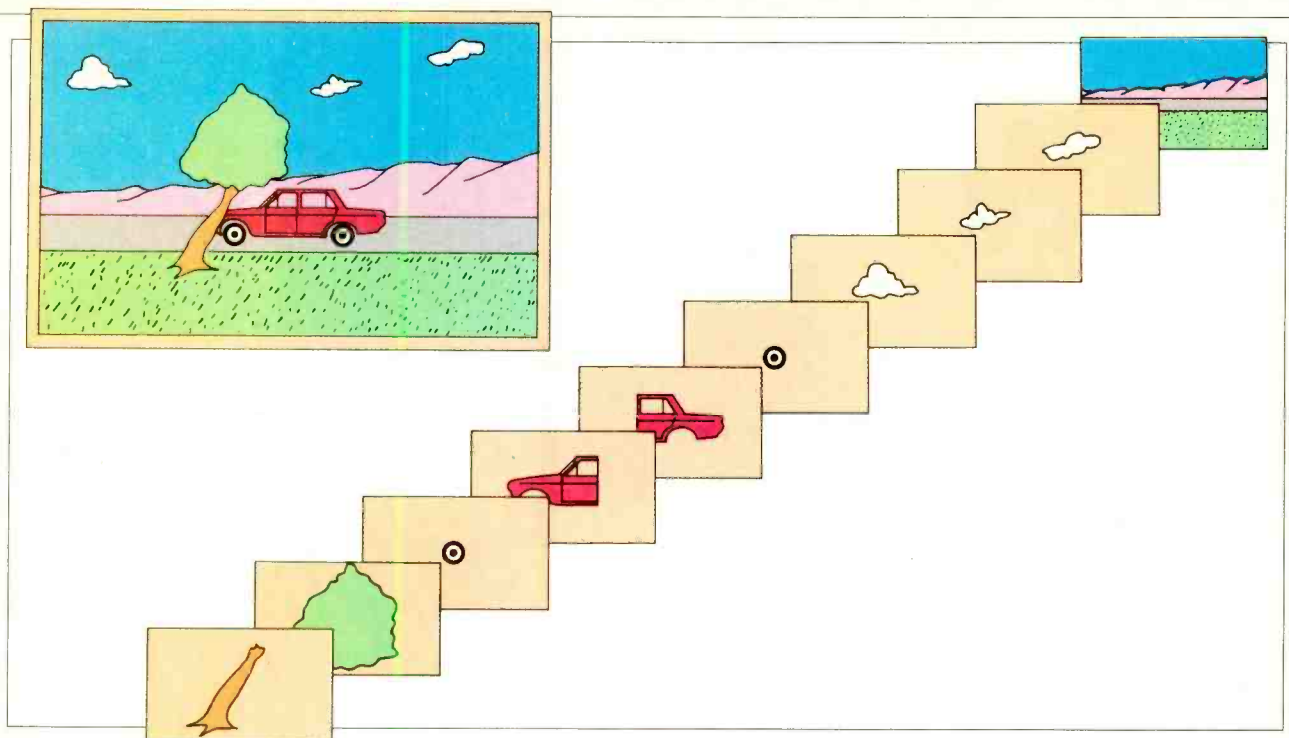
When you are moving composite sprites, such as those in Fig. 2, you must maintain the relative positions of the individual sprites at all times. By holding the scenery planes steady while incrementing the positions of the car parts, you can make the car appear to be traveling down the highway and passing behind the tree.

### Collision Detection

Another attribute of sprites is their ability to sense and detect collisions. When one sprite passes in front of another, a collision takes place. Granted, sprite law dictates that the dominant sprite take precedence, but the collision is still noted. This collision signal can be put to good use.

You've undoubtedly played a *Star Wars* type of game at least once in your life, either on a computer or an arcade machine. The object is to put the target and some sort of projectile on a collision course. The computer's job is to sense the collision as it occurs. With sprites this sensing is automatic. At the instant the two sprites overlap, a collision signal is generated. The computer can use this signal to remove the target from the





**Fig. 2. Complex animation can be accomplished by using a number of sprite planes and changing their coordinates as necessary.**

wings in a different position, to give the illusion of flight. With sprites, there are several ways to accomplish our goal.

The most obvious is to define five different sprites for the bird and recall them in order. Unfortunately, sprites, when first recalled from memory, tend to take a while to form on the screen. If the wings of the bird have to change rapidly through their five positions, there isn't enough time to paint five different sprites on the screen in succession.

It's much more efficient to place all

five sprites on the screen at the same time and at the same spot, and to turn off all the sprites but one.

Disabling a sprite from view by switching it off doesn't remove it from the screen—it simply makes it invisible. By rapidly turning sprites on and off in sequence, we achieve animation.

The spritely athlete illustrated on the opposite page can also be generated in two ways. In the first, three entire sprites can be used, each activated in sequence. The second method uses four

sprites. The first represents the stationary lower portion of the athlete's body; the other three depict the upper portion in various positions. The second method, in many instances, can save considerable memory and programming effort over the first.

Which is exactly what sprites are about. They enable users to create images with increased ease and flexibility. With them, we can portray many objects quite easily, manipulate them, and even surprise ourselves when they interact. ◇

## SPRITES ON A CHIP

**T**HE advent of VLSI (Very Large Scale Integration) video chips containing sprites is opening the way to high-quality computer graphics. What used to be done in software can now be done in single-chip hardware. The TMS9918, from Texas Instruments, is such a chip.

In the TI chip, the sprites come in two different sizes,  $8 \times 8$  and  $16 \times 16$  pixels. The smaller sprite is defined by 8 bytes of data. The sprite pixels are arranged in a bit-mapped grid measuring  $8 \times 8$ . The first byte defines the first pixel row; the second byte defines the second row; and so forth. A logic-0 bit makes a pixel transparent, while a logic-1 gives it substance. In the  $16 \times 16$  mode, the grid rows are 16 pixels long. Therefore, 2

bytes are required to define each row.

The sprite-defining information is loaded into a *sprite generator table* and an 8-bit name is assigned to it. The name resides in the *sprite attribute table*. Altogether, the TMS9918 will support up to 32 different sprites, each on its own plane.

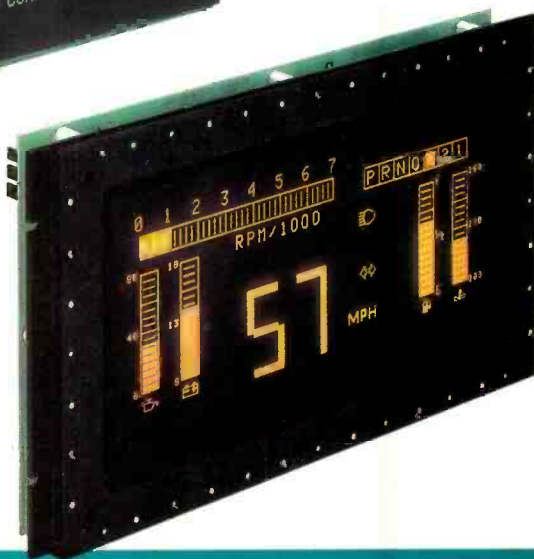
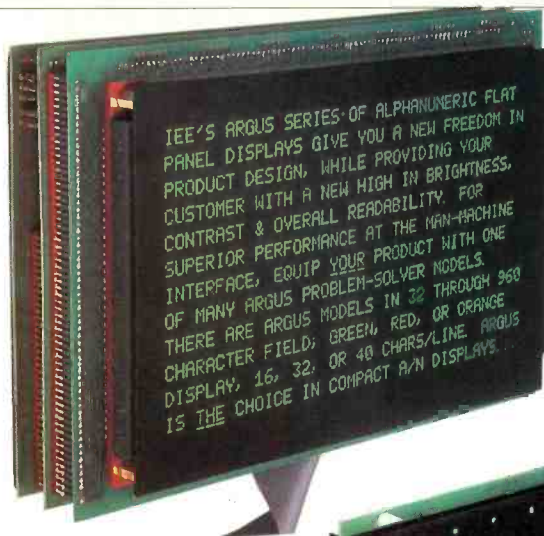
Retrieving a sprite is a simple matter of addressing the sprite attribute table and entering the name of the sprite desired. In addition to the 32 sprite planes, the TI chip includes a background plane, a solid color backdrop plane, and an external video plane, with their priorities falling in that order. The external plane is unique in that it can display such video information as that generated by a video camera. And because it has the lowest

priority of all planes, sprites can be superimposed over the images on it.

In cases where two sprites on different planes occupy the same spot on the screen, the sprite on the plane closest to the viewer takes precedence and masks the spot behind it. At the same time, a coincidence flag is set in the *status register* identifying the collision.

TI sprites are expandable. In the magnification mode, the sprites double in size. An  $8 \times 8$  sprite becomes  $16 \times 16$ , and the  $16 \times 16$  becomes  $32 \times 32$ . The resolution of the sprite doesn't change, though, and the expanded sprites are graphed as  $2 \times 2$  pixels instead of a single pixel. The sprite mapping, on the other hand, doesn't change; the sprite can still be moved 1 pixel at a time. ◇

# NEW FLAT PANEL DISPLAYS



*Gas plasma and vacuum fluorescent displays provide bright alternatives to LCDs as replacements for the traditional CRT*

**BY BOB MARGOLIN**

If you were among the millions who watched the Olympic Games on television, you probably saw IBM's commercial. What made that commercial worth noting was that IBM prominently featured its Model 3290 Information Panel, an intelligent terminal with a large flat panel display. Apparently IBM is promoting its flat panel display as an important advancement towards the future of video display technology. And it may very well be right. Even now, flat panel displays offer better performance, greater reliability, and longer service life than the cathode ray tubes (CRT) in general use. Their only current drawbacks, higher initial cost and the lack of multicolor displays, will no doubt be solved with time. Moreover, flat panel displays are less costly to maintain.

Flat panel displays come in four basic varieties—liquid crystal (LCD), gas plasma (GPD), electroluminescent (ELD), and vacuum fluorescent (VFD).

LCDs are now in widespread use for everything from wrist watches to portable computers (see "Big Picture Displays," August 1984, *COMPUTERS & ELECTRONICS*). However, they require an external light source and cannot be read unless viewed nearly head-on. VFDs are also being used today, but they are relatively small and are not well suited to most computer applications. That currently leaves GPDs and ELDs as practical emissive flat panel alternatives to conventional CRTs in computer applications.

GPDs and ELDs are very similar, the major difference being the source of the emitted light. In GPDs, the light results from the ionization of a gas—usually neon or a mixture of neon and argon—between a pair of electrically charged electrodes. In ELDs, the light is produced from the stimulation of

a luminescent material between a pair of electrically charged electrodes. In both types, the electrodes, insulators and spacers, and the light-emitting material are contained within sealed glass envelopes that are typically thinner than 0.5".

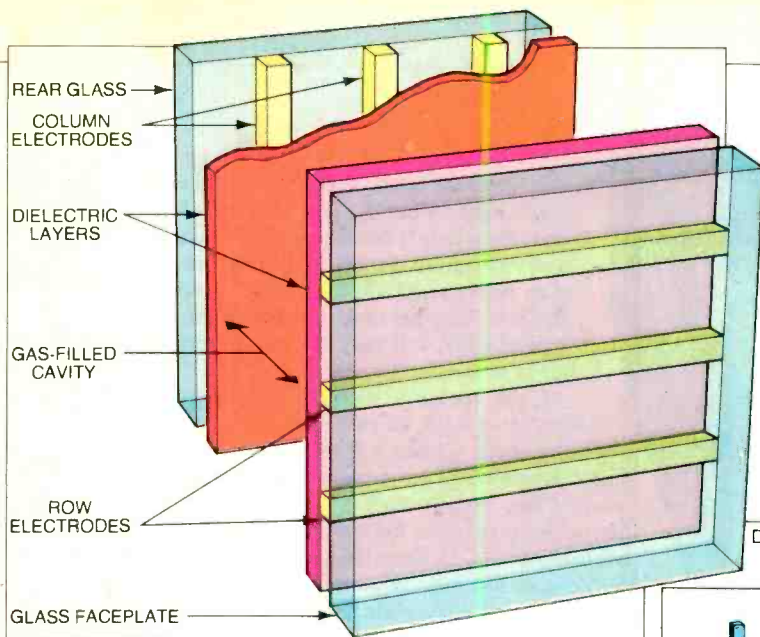
## Making Them Work

Bare GPDs and ELDs are analogous to bare CRTs. To function as complete monitors, they must be supplemented with driving electronics that selectively energize the correct pixels in the display. In some cases, the electronics are stacked on the rear surface of the glass envelope. In others separate boards that plug into the host data source are used.

Just about all flat panel displays use row-and-column addressing schemes. With row-and-column addressing, any pixel can be lit by energizing the specific row-and-column electrode pair that intersect at its location. In this way, a relatively few driving circuits can address several hundred thousand pixels.

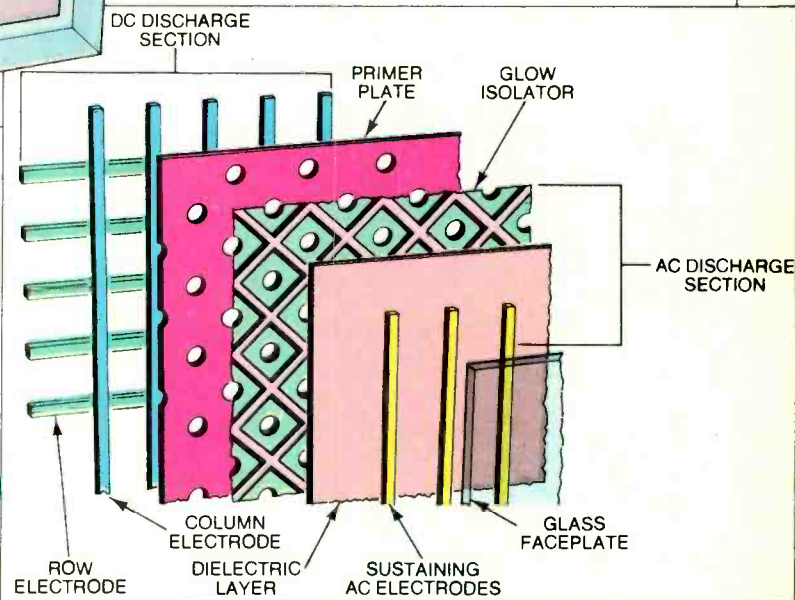
While row-and-column addressing can minimize the driver circuitry, it has a serious drawback. Light is emitted only so long as energizing power is maintained. To get around this problem, scanning circuitry is used that sequentially addresses the pixels in each row column by column in the same manner that the screen of a CRT is swept. Because each column electrode is energized for only a fraction of each horizontal scan, each pixel is on only as long as it is addressed. However, the pixels appear to be lit continuously because the scanning rate is so high that a human eye cannot detect the off-on-off cycling.

Unlike CRTs, however, GPDs and ELDs do not require ki-



**Fig. 1. (Left) Construction of a basic ac gas discharge display.**

**Fig. 2. (Below) Cross section of a hybrid gas discharge display.**



Photos at left show Industrial Electronic Engineer's dot matrix dc gas discharge display (top) and Planar Systems 256 × 512 electroluminescent display.

lovolt power supplies; less than 200 V will do nicely. Moreover, many GPDs and ELDs contain built-in dc/dc converters that typically operate on 24 V or less.

### Gas Plasma Displays

Gas plasma displays, also called gas discharge displays, operate like common neon lamps. Simply put, some of the electrons in gas atoms are stimulated to higher energy states by applying a voltage across them. This higher energy state is not maintained, however, even though the voltage remains applied. When the electrons drop back to their normal energy states, the energy lost in the decay process is converted into light.

The voltage at which light is first emitted—the firing voltage or potential—depends on the atomic structure of the gas being used. Neon-based gas mixtures are used in GPDs because they fire at relatively low voltages—typically between 130 and 185 V. Since the color of the light emitted by a gas also depends on its atomic structure, GPDs are inherently monochromatic. Fortunately, neon produces an orange light that is very close to the amber that some experts believe is the most comfortable to view.

Light can be obtained from a gas discharge with either ac or dc voltage applied across the gas. In fact, both ac and dc gas discharge displays are made. Although they produce the same kind of light, their construction and operating characteristics are quite different.

Dc gas discharge displays usually consist of rows and columns of solid electrodes, separated by spacers or isolators, within a gas-filled glass envelope. In most cases, the “front”

electrode is actually a transparent conductive material painted on the inside of the display's faceplate. Less often metal electrodes are used. The “rear” electrode is often etched metal though occasionally a conductive coating is used.

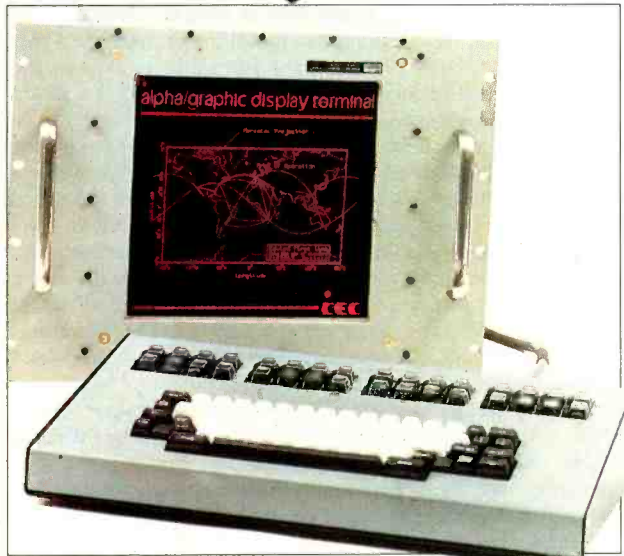
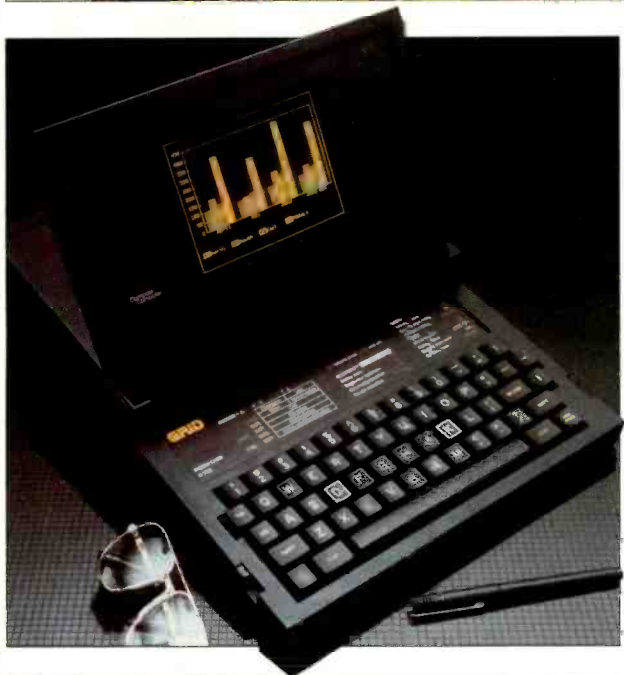
Gas tends to fire very slowly when a direct current is applied across it. In fact, it can take as long as 15 seconds or more after a dc voltage is applied for all the gas between a pair of electrodes to begin emitting light. For a display to be useful, all the gas must fire within a fraction of a second. To obtain the required high-speed turn on, a portion of the gas in a dc display is kept ionized by continuously energized keep-alive electrodes. This ionized gas, acting as a primer, greatly shortens the time to fire all of the gas between a pair of energized electrodes by lowering the net resistance between them.

Because the applied dc voltage maintains a given polarity, current always flows through the gas in the same direction. Over a period of time, some of the gas forms molecules that have a much higher firing voltage than the free gas atoms alone. As a result, the concentration of usable gas drops and the amount of light generated decreases.

Of even greater consequence, however, is the slow deposition on the glass faceplate of metal atoms knocked off negatively charged electrodes by positively charged gas ions smashing into them. Eventually the increasingly opaque metallic film attenuates the light being emitted by the gas.

Finally, the combination of lowered concentrations of us-

*Bob Margolin is a California-based free-lance author, having written various articles on high-technology subjects in the computer and electronics field.*



**Sharp electroluminescent display (top) is used in the Grid Compass (center). Interstate Electronics ac gas discharge display (bottom).**

able gas and metal deposition reduce the display's light output to a level that is no longer usable. How long it takes depends on many factors and varies from display to display, but typically runs between 20,000 and 30,000 hours. While this is 50% longer than the useful service life of a typical CRT, it is only about one-third the lifetime of ac gas discharge displays.

Ac gas discharge displays are able to provide longer service life, in part, because the alternating polarity of the applied voltage minimizes the permanent formation of gas molecules. Moreover, since ac current can pass through a capacitor, the electrodes can be protected from ion bombardment with a dielectric coating (Fig. 1). Since the gas ions cannot reach the electrodes, no free metallic atoms are present in the gas to deposit on the glass faceplate. In addition, an oxide coating is often added to the dielectric layers to increase the number of free electrons in the gas mixture through secondary emissions, which increases the turn-on speed.

The internal construction of ac and dc gas discharge displays is very similar, except for the dielectric layers, which give ac displays an inherent memory. When a pair of electrodes in an ac display is energized, localized surface charges, sometimes called wall charges, develop in the dielectric. If a sustaining voltage of slightly less than the minimum needed to maintain the gas discharge is applied, the local surface charges in the dielectric will add enough voltage to raise it above that minimum. As a result, once the gas between a pair of electrodes is ionized and begins emitting light, the process continues as long as the sustaining voltage is present, even in the absence of firing potential.

In actual practice, the sustaining voltage is often applied across all of the electrode pairs in the display. Since this voltage is well below the firing potential, none of the gas ionizes and no light is emitted. When the gas between a specific pair of electrodes is to emit light, a firing pulse applied across them raises the net voltage to a level high enough to fire the gas. Although the time the pulse is present is very short, it is long enough for the wall charges to develop in the dielectric layers, sustaining the discharge process after the firing pulse is removed. When the light is no longer desired, a pulse of the opposite polarity is applied across the electrode pair to reduce the net voltage to a level below the minimum needed to maintain it. Once the gas discharge stops, the surface charge rapidly dissipates, and the net voltage remains below the minimum needed to sustain it, even after the turn-off pulse is removed. This memory effect enables simple row-and-column drivers to address individual pixels anywhere in the display selectively and directly.

Although ac gas discharge displays offer longer service life and have the added benefit of inherent memory, they are more costly to build than dc displays. In part, the added expense is due to extra dielectric coatings, tighter tolerances, and added circuitry needed to maintain sustaining voltages and turn-on and turn-off pulses.

### **Alphanumeric and Graphics Displays**

Flat panel displays come formatted and unformatted. Formatted displays, with their electrodes arranged in a dot matrix pattern, can only reproduce alphanumeric characters within the predetermined dot cells. Unformatted displays, or fully populated displays as they are often called, have electrodes distributed uniformly over the entire active display area. As a result, they can display graphics as well as alphanumerics.

As a general rule, formatted GPDs make use of dc technol-

ogy, while fully populated GPDs use ac technology. The major reason is cost. Since formatted displays cannot reproduce graphics, their use is limited to such relatively simple alphanumeric applications as status monitors for industrial controls and automatic bank teller machines. In these applications, the inherent memory effects and graphics capabilities of the more costly ac displays are of no value. Moreover, the keep-alive electrodes in dc GPDs and the light produced by the gas ionized between them can be hidden behind opaque masking between the matrix cells. In fully populated displays, there is no way to hide the cells since the entire active area of the display is used.

The Argus line of dot matrix message panels manufactured by Industrial Electronic Engineers (Van Nuys, CA), better known as IEE, is a good example of formatted dc gas discharge displays. Currently, message panels displaying up to 960 characters are available, though IEE expects to offer larger panels later this year. Each cell contains 35 dots in a  $5 \times 7$  matrix that, depending on model, can produce characters as high as 0.3". The message panels are offered not only with standard neon-orange displays, but also with red and green. The red display is produced by optically filtering the orange generated by neon. Green displays, on the other hand, are produced by coating the glass faceplate with a special phosphor material and replacing neon with xenon, which emits ultraviolet light.

Probably the best-known ac gas discharge display is the one used in the IBM Model 3290 Information Panel, which costs \$7100. The display itself, the Model 580, is probably the most advanced GPD now available, providing a display of 960 rows by 768 columns. Because it displays 737,280 pixels, it can reproduce up to 9920 characters, enough to display four full pages simultaneously. The high pixel count and a 14" wide  $\times$  11" high display area results in a 71.4 line-per-inch density, which provides very-high-resolution graphics.

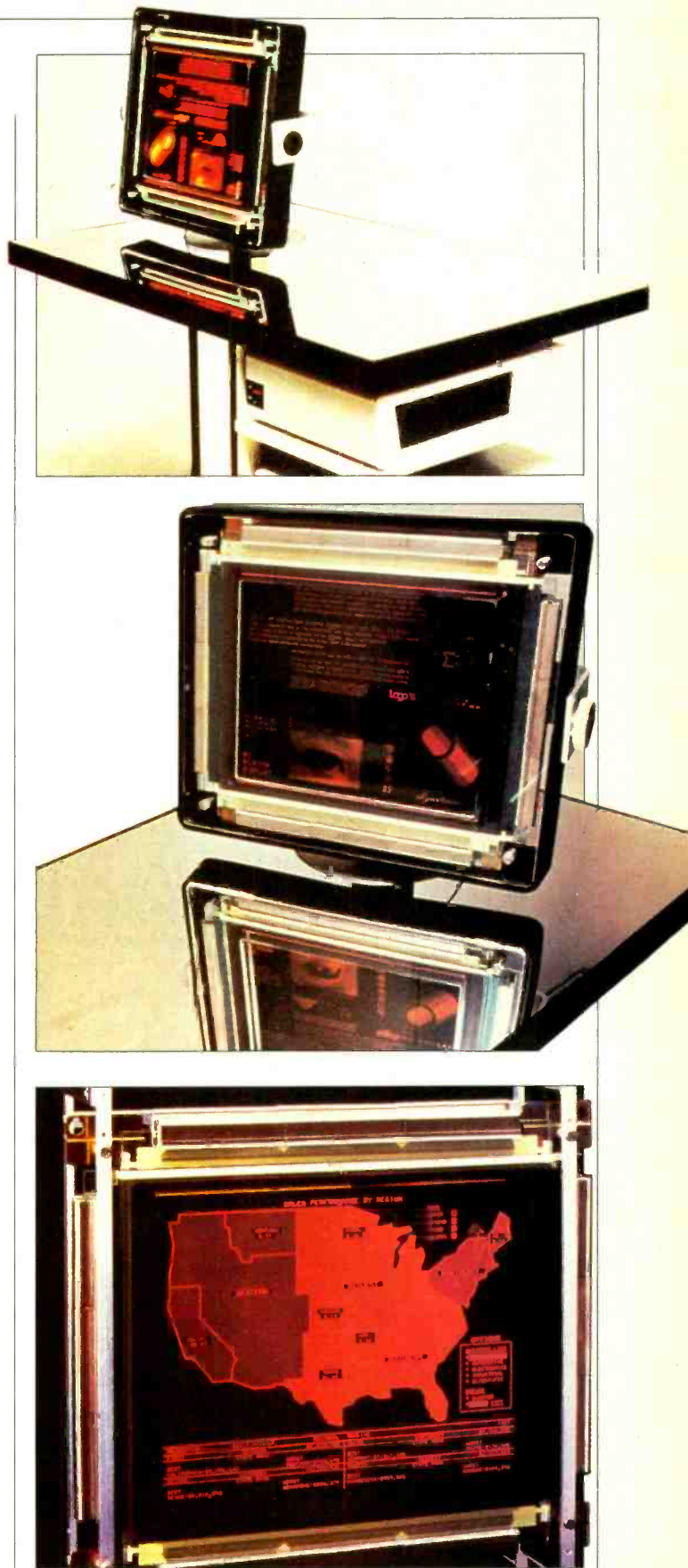
The extremely large number of pixels requires very fast scanning to prevent visible flicker. To accomplish this, IBM created a new drive architecture that provides row-and-column addressing when the entire display must be refreshed, but which can also address specific groups of 64 pixels when only partial refreshes are needed. A single line of characters 16 pixels high can be written across the display in 3.6 milliseconds, and the entire display can be updated in less than 0.2 second. Even though IBM had to push the state of the display art to produce the Model 580, extensive life testing indicates that the average service life of these displays is about 350,000 hours. That works out to 132 working years!

Ac gas discharge displays are also finding their way into military applications. Interstate Electronics (Anaheim, CA), for example, offers an extensive line of militarized ac GPDs with alphanumeric units displaying 6 lines  $\times$  44 characters or  $512 \times 512$ -pixel graphics units. Although the basic display construction is straightforward, militarization, which includes protection against a variety of environmental conditions, significantly adds to the cost.

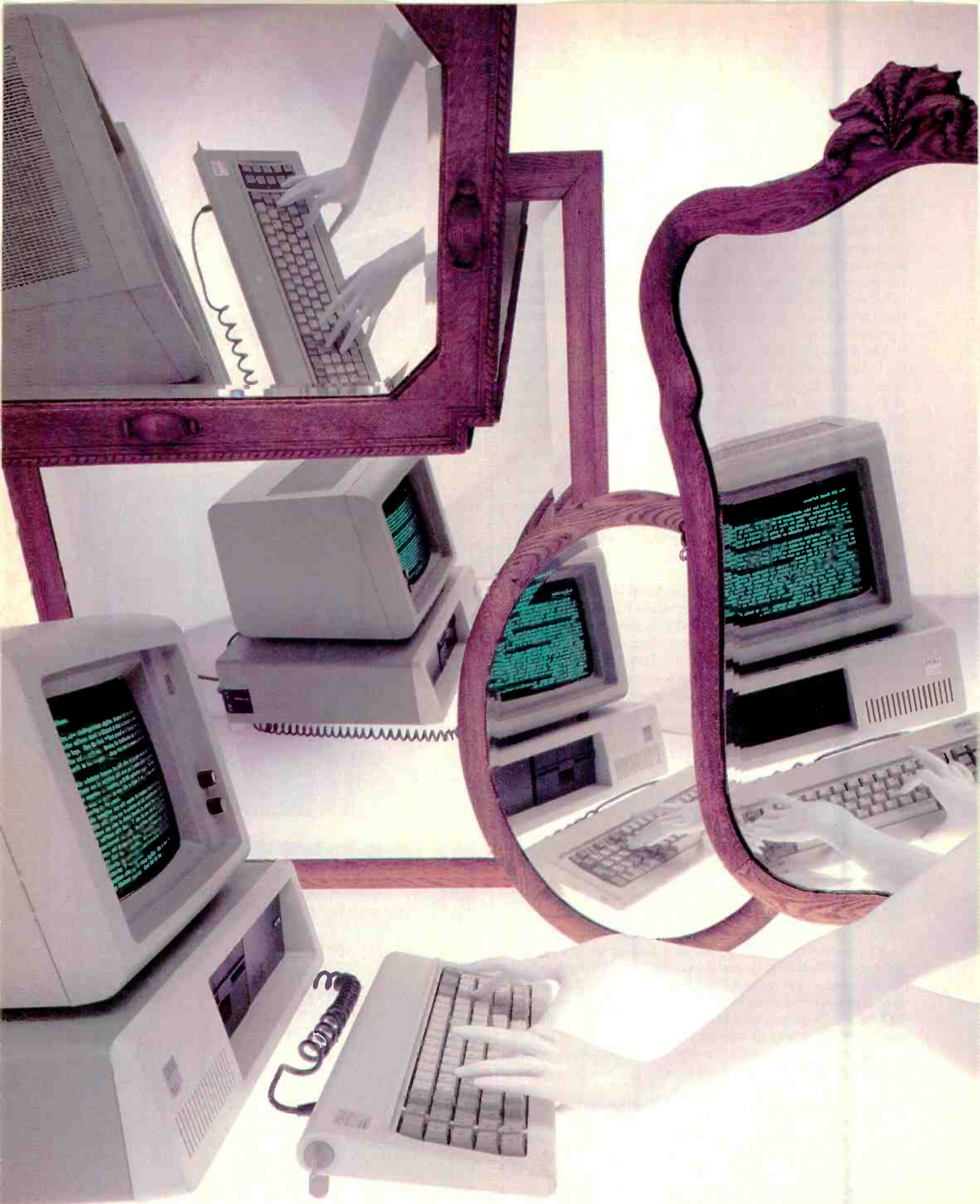
#### A Meshing of AC and DC Technology

PlasmaGraphics (Warren, NJ) produces a fully populated display of 250 rows and 480 columns that provides 25 lines  $\times$  80 characters in a 3.7"  $\times$  7.2" viewing area. The unit, the Model 120 Self-Scan Memory Display, makes use of technology pioneered by Burroughs Corporation to combine the best features of ac and dc gas discharge designs. This hybrid display contains separate ac and dc sections separated by a priming plate with holes through it at each pixel location. The dc

*(Continued on page 108)*



Three views of the IBM Model 581 gas plasma display.





# MULTI-USER MICROS

*Some applications simply can't be handled by a bunch of single-user micros*

**BY MICHAEL K. GUTTMAN**

**D**ESPITE what your friends tell you, a personal computer—even a very powerful one—may not be sufficient for your computing needs.

A personal computer may be too slow or unable to hold enough data, limitations that more than likely result from its very nature: A personal computer is made to be used by only one person at a time. While it is fine for some tasks, it isn't suited for many business applications that involve the simultaneous processing of a common collection of data by more than one person.

For example, a sales department might need a system for several salespersons that allows each to place orders against existing inventory. When an order is placed, the inventory figures must be updated, and the results must be immediately accessible to all other sellers.

If each salesperson had a personal computer, no one would ever be properly apprised of the true state of the company's inventory since the figures in each would not reflect the activities of the other salespersons. In fact, two clerks might sell the same stock.

## **Some New Solutions**

Until recently, the solution to such problems usually was buying a relatively expensive mainframe or minicomputer that could support multiple users sharing a common database. Small organizations that could not afford such a costly purchase were left behind. Even when an organization could afford to buy a large computer, chances are it would be reserved for a few vital functions and generally unavailable for tasks of lower priority.

Fortunately, however, more manufacturers are applying microcomputer technology to the problem of providing relatively inexpensive hardware and software that supports multiple users. These solutions take one of two general

forms—local area networks (LANs) or multi-user systems (MUSs).

LANs are used to hook together a number of independent personal computers so that they can share peripherals. Data transfer between the PCs and the peripherals takes place serially, generally over twisted pair or coaxial cable. This kind of configuration is gaining considerable popularity among PC users working mostly independently who want occasionally to share files and printers with other PC users or even link with mainframe computers.

But because LANs have low data transfer rates and lack dominant CPUs, they are slow doing tasks that require heavy use of common peripherals, particularly shared hard disks. Such tasks require a computer dedicated to managing users whose activities frequently interact. A MUS is just this sort of computer.

With a MUS, users are connected directly to a central processor via a high-speed system bus. They can transfer data to each other at high speeds using what are known as direct memory access (DMA) channels. In addition, because all tasks are tightly controlled by a central processor, users get optimal use of the common peripherals.

## **Much More Than One PC**

At first glance a MUS appears to be merely a collection of personal computers or a single personal computer with more than one keyboard and monitor. Let's look more closely. Keeping track of all users and making sure all their tasks are properly processed is just part of what a MUS does. In addition, the MUS allows shared access to one or more hard disks, printers, modems, and

*Michael Guttman is a partner in Professional Computer Technologies, a software development and consulting firm in Chico, CA.*

other peripherals, putting these operations into sequence so that the often simultaneous demands of the users don't result in any damaging conflicts.

The accomplishments of MUSs are more impressive when you realize current and would-be MUS manufacturers must proceed without established standards. While personal computer manufacturers can mimic the single-user IBM PC, no leader has yet emerged to take clear control of the MUS market and provide a focused direction.

No matter what the difficulties may be, however, the market for microcomputer MUSs keeps growing, for there simply is no other reasonable cost-effective solution to the problems they address. These MUSs are much cheaper than mainframes or minis and much more powerful than PCs.

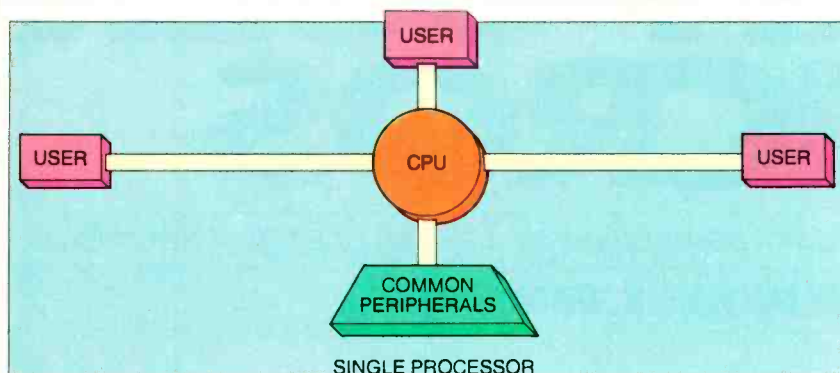
## **Hardware Architecture**

In general, the various MUSs can be described by their architecture—the type of CPU used, the number and configuration of the system workstations, and the specific functioning of the operating system.

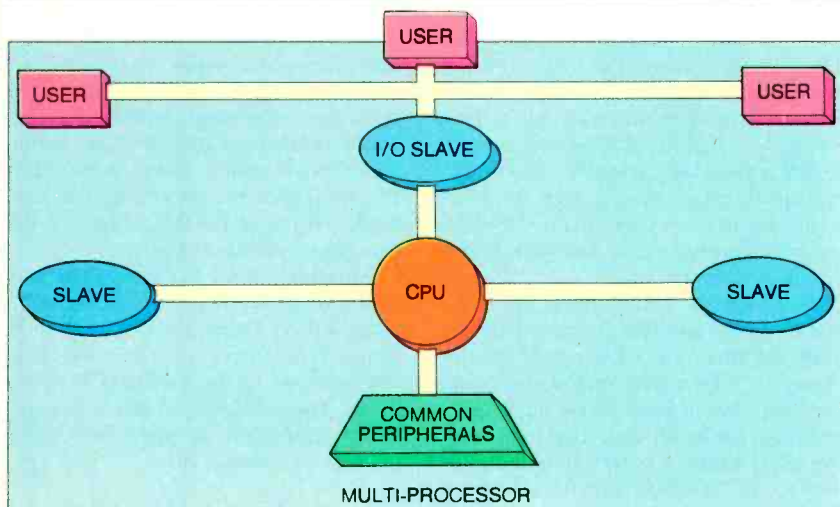
In general, MUS hardware can be divided into systems with a single CPU and those with one CPU and one or more slave processors. In a single-processor system, the CPU must handle every task itself, a situation that lends itself to tight control over system resources but also to system degradation as the number of users and tasks increases.

Multi-user systems with more than one processor can be further subdivided. In one form, the central processor spins off tasks to one or more slave coprocessors, but keeps a tight rein on their activities. A common example is a system that has a separate I/O processor to monitor interaction with each workstation. It allows the main processor to be free of various housekeeping tasks—such as waiting for user input and out-

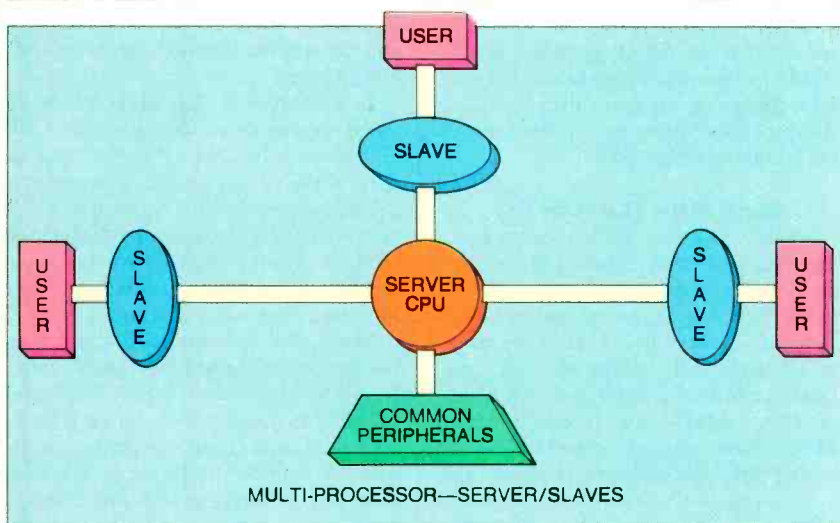
# HARDWARE ARCHITECTURE



**System in which users connect to a central processor; all have use of peripherals, but response degrades as number of users increases.**



**Multi-processor CPU spins off tasks to coprocessors, keeps tight rein on their activities. Main processor needn't wait for user input and output.**



**Multi-processor with server/slaves assigns users to a semi-independent coprocessor that does user's tasks locally until shared resource is needed.**

put. In general, however, this form of multiprocessing is not much different from having just a single processor, except that overall performance is somewhat improved.

In the other form of multiprocessor system, each user is assigned to a semi-independent coprocessor. This coprocessor performs the user's tasks locally until a shared resource is required, at which point it requests action from the central processor.

In such a system, the central processor is almost a slave to the other components. In fact, it is generally referred to as a server. New users can be added to the system without reducing overall system performance, at least when local tasks are being executed. This configuration is similar to a LAN, but it is cheaper and faster because its design is more integrated.

## Operating Systems

None of these hardware architectures is inherently better or worse than the others; all are attempts to provide the most performance for the price. How they actually execute tasks depends on their operating systems—the software of MUS architecture, which must not only perform the usual functions associated with disk, screen, and keyboard I/O, but must also keep track of the various users and their tasks. Most machines can run many different operating systems.

Operating systems themselves come in two types: user-oriented and task-oriented. User-oriented systems treat users as completely independent entities, each with a separate set of tasks. The users share common peripherals, of course, but never directly interrupt each others' jobs or co-ordinate each others' activities.

Task-oriented operating systems support multiple users, but the activity of any user is just another task that can be turned off or on or interrupted. In this kind of system, users can interact with each other, not just through the hard disk or other peripherals, but directly, sharing tasks and passing information among themselves.

In general, although task-oriented operating systems are in their infancy, they show promise for greater interaction among users. User-oriented systems are the current workhorses, allowing individual users to get on with their daily tasks without being interrupted by the activities of others. Many user-oriented systems, however, now offer a limited form of multitasking. These systems, letting each user spawn several concurrent tasks, allow for more efficient and flexible use of each workstation.

**What's out There Now—  
MP/M and Unix**

The first CPU to gain acceptance as the basis for a microcomputer MUS was the 8-bit Z80, the same chip used for many early PCs. Unlike most other 8-bit processors, its 64K memory addressing could be bank-switched up to 1M byte, which theoretically would provide a 64K workspace for up to 16 users. In reality, however, one Z80 CPU is generally too slow to support more than two or three users effectively. To improve performance most Z80-based vendors add additional coprocessors, usually other Z80s and/or Intel's 8/16-bit 8088.

Digital Research, which created CP/M for single-user computers, also created a multi-user version called MP/M. For many years, in fact until recently, MP/M on the Z80 or 8088 was the closest thing to a standard. As a result, most systems in use and most of the time-tested software is based around MP/M or TurboDOS, an MP/M clone. MP/M, which can be made to work on both single- and multiprocessor hardware, is a user-oriented operating system.

In the past year or two, however, the dominance of MP/M has been threatened by Unix, the operating system originally developed by Bell Labs for minicomputers.

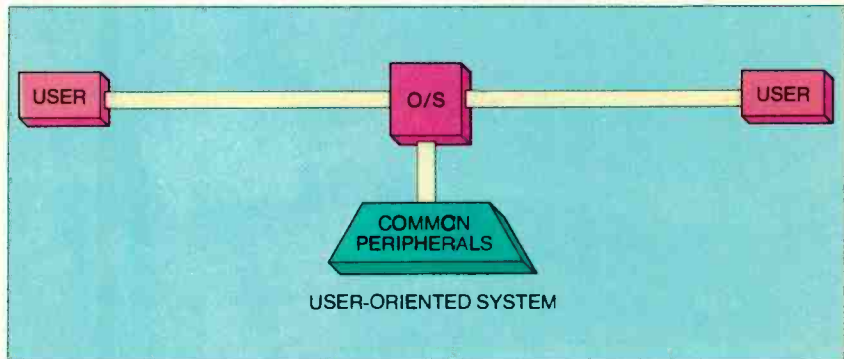
Unix, a task-oriented system, allows users to create and even share tasks running concurrently. Unix has been around for a while, and many programmers are familiar with it and its various extensions and utilities. It's a strong contender because much of the software developed for Unix on minis can, with some modifications, be ported to Unix-based micros.

Because Unix was born in a 32-bit environment, manufacturers have generally picked 32-bit (registers) microchips, such as the Motorola 68000, as the CPU in Unix-based microcomputer MUSs. These chips are powerful enough to support a substantial number of users by themselves, and promise to rival mini-computer performance when mated with coprocessors.

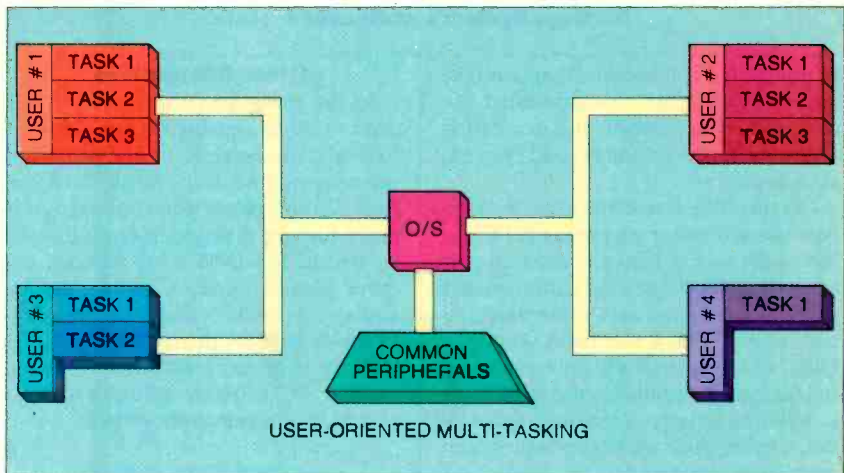
For the next few years, prospective buyers of microcomputer MUSs not already biased toward MP/M or Unix will probably have trouble choosing between the two. MP/M-based systems have the general advantages of low cost, dependability, and a solid base of software.

In comparison, Unix-based systems are still unproved and rather expensive. They benefit from neither a clear set of standards nor a base of truly portable applications software. In addition, the kind

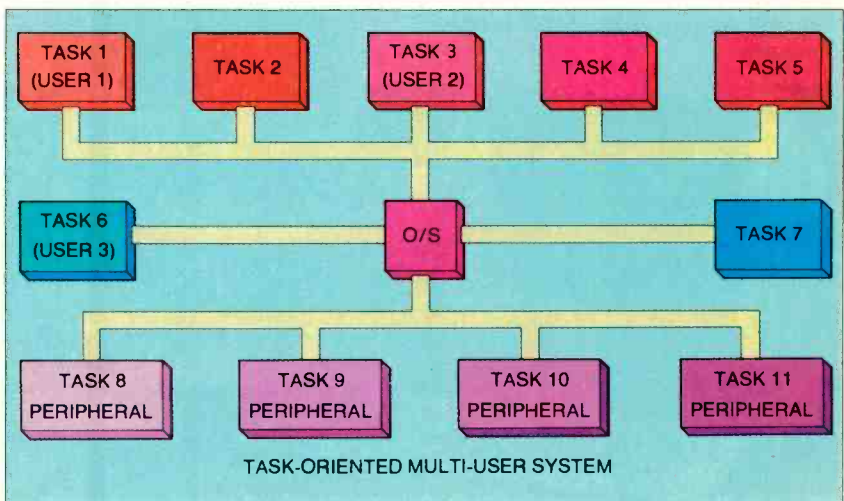
# OPERATING SYSTEMS



**Simple user-oriented multiuser system lets users share peripherals but not directly interrupt each other's jobs or coordinate other's activities.**



**A user-oriented system treats users as independent, with their individual sets of tasks. Network-like systems are generally user-oriented.**



**With task-oriented operating systems, users can interact with each other directly, sharing tasks and exchanging information.**

## Multi-user Micros



**Durango System's multi-user system.**

of innovative applications that can take advantage of Unix's task-oriented approach may be as much as a generation away from development and general acceptance.

On the other hand, Unix has the support of such major players as ATT and Microsoft and at least nominal support from IBM. IBM's new AT, although not primarily designed as a multi-user system, runs Xenix, a Microsoft version of Unix, which in itself will create substantial interest. In addition, of course, Unix is well-known at colleges and universities, where many applications programmers learned the trade.

Even if Unix is the winner, however, it's not clear which version, with what extensions, will dominate. Unfortunately for consumers, it's still too early to tell who will be top in the MUS market tomorrow.

### Other Alternatives

In the meantime, the market is still open to other aspiring entrants. Several have already entered it. One promising innovation comes from North Star Computers, which recently introduced a computer running a proprietary, multi-user version of MS-DOS 2.11. At least one other manufacturer, Corona, has announced a similar computer, the Mega PC, with a 10M-byte hard disk. Users of these systems can continue to use their familiar PC software while developing custom multi-user applications.

Another recent micro entrant, ported from minicomputer and mainframe environments, has been Pick, a multi-user operating system. Pick has recently been ported to the IBM-XT, and several versions exist on 68000-based machines. Pick comes with an array of features for developing multi-user applications and, in theory, offers compatibility with IBM products, from the PC up to a 4300 mainframe.

One particularly interesting approach to the problem of multi-user operating systems comes from Stride (formerly Sage) Computers, makers of a 68000-based MUS. The Stride 400 series computers feature a proprietary multitasking BIOS that allows one machine to run many different operating systems at the same time. This flexibility frees users from the limitations of any one operating system and its applications software. At present, Stride's approach is unique, but eventually we can expect imitators.

### Choosing and Configuring a MUS

The most obvious question a prospective buyer should ask is "How many workstations will the MUS support?" Answering it is a little tricky because performance depends somewhat on what activities are typically performed. If the use of each workstation is relatively light, then more stations can be supported on the same system. If use is to be fairly heavy, then use patterns must be analyzed, to separate those that are input/output (I/O)-intensive from those that are processing-intensive.

Tasks that are processing-intensive are best handled by multiprocessor configurations, in which coprocessors can take some of the load off the CPUs. Systems primarily intended for scientific applications or computer-aided design for example, are processor-intensive.



**A LAN can join 63 of the pictured MAI 2000 desktop units, each of which can handle 14 users.**

If the tasks are mostly input/output-intensive—that is, if the I/O is mostly to and from each user's screen, keyboard, or other device—the best choice is a system that has either a supporting I/O coprocessor or a coprocessor for each user. Systems primarily doing word processing or spreadsheets are examples.

Many tasks make heavy use of a system's common hard disk storage. For example, an online inventory system might need constantly to update and reference a common set of files. In such cases, the size and speed of the hard disk, the speed of the disk controller, and the availability of special hardware and software to improve disk performance are extremely important. Such provisions might include a RAM disk for storage of commonly used programs and functions and/or fast cache memory to store the most recently and frequently accessed storage areas.

#### Other Issues

Even if the manufacturer is using a standard operating system, such as Unix or MP/M, chances are it has been customized to some extent. Hardware limitations might be the reason; a more likely cause is that many common features and functions are simply not standard. Pay attention to such problems.

Take print spooling. Nearly all ma-

chines make it possible for users to share a common printer. Since most printers are slow compared to other system resources, competition for the common printer may be considerable. Print spooling allows printing jobs to be spooled to disk files, to be printed as printer time becomes available. For a system used for word processing, for instance, efficient functioning of a print spooler may be one of the most important features.

As important as spooling may be, there is no spooling standard. Systems in other respects similar may vary widely in their spooling options. For example, a sophisticated spooler might allow users to print jobs on a special schedule or by priority, transmit specialized control commands to the printer, or alter the execution sequence or parameters of print jobs already spooled. On the other hand, a simple spooler might be crudely automatic, allowing almost no human control over spooling processes.

Other examples of important, but nonstandard, features include electronic mail, storage backup, background batch processing, damaged file and directory recovery, password security systems, shared modem facilities and, of course, networking to similar or different computers. It's important for prospective users to be aware that many features that may not at first seem important may

suddenly become critical as use (and sophistication) increases.

#### Getting Ready for a New MUS

After selecting the equipment and a dealer/consultant, a new user must begin to make preparations for its installation. Those users who are accustomed to the *ad hoc* purchase and installation of personal computers will find they need careful planning because a new MUS is likely to have substantial impact on the organization.

Preparations generally take on two general forms: site preparation and organization preparation. Although MUS systems are not necessarily physically obtrusive, they do require proper siting to make it reasonably convenient to connect the various users and shared peripherals. In addition, users should make sure that the system will have adequate dedicated power and ventilation, since a power failure or overheating will affect every user on the system.

Organization preparation involves deciding who will have access to which system resources, who will be responsible for system maintenance and supervision, and how system-wide costs will be allocated among the various users. These decisions which requires the involvement of everybody affected, should be worked

(Continued on page 99)

### SOURCES OF MULTI-USER SYSTEMS

#### MP/M SYSTEMS

**Altos Computer Systems**  
2641 Orchard Parkway  
San Jose, CA 95134  
408-946-6700

**Compupro**  
3506 Breakwater Ct.  
Hayward, CA 94545  
415-786-0909

**Micromation**  
165 Eighth St.  
San Francisco, CA 94103  
415-626-5960

**Molecular Computer Corp.**  
251 River Oaks Parkway  
San Jose, CA 95134  
408-262-2122

#### UNIX SYSTEMS

**Altos Computer Systems**  
(see above)

**CIE Systems**  
C. Itoh  
2505 McCabe Way  
Irvine, CA 92714  
714-660-1800

**Convergent Technologies**  
2500 Augustine Dr.  
Santa Clara, CA 95054  
408-727-8830

**Dual Systems Corp.**  
2530 San Pablo Ave.  
Berkeley, CA 94702  
415-549-3890

**Durango Systems**  
3003 N. First St.  
San Jose, CA 95134  
408-946-5000

**Hewlett-Packard**  
11000 Wolfe Rd.  
Cupertino, CA 95014  
408-725-8900

**IBM (Xenix)**  
PO Box 1328  
Boca Raton, FL 33432  
800-447-4700

**NCR**  
1700 S. Patterson Blvd.  
Dayton, OH 45479  
513-445-5000

**Radio Shack**  
Tandy Corp.

1700 One Tandy Center  
Ft. Worth, TX 76102  
817-390-3011

#### MS-DOS

**Corona Data Systems**  
275 E. Hillcrest Dr.  
Thousand Oaks, CA 91360  
805-495-5800

**North Star Computers**  
14440 Catalina St.  
San Leandro, CA 94577  
415-357-8500

#### OTHER

**Alpha Microsystems**  
17332 Von Karman  
Irvine, CA 92714  
714-641-5145

**Anex Technology**  
151 N. Route 9W  
Congers, NY 10920  
914-268-2400

**Computone Systems**  
1 Dunwoody Park  
Atlanta, GA 30338  
800-241-3946

**Data General Corp.**  
4400 Computer Dr.  
Westboro, MA 01580  
617-366-8911

**MAI/Basic Four Information Systems**  
14101 Myford Rd.  
Tustin, CA 92680  
714-731-5100

**PC Technologies**  
704 Airport Blvd.  
Ann Arbor, MI 48104  
313-996-9690

**Pick Systems**  
17851 F-Skypark Circle  
Irvine, CA 92714  
714-261-7425

**The Software Link**  
Suite 336  
8601 Dunwoody Place, NE  
Atlanta, GA 30338  
404-998-0700

**Stride Micro**  
4905 Energy Way  
Reno, NV 89502  
702-322-6868



# TANDY'S NEW MODEL 200 BRIEFCASE COMPUTER

*Sixteen-line successor to popular Model 100 sports improved text editor and Multiplan*

**BY KERRY LEICHTMAN**

**A**LTHOUGH sales of lapsed computers have yet to live up to industry expectations, manufacturers continue to offer upgraded versions with larger memories and more sophisticated software. Tandy, the leader in the lapsed field with its TRS-80 Model 100, has introduced its newest briefcase micro, the Model 200. Weighing 4½ lbs and incorporating many of the best features of the Model 100, the 200 adds a longer display and such software enhancements in ROM as an alarm function and a scaled-down version of Multiplan.

The Model 200, which lists for \$999, features 72K of ROM expandable to 104K and 24K of RAM expandable, with two 24K banks, to a total RAM capacity of 72K. ROM firmware includes Microsoft BASIC, a simple word pro-

cessor, a communications program, address book, appointment calendar, and note-taker features as well as Multiplan. The additional 32K of ROM provides space for a variety of "chipware" (software on a chip) plugged into a ROM socket on the machine's underside. According to Tandy, the first chipware program, a full-featured version of Multiplan, will arrive this summer.

While many of the Model 200's physical features recall its predecessor, there are some changes. The most noticeable is the new screen, a flip-up LCD with a 16-line by 40-character display, double the length of the Model 100's display. Nearly all of the other second-generation lapsed machines use 80-character-width screens; Tandy retains the 40-character width, which the company feels is consistent with its concept of a portable

computer as a separate genre with its own functions and purposes. "Everyone's trying to sell their portables as portable PCs," said Stewart Weinstock, Tandy buyer for the two portables. "We're not."

"We didn't change the basic character of what we think a portable computer should be," said Ed Juge, Tandy's director of market planning. "For what it is used for, we didn't feel the wider screen was necessary." Similarly, while other portables, such as the DG One, offer longer screens, their character sets are appreciably smaller and can be less legible. With the Model 200, a full-size paragraph fits easily within the screen's parameters and the character set is easy to read. The display, like that of the Model 100, can be fine-tuned with an exterior dial.

PHOTOS BY RICK DYKES

### Keyboard Improvements

The standard QWERTY keyboard arrangement has 10 special function keys, eight programmable function keys, and an arrow-key cluster at the top-right corner—a much more logical arrangement than the row of arrow keys on the Model 100. The other main difference in the new keyboard is the placement of the programmable function keys and the PASTE, LABEL, PRINT and BREAK keys. Reversing the earlier configuration of these keys, the Model 200 locates them at the leftmost side of the machine, almost directly under the LCD. When LABEL is invoked, the function key labels line up with the keys they reference.

The keyboard lies flat, which might seem awkward. Many people installed small legs on the bottom of the Model 100 to create a more natural typing slope and to improve the angle of the screen. The Model 200's flip-up screen solves the viewing problem, but creates another because the prop legs available for the Model 100 are too long and make screen viewing a bit difficult. Perhaps a third party will supply a smaller prop leg to solve the problem.

The power switch is located near the PASTE key. The machine is powered either by four AA batteries that fit into a compartment underneath the 200 or by a 6-volt adaptor that plugs into the side of the machine. The power adaptor is compatible with the one available for the Model 100. The ac current or batteries power a set of NiCd cells capable of holding RAM intact for up to 15 days. The AA batteries can provide 10-16 hours of use.

The CPU of the Model 200 is the same 80C85 CMOS microprocessor used in the Model 100. Tandy and Microsoft did have to rewrite the machine's coding to support the new features, and this re-writing makes Model 100 machine-language programs incompatible with the new computer. BASIC programs with

ROM calls will also be unusable. On the up side, however, the ROM, unlike the 100's ROM, which was virtually custom-made, is a standard chip. As a result, it will be easier for third-party software developers to get PROMs and EPROMs for firmware programs.

The Tandy 200's RAM is divided into three 24K banks, each with menu slots for 46 files. You can switch from bank to bank by pressing F1 while in the main menu mode. Other functions accessible from the main menu mode let you kill files and copy files from one bank to another. To kill or copy a file, you place the cursor on the file name and press the appropriate key. The KILL function has a built-in confirmation feature to prevent unfortunate errors.

The built-in calculator can be accessed at any time by first invoking the 200's number pad, which turns a cluster of alphanumeric keys on the standard keyboard into numeric keys, then hitting a special function key. When this is done, the number pad becomes a calculator that uses the top line of the LCD screen to display the output. Although this feature is available in TELCOM mode, its use may interfere with online data communications, depending on the protocol used.

### Built-in Software

Also accessible during any Tandy 200 operation is an alarm that works in much the same way as Tandy's DeskMate software (COMPUTERS & ELECTRONICS, December 1984, page 70) and other desk management software, (page 70). To operate the alarm, you enter the dates and times of appointments, along with any notes, into the NOTE.DO file created in TEXT, the Model 200's word processing program. When the preprogrammed time and date are reached, the 200 sounds an alarm and displays the NOTE.DO entry on the screen. The function provides space for up to 255 alarm entries and can recall the last four alarms. Alarms will sound and display even when the machine is turned off.

The Model 200 improves the word processor of the 100. New features include simple output formatting to control page width and length, left and top

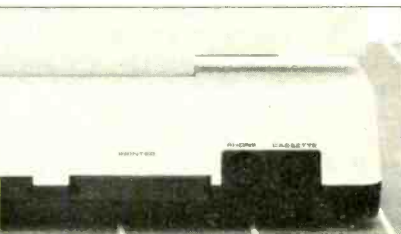
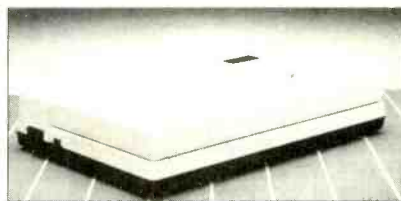
margins, number of lines per page, and a choice between nonstop printing or pausing between pages. Also new to TEXT is a LIST function that performs a repetitive string search within documents. TEXT, of course, retains the features present in the Model 100 version, including delete and insert, block delete and move (both within a file and between files), and the print screen function.

The scaled-down Tandy 200 Multiplan has a 63-column by 99-row capacity. Files created with a desktop version of Multiplan can be transferred to the 200 and vice versa.

Although the communications program, TELCOM, supports transfer rates as fast as 19,200 baud, the Model 200's built-in modem is only capable of 300-baud transmission. The originate/answer selection, which was controlled by an external switch on the Model 100, is now software controlled. A software toggle for a control character filter will ignore the ASCII codes 0-31, except those for carriage return and line feeds. This toggle can be set to ignore line feeds after a carriage return and will support the 10 pps rate of touch-tone phones.

The 200 comes with ports for connecting to a Centronics-standard parallel printer, RS-232 devices, cassette player, telephone, bar code reader, 6-volt ac adaptor, and disk/video interface.

The basic 24K unit is priced at \$999, the same introductory price of the 24K model almost two years ago. Additional RAM, in 24K segments, are \$249.95 each. Options include: video/disk interface (\$799 includes one 184K drive, second drive \$239.95), bar code reader (\$799), direct-connect modem cable (\$19.95), acoustic coupler (\$39.95), carrying case (\$39.95), TRP-100 portable printer (\$299.95), parallel printer cable (\$14.94), ac adaptor (\$5.95), and CCR-82 cassette recorder and cable (\$49.95). ◊

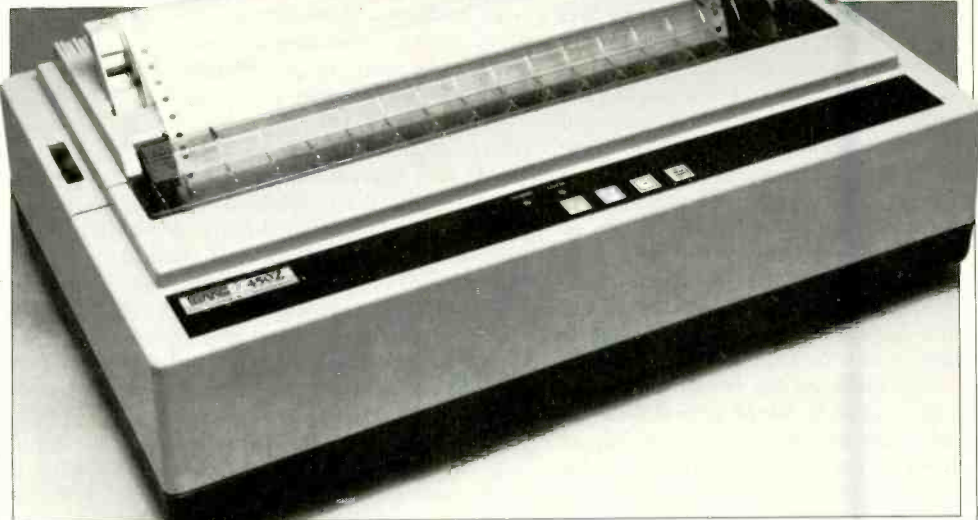


# NEW PRODUCTS

## DISK DRIVE TESTER

The EX2000 from Proto PC is a microprocessor-based test instrument used to repair and align floppy disk drives using SA400 and SA800 interfaces. It features test points for scope hookup, single key-stroke for any alignment track, hysteresis check, speed check (both average and instantaneous), step rate select, and standard exerciser functions. Optional accessories include cables for 5 $\frac{1}{4}$ " and 8" drives, alignment diskettes, and manuals for virtually every floppy disk drive. \$299.

Circle No. 71 on Free Information Card



## HEAVY-DUTY DAISY-WHEEL PRINTER

Data Terminals & Communications' DTC 450Z can run at a 100% duty cycle and is designed for heavy-duty use in a

commercial setting. It prints at 45 cps, producing one-eighth the noise of a standard office typewriter. With 100-character printwheels, it can print in 30 word-processing and 28 data-processing type

styles. It does sub- and super-scripts as well as automatic underlining, double striking and shadow printing. It utilizes standard Diablo 630 command codes. \$15.95.

Circle No. 72 on Free Information Card



## 5M-BYTE HARD DISK SYSTEM UNDER \$2000

Morrow has introduced a hard disk computer system with 5.4M bytes of storage capacity for less than \$2000. The MD5-E uses a 5 $\frac{1}{4}$ " Seagate Winchester drive capable of storing 2800 pages of text and also includes a dou-

ble-sided double-density 5 $\frac{1}{4}$ " floppy disk drive with a capacity of 384K bytes. The system, based on a 4-MHz Z80A, comes with 128K of RAM, keyboard, and terminal. It uses the CP/M Plus operating system, and NewWord and Correct-It software are included. \$1999.

Circle No. 73 on Free Information Card

## SOFTWARE SOURCES

**Art on the IBM PC.** With Dr. HALO, from Lifeboat Associates, your IBM PC can paint like an Apple Macintosh—in color. Dr. HALO lets you and your mouse create color images on the screen and print them out on a color printer, such as the IDS Prism. You can draw, paint, move, cut and paste, vary the width of the screen "brush" and copy one section of the screen to another, creating combinations of filled and unfilled rectangles, circles, squares and ellipses. Included in the package are six type fonts—including italic, script, Old English and Greek—with which you can label your drawings. The program also edits images created with other software, such as graphs from Lotus' Symphony. Dr. HALO is compatible with any Microsoft, Mouse Systems and Summagraphics mouse, as well as with many digitizers. It requires an IBM-PC-compatible color graphics board. If your PC doesn't have a mouse, you can still paint with keyboard commands. \$99.

Circle No. 83 on Free Information Card

**Apple Drum.** For percussionists now there's Drum-Key, an electronic music interface card and software for the Apple II+ and IIe. The sounds from Drum-Key are digital recordings of percussion instruments, including bass drum, snare, tom-toms, cymbals, cowbell and tambourine. You can compose, play and record your own patterns or play along with some 100 patterns and 26 songs built into the system. Musical notes appear on the screen during composition. You can set the tempo and the meter and store the patterns to disk. \$139. Address: Ensoniq, 1 Great Valley Parkway East, Suite 10, Malvern, PA 19355.



# YOU'LL AGREE.

For Business or Home, the Advanced Technology Tandy 1000 is Clearly Superior.™

Whatever your needs, the new Tandy 1000 is the personal computer for you. Unlike others, Tandy 1000 comes with multi-function DeskMate™ software when you buy it. But that's just the beginning.

## Choose from Popular Business Packages

Use your Tandy 1000 personal computer with top-name programs like Lotus 1-2-3, the number one seller on every software list! Or choose Finance Manager to gain a better understanding of your

finances. Many other packages are available to help you stay ahead of the game.

## The One Computer for the Whole Family

Tandy 1000 is a great learning tool for kids, too. Inexpensive educational programs like Facemaker help children become comfortable with computers by playing fun, games.

Plus, you and your kids both will enjoy action games like One-On-One basketball, strategy games like King's Quest and many others

## Tandy 1000 . . . Clearly Superior.

Software selection, easy user expansion and superb graphics make Tandy 1000 the best \$2000 computer you can buy—for only \$1199\*

Available at over 1200 Radio Shack Computer Centers and at participating Radio Shack stores and dealers

## Radio Shack® COMPUTER CENTERS

A DIVISION OF TANDY CORPORATION

\*Monitor and second drive sold separately. Prices apply at Radio Shack Computer Centers and participating stores and dealers. Lotus 1-2-3/TM Lotus Development Corp. Facemaker/TM Spinnaker. One-On-One/TM Electronic Arts. King's Quest/TM Sierra On-Line, Inc.



**Engineered for Excellence**  
The Tandy 1000 represents the state of the art in technology, outstanding quality and price breakthrough.

**Send Me a New 1985 Computer Catalog!**  
Mail To: Radio Shack, Dept. 85-A-396, 300 One Tandy Center, Fort Worth, Texas 76102

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
PHONE \_\_\_\_\_

## SOURCES OF INFORMATION ABOUT ONLINE DATABASES

### Magazines and Periodicals

#### Directory of Online Databases

Cuadra Associates  
2001 Wilshire Blvd., Suite 305  
Santa Monica, CA 90403  
213-829-9972

Quarterly publication. Publishes two main volumes per year, plus two supplement/updates, listing over 2000 databases. \$75/year

#### Online Today: The Videotex/Computer Magazine

CompuServe  
PO Box 20212  
Columbus, OH 43220  
614-457-8600  
Monthly, \$24/year

#### Online: The Magazine of Online Information Systems

Online  
11 Tannery Ln.  
Weston, CT 06883  
203-227-8466  
Monthly, \$78/year

#### Database: The Magazine of Database Reference and Review

Online  
11 Tannery Ln.  
Weston, CT 06883  
203-227-8466  
Monthly, \$56/year

#### Database Informer: The Newsletter of Information USA's Computer Data Service

Information USA  
4701 Willard Ave.  
Suite 1707  
Chevy Chase, MD 20815  
301-657-1200  
Monthly, \$78/year

#### Online Review: The International Journal of Online Information Systems

Learned Information  
143 Old Marlon Pike  
Medford, NJ 08055  
609-654-6266  
Monthly, \$70/year

#### Electronic Publishing Review: The International Journal for the Transfer of Published Information Via Videotex and Online Media

Learned Information  
143 Old Marlon Pike  
Medford, NJ 08055  
609-654-6266  
Monthly, \$66/year

### Books

#### Online Bibliographic Searching: A Learning Manual

by Ching-Chih Chen and  
Susanna Schweizer  
(Neal-Schuman Publishers  
New York, NY 10014)  
\$24.95

#### Get Connected: A Guide to Telecommunications

by Tom Kieffer and Terry Hansen  
(Ashton-Tate Publishing Group  
Culver City, CA 90230)  
\$24.95

#### The Online Micro User's Guide

by Carol Hansen  
(Hayden Book Co.  
Hasbrook Heights, NJ 07604)  
Includes Business Computer  
Network's communications program,  
SuperScout.  
\$21.95

#### The Complete Handbook of Personal Communications: Everything You Need to Go Online with the World

by Alfred Glossbrenner  
(St. Martin's Press  
New York, NY 10010)  
\$14.95

#### The Joy of Computer Communication

by William J. Cook  
(Dell Publishing Co.  
New York, NY 10017)  
\$5.95

#### Inc. Magazine's Databasics: Your Guide to Online Business Information

by Doran Howitt and  
Marvin I. Weinberger  
(Garland Publishing  
New York, NY 10016)  
Includes coupons redeemable for telecom-  
munications services and products.  
\$16.95

#### How to Get the Most Out of CompuServe

by Charles Bowen and David Peyton  
(Bantam Computer Books  
New York, NY 10103)  
\$12.95

#### Answers Online: Your Guide to Informational Databases

by Barbara Newlin  
(Osborne McGraw-Hill  
Berkeley, CA 94710)  
\$16.95

#### Getting On-Line: A Guide to Accessing Computer Information Services

by M. David Stone  
(Prentice-Hall  
Englewood Cliffs, NJ 07632)  
\$14.95

#### Omni Online Database Directory

by Mike Edelhart and Owen Davies  
(Macmillan Publishing Co.  
New York, NY 10022)  
\$19.95

### Software

#### Search Helper

Information Access Co.  
11 Davis Dr.  
Belmont, CA 94002  
415-591-2333  
800-227-8431  
Systems: Apple II and IIe  
IBM PC and XT  
\$200

#### In-Search

Menlo Corp.  
4633 Old Ironsides Dr. # 400  
Santa Clara, CA 95050  
408-986-0200  
Systems: IBM PC, XT, PCjr  
\$399

#### Dow Jones Access

##### Investor's Workshop

Systems: Apple II, IIe, IIc \$149

##### Market Manager Plus

Systems: IBM PC \$249.00  
Apple Macintosh \$199.00

##### Straight Talk

Systems: Apple Macintosh \$79  
Dow Jones  
PO Box 300  
Princeton, NJ 08540  
800-257-5114

##### Natural Link

Texas Instruments  
PO Box 402430  
Dallas, TX 75240  
800-527-3500  
Systems: Texas Instruments/IBM PC  
\$150

##### Portfolio Management System

IBM Personally Developed Software  
PO Box 3280  
Wallingford, CT 06494  
Systems: IBM PC & compatibles  
\$99

#### Programmable Access

##### ASCOM

Dynamic Microprocessor Assoc.  
545 Fifth Ave.  
New York, NY 10017  
212-687-7115  
Systems: CP/M, MS-DOS, others  
\$195

##### ASCII Express

Southwestern Data Systems  
PO Box 582  
Santee, CA 92071  
619-562-3221  
Systems: Apple  
\$129.95

##### Crosstalk XVI

Microstuf  
PO Box 33337  
Decatur, GA 30033  
404-952-0267  
Systems: IBM PC, Apple  
\$199

##### ERA 2 (includes modem)

Microcom  
1400A Providence Hwy.  
Norwood, MA 02062  
617-762-9310  
Systems: IBM PC \$499  
Apple IIe \$499  
Mac Modem \$599

##### Hayes Terminal Program

Hayes Microcomputer Products  
5835 Peachtree Corners E.  
Norcross, GA 30092  
404-449-8791

##### Microcomputer Information Support Tools + (MIST+)

New Era Technologies  
# 922  
2025 Eye St., NW  
Washington, DC 20006  
202-887-5440  
Systems: IBM PC  
\$295

##### Superscout

Business Computer Network  
2533 S. Highway 101, Suite 210  
Cardiff, CA 92007  
\$5/month software & database access

# Superior Selections Practical Prices!

Programs and projects for home and business use  
 Books on every popular personal computer!

Select 5 Books  
 for Only \$2<sup>95</sup>



**1985 Computer Era Calendar FREE!**



1743  
 List \$16.95



1394  
 List \$15.95



1285  
 List \$16.95



1506  
 List \$13.95



1620  
 List \$10.25 (paper)



1389  
 List \$15.95



1721  
 List \$11.50 (paper)



1276  
 List \$10.25 (paper)  
 1455  
 List \$10.95 (paper)



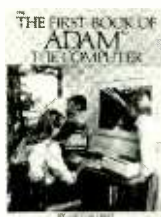
1466  
 List \$18.95



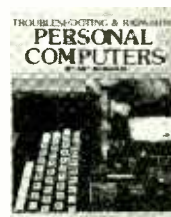
1726  
 List \$14.95



1501  
 List \$15.50 (paper)



1720  
 List \$14.95



1539  
 List \$21.95



1754  
 List \$12.95

**Solving Math Problems in BASIC**  
 by Thomas P. Price

1564  
 List \$19.95



1750  
 List \$19.95



1840  
 List \$16.95



1228  
 List \$9.25 (paper)



1821  
 List \$15.95



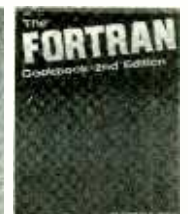
1449  
 List \$19.95



1860  
 List \$19.95



1709  
 List \$18.95



1737  
 List \$18.95

## 7 very good reasons to join The Computer Book Club®

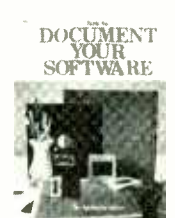
- Big Savings.** Save 20% to 75% on books sure to increase your computer know-how.
- No-Risk Guarantee.** All books returnable within 10 days without obligation.
- Club News Bulletins.** All about current selections—mains, alternates, extras—plus bonus offers. Comes 13 times a year with hundreds of up-to-the-minute titles you can pick from.
- "Automatic Order."** Do nothing, and the Main selection will be shipped automatically. But . . . if you want an Alternate selection—or no books at all—we'll follow the instructions you give on the reply form provided with every News Bulletin.
- Bonus Books.** Immediately get a Dividend Certificate with every book purchased and qualify for big discounts of 50% to 80%.
- Extra Bonuses.** Take advantage of added value promotions, plus special discounts.
- Exceptional Quality.** All books are first-rate publisher's editions selected by our Editorial Board and filled with useful, up-to-the-minute information.



1748  
 List \$16.95



1428  
 List \$10.95 (paper)



1724  
 List \$19.95



**1985 Computer Era  
 Calendar FREE  
 when you  
 join!  
 Publisher's List \$6.95**

## ITT Xtra

(Continued from page 32)

ed by ITT, I succeeded in creating and manipulating dBase files. There was no problem with version 2.41 of dBase II under ITT-DOS or PC-DOS on the Xtra.

Other IBM format programs that worked normally on the Xtra included WordStar, Flight Simulator, Borland International's Sidekick, the Crosstalk communications program, and miscellaneous public domain software packages.

### ITT VisuALL Shells

One extra that the Xtra does offer to users is a special "VisuALL" menu system supplied with all ITT-label software (currently WordStar, Easywriter I, and Multiplan). Unfortunately, the main VisuALL program, called ITT.PRO, was not being shipped at the time of this review so I couldn't get any hands-on experience of the ITT versions of this product. However, I am familiar with

#### Specifications

**Product:** ITT Xtra

**Mfr:** ITT Information Systems,  
1455 W. 12 Place,  
Tempe, AZ 85281

**Dimensions:** 15 $\frac{3}{4}$ "  $\times$  14"  $\times$  5 $\frac{1}{2}$ "

**Price:** \$3425

**Features:** 8088 CPU, 256K bytes of RAM, dual 360K half-height floppy disks, video adapter card, serial and parallel ports, color monitor

the generic VisuALL product, a pseudo-windowing system for a wide range of MS-DOS machines.

The notion behind VisuALL is that instead of requiring users to learn all the major MS-DOS commands before they can efficiently use an IBM PC or similar machine, the program provides a user-friendly software "layer" on top of MS-DOS. This layer, or shell, allows you to select various commands or program names from a window-like menu that can be displayed at any time.

So, if you want to use the Edlin line editor, you would bring up the VisuALL MS-DOS menu, place the cursor under the "Edlin" entry and press the return key. Since Edlin always needs to be given a filename to work on when it is first invoked, VisuALL would then prompt for a filename before loading the program.

Typically, a VisuALL shell will provide a variety of task-specific menus. Within a word processor there might be one menu for text editing functions and another for document printing, for example. Commands can be entered via keyboard function and cursor control keys or, preferably, by means of an attached mouse.

There is no doubt that the VisuALL shells can help you learn about a new program fairly quickly and painlessly. However, the application shells do tend to occupy large amounts of disk space (since there must be a statement accounting for each and every menu selec-

tion). Many users will find that, after a month or so, they can use most programs quite happily without VisuALL.

### Conclusion

Those hoping that the ITT Xtra will provide new, sophisticated features above and beyond those available with the IBM PC will be disappointed. The Xtra does have some plus points: It comes standard with both a serial and a parallel port and it has a slightly smaller footprint than the IBM PC. Internally, it is well designed, and all the accompanying documentation is professionally produced and quite thorough.

In its current form, the ITT Xtra only ranks as a "good" IBM-type personal computer. ITT must put much more effort into the development of ITT-specific hardware and software products if the Xtra is ever to stand above the rest of the compatible crowd.  $\diamond$

**Editor's Note:** ITT has announced three new products to be released in March, 1985. These are a voice communications system, a micro-to-mainframe communications link, and a graphics board. The voice communications system consists of a plug-in board for speech recognition, digitization, and playback, with telephone capabilities. With the board are a speaker enclosure, microphone and software. The two boards for micro-to-mainframe communications are: one for emulating an IBM 3278 or 3279 display terminal, and another that supports IBM 3270 PC emulation. An adaptor board provides text and graphics on a variety of ITT monitors.

## Computer Scientist

(Continued from page 24)

about 120, I used WINDOW to establish  $xy$  coordinates having  $\pm 60$  units.

Lines 60-150 establish a loop that draws the progressively smaller boxes and plots on the screen the joystick-controlled dot. Line 130 draws the box having dimensions given by the FOR statement in line 70. Line 80 assigns variables to the joystick outputs, and line 90 applies a correction factor so that the joystick values range from -60 to +60 in both the  $x$  and  $y$  directions.

Line 100 lights up the pixel at the corrected joystick  $xy$  values. Line 110 removes the negative sign from the joystick values. And line 120 detects when the joystick coordinates exceed those of the box. When this occurs, the computer beeps and the remaining score is decreased.

After the shrinking box disappears into the center of the screen, the final score is printed on the monitor. Lines 170-190 permit the user to try again by pressing one of the joystick buttons.

The program in Listing 3 can be modified in several ways. For instance, the rate at which the box shrinks can be slowed down or speeded up by changing the step value in line 70. Keep in mind that this will also change the maximum possible score and will therefore require that line 50 be revised accordingly. In any case, this program may require more modification for use with computers other than the PCjr than do the previous programs.

### Centering Ability Test

How many times have you tried to place a dot at the exact center of a circle? This task isn't as easy as it might first appear, as you will quickly learn by trying the program in Listing 4.

This program draws a circle on the screen and then starts a timer. The object is to use a joystick to move a dot on the screen until it's located precisely at the center of the circle. The computer will then beep and the elapsed time will be

displayed on the screen (Fig. 2).

Like the program in Listing 3, this program uses a few PCjr statements that are not available with all computers. Nevertheless, it should be possible to adapt the general ideas to other machines without major difficulty.

In operation, line 50 sets the clock to 00:00:00 hours. As in Listing 3, lines 60-100 establish custom screen coordinates of from -60 to +60 for both the  $x$  and  $y$  axes and apply an appropriate correction factor to the joystick readings. The loop formed by lines 80-140 monitors the movement of the joystick until its  $x,y$  values equal the coordinates at the exact center of the circle (0,0). When this occurs, the computer beeps, and the elapsed time is displayed on the screen. Lines 160-180 permit the program to be run again simply by pressing one of the joystick buttons.

This program can be modified to present the average elapsed time of a sequence of runs. One modification I tried

# Computer Scientist

that at first seemed interesting was to cause the joystick to draw a continuous track on the screen. Unfortunately, the continuous line soon merged into a blob near the center of the screen as the search for the exact center progressed. Since it was impossible to find the moving dot within the blob, I eliminated this feature from the final program

## Hi-Lo Game

Computers are well suited for presenting many kinds of logic tests that, while simple, are too complex for presenting on paper. The Hi-Lo game in Listing 5 is a typical example.

The object of this game is to guess in as few tries as possible a number between 0 and 100 randomly selected by the computer. The computer informs the player whether the guess is too high or too low, and the player is then allowed another guess. When the guess is correct, the computer informs the player and gives the total number of guesses.

The program in Listing 5 is straightforward and self-explanatory. It should run on most computers, though the random number statement in line 10 may require revision. As for additional revisions, you might better spend your time devising other logic games. The possibilities are endless.

## Optical Illusion Test

Figure 3 shows how a very well-known optical illusion appears on a computer screen. Many other optical illusions can be replicated this way.

The program used to produce the image in Fig. 3, which is given in Listing 6, is straightforward and easily modified for use with most computers. Lines 60-170 draw the two figures on the screen using the PCjr's medium-resolution coordinates. If you have a different computer, determine the proper coordinates by sketching the image on a grid marked with your machine's xy coordinates.

## Going Further

Though the tests described above are presented on an individual basis, they can be merged into a single program. A few extra instructions would enable the program to present a cumulative score for all six tests.

Some of these tests, particularly those that measure reaction time and memory, might make interesting subjects for research studies. For instance, subjects could be tested before and after strenuous physical activity or consuming a drug like alcohol.

Keep in mind that the six programs

**"RATED #1 FOR SERVICE & RELIABILITY"**

**J&R MUSIC WORLD**

**23 PARK ROW  
NEW YORK CITY  
NEW YORK  
10038**

**SPECIALS OF THE MONTH**

MasterCard  
VISA

---

**COMMODORE PLUS/4**

**IN STOCK!**



GAK Computer with Word Processing, Spreadsheet, Graphics and File Manager Software Built-in

**COMMODORE 64 SOFTWARE**

BATTERIES INCL. SuperDisk/Smart ACCESS 3.5" 124.95  
SCARBOROUGH MasterType 30M 124.95  
COMMODORE Simons Basic 124.95  
EPYX Summer Games 124.95  
EPYX Baseball 124.95  
SYNAPSE Bull Mail 124.95  
ACCESS Read On Novels 124.95  
COMMODORE Nevada Fortune 124.95  
CONTINENTAL Home Accountant 124.95  
SYNAPSE Zeebook 124.95  
HAYDEN Simon II Chess 124.95  
ATARISORT Blue Position 10M 124.95  
HESWARE Whelan 124.95  
COMMODORE E7 Script 124.95  
PRECISION SuperBase 124.95  
EPYX World Zone 124.95  
EPYX Inspire Mission 124.95  
COMMODORE Nevada 124.95  
COMMODORE Logo 124.95  
COMMODORE M6K 124.95  
BARRONS J.A.T. Study Course 124.95  
ELECT ARTS Profile Construction 124.95  
SCARBOROUGH Alpha Network 124.95

**JUKI 6100 DAISY WHEEL COMPUTER PRINTER**

**\$399**

Triplet Pitch, 8-Directional Printing Parallel Interface, Soft-Touch Controls

**PRINTERS**

JUKI TRACTOR ADAPT 6100 139.95  
SILVER REED EXP500P Daily 149.95  
COMMODORE MIP500 Dot Mat 159.95  
ATARI 1027 Letter Quality 159.95  
EPSON MX100 100 Column 429.95  
OKIDATA PRINTERS 249.95  
EPSON RX200 1 Dot Matrix 289.95  
CANON PC 10 Inkjet Color 229.95

**COMPUTER SYSTEMS**

ATARI 800XL 384 Computer 114.95  
COMMODORE 64 100K Upgrade IN STOCK!  
IBM PC 4 IBM PC AT IN STOCK!  
APPLE IIc Portable 38K Drive IN STOCK!  
SANYO MBC 555H 640-Qua Drive 1029.95  
EPSON QX-10 1000s Computer IN STOCK!  
APPLE IIc Upgrade & Repair Systems IN STOCK!  
SHARP EL5000 Mini-Notebook 724.95

**IBM SOFTWARE**

HAYDEN Simon II Chess 139.95  
BLUE CHIP Microbase 149.95  
SCARBOROUGH MasterType 30M 124.95  
ATARI D5510 Robotron 20M 124.95  
MICROSOFT Trip Simulator 139.95  
CBIS Multimedia 12 279.95  
MECA Airline Management 169.95  
BARRONS 5.1.1 Study Course 69.95  
ALPHA Network Organizer 259.95  
BLUE CHIP Microbase 149.95  
BRODERBUND BankStreet Writer 59.95  
INFOCOM 2000 409.95  
LOTUS 1-2-3 299.95  
SIERRA Championship Bowling 124.95  
INFOCOM 2000 409.95  
ATARISORT D5510 Defender 79.95  
SPRINKLER Lawn Drawing 32.95  
CBS SOFTWARE Learning Bridge 49.95

**APPLE SOFTWARE**

EPYX Summer Games 124.95  
CONTINENTAL Home Accountant 124.95  
SCARBOROUGH BankStreet Writer 124.95  
SCARBOROUGH MasterType 30M 124.95  
ELECT ARTS Sky Fog 124.95  
HAYDEN Simon II Chess 124.95  
SIERRA Ultima II 124.95  
SIERRA Ultima III 124.95  
BARRONS 5.1.1 Study Course 69.95  
ELECT ARTS ArcBall Construction 79.95  
SIERRA Screen Writer & Editor 69.95  
ELECT ARTS Music Construction 79.95  
KODAL Touch Tablet 179.95  
KODAL Logo Design Maker 124.95  
SUNCOM Party Quiz Game 58.95  
SPRINKLER Lender's Loan 119.95  
SIERRA HomeWorld 34.95

**APPLE MACINTOSH**

**IN STOCK!**

The Computer For The Rest Of Us™

**MACINTOSH SOFTWARE**

HAYDEN Simon II Chess 139.95  
BLUE CHIP Microbase 149.95  
INFOCOM Encipher 79.95  
INFOCOM WordPerfect 119.95  
MICROSOFT BASIC Interpreter 129.95  
SIERRA Frogger 129.95  
HAYDEN Balance Sheets 139.95  
MICROSOFT WordPerfect 120 169.95  
SOFTWARE PUB. 385 Pack 99.95  
SOFTWARE PUB. 385 Report 99.95  
T. HAWKER Cockpit 139.95  
MONOGRAM Dollars and Sense 119.95

**ATARI SOFTWARE**

ATARI RX8016 ScanWriter 30M 134.95  
MPP Macintosh 30M 134.95  
ATARI RX8043 384 KHz. Mini ROM 14.95  
ATARI CX4024 Librarian 30M 14.95  
SCARBOROUGH MasterType 30M 124.95  
ATARI RX8019 Eastern Front 150 124.95  
ELECT ARTS Action II 29.95  
ORION Ultima II 64.95  
ATARI CX4022 384 KHz. Mini ROM 132.95  
SEGA Zeebook 30M 29.95  
ACCESS Bookhead 24.95  
ATARI RX8014 Rose Position 30M 34.95  
BRODERBUND BankStreet Writer 44.95  
ELECT ARTS 7 Cities of Gold 29.95  
INFOCOM Zone 124.95  
ATARI CX277 Touch Table 39.95  
ATARI CX8126 MicroSoft BASIC 139.95

**DISCWARE SPIKEMASTER SURGE PROTECTOR**

**\$44.95**

4 Outlet Multi Stage Suppressor RFI Filter and Extension Cord

**COMPUTER ACCESSORIES**

CARDCO 7 + C Cc Printer Interface 64.95  
NETWORK WIRE TREE II Plus Surge Prot 49.95  
ATARI RX8043 384 KHz. Mini ROM 14.95  
PANAMAX II Plus Surge Prot 59.95  
MPP 1000C Cheat Code-Anti Cheat 119.95  
NES Super 2 w. Software 89.95  
ORANGE MICRO Apple Cc Adapter 99.95  
CLASSIC Virus Computer Clean 169.95  
Special Mode with Order 46.99 ea.  
HAYES 1200 External Modem 479.95  
NOVATION APPLETALK Low Noise 208.95

ALL SOFTWARE DISK BASED UNLESS OTHERWISE NOTED

**SUB-LOGIC FLIGHT SIMULATOR II**



**\$34.95**

Choose Airports, Weather and More! Available for C64, Apple, Atari

**5.25 INCH FLOPPY DISKS**

NASHUA MD10 15 10 18.99  
NASHUA MD20 15 10 24.99  
TOK M105 15 10 22.99  
RANA 1000 DOS Atari Drive w/ 205 229.95  
MEXAL M105 15 10 28.95  
OYSAN 104 10 15 10 29.99  
VERBATIM MD25 15 10 29.99  
MEXAL M105 15 10 39.99

**OKIMATE 10**

**IN STOCK!**

**COLOR PRINTER**  
• Over 25 Colors! • Print Letter Quality Reports • Atari/Commodore 64 Compatible (Specify When Ordering)

**DATA STORAGE**

COMMODORE 1541 Disk Drive 239.95  
COMMODORE 1550 Disk Drive 199.95  
ATARI 1050 Disk Drive w/ 205 199.95  
ATARI 1510 Disk Drive Recorder 159.95  
INDUS ATARIC Deluxe Atari Drive 299.95  
RANA 1000 DOS Atari Drive w/ 205 229.95  
RANA ELITE II 1.1 Mega Byte Car Card 299.95  
APPLE IIc External Drive 299.95  
APPLE MACINTOSH Ext. 15. Drive 429.95  
INDUS APPLICET Apple IIc Drive 139.95

**NOTE: WE CARRY A FULL LINE OF AUDIO, VIDEO, AND COMPUTERS IN EVERY MAJOR BRAND. THIS LISTING IS JUST A SMALL SAMPLE IN OUR 10,000,000 INVENTORY. PLEASE CALL US TOLL FREE OR WRITE TO US FOR PRICES ON ITEMS NOT LISTED IN THIS AD.**

**23 PARK ROW, DEPT. CE2, NYC, NY 10038**

**\* FREE GIANT CATALOGS: CALL TOLL FREE 1-800-426-6027**

368 PAGE AUDIO/VIDEO/COMPUTER CATALOG • 80 PAGE RECORD AND CASSETTE CATALOG • 80 PAGE VIDEO MOVIE CATALOG

\* Please Send \$1.00 For Shipping & Handling

# FREE CATALOG

**YOUR 80-PAGE GUIDE TO COMPUTER SUPPLIES AND ACCESSORIES - INCLUDING COMPLETE NEW PRODUCT DESCRIPTIONS.**

- Packed with over 1600 products for microcomputers, mini-computers, and word processors - many available nowhere else.
- Big special section devoted to new supplies and accessories.
- Comprehensive product descriptions - with more than 475 full-color photos - clearly explain features and benefits.
- Easy-to-use cross reference guides to magnetic media, ribbons, and more - along with the industry's most complete cable guide.
- Helpful suggestions and tips, ranging from flexible disk care to proper ribbon selection to useful application ideas.

**PHONE TOLL-FREE 1-800-547-5444\* OR SEND COUPON BELOW TODAY.**

\*In California, call 1-800-547-5447

**inmac**™

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_ ZIP \_\_\_\_\_ PHONE \_\_\_\_\_

Please rush my free copy of the Inmac Catalog. I understand there is absolutely no obligation whatsoever.

Circle No. 12 on Free Information Card

# DAISY WHEEL PRINTER SALE!

# JUKI®

DELUXE LETTER QUALITY  
"DAISY WHEEL PRINTERS"



Letter Quality Printer

# JUKI®

DELUXE COMPUTER PRINTER

List Price \$399      **SALE \$249**

- Superb "Daisy Wheel" Computer Printer
- 100 Characters
- Bi-directional with special print enhancements-many type styles-\$18.95
- Pitch 10, 12, 15 CPI
- Print Speed up to 12 CPS
- Print line width: 115, 138, 172 characters
- 13" Extra large carriage
- Drop in cassette ribbon (replacement \$8.95)
- Centronics parallel, RS 232 Serial interface built in (specify)

# JUKI®

DELUXE "COMBINATION"  
PRINTER/TYPEWRITER

List Price \$499      **SALE \$299**

- Superb Computer Business printer combined with world's finest electronic typewriter!
- Two machines in one—just a flick of the switch!
- Superb letter quality correspondence—home, office, word processing!
- 13" Extra large carriage
- Drop in cassette ribbon—replacement \$8.95
- Precision daisy wheel printing—many type styles! \$18.95
- Pitch selector-10, 12, 15 CPS, Automatic relocate key!
- Automatic margin control and setting! Key in buffer!
- Centronics parallel or RS 232 Serial interface built-in (specify)



Letter Quality Printer/Typewriter

**15 Day Free Trial - 90 Day Immediate Replacement Warranty**

• COMMODORE 64 COMPUTER INTERFACE ONLY \$49.00

- ATARI INTERFACE \$79.00

ADD \$10.00 for shipping and handling!!

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail! Canada orders must be in U.S. dollars. VISA — MASTER CARD ACCEPTED. We ship C.O.D.

# PROTECTO ENTERPRISES

WE LOVE OUR CUSTOMERS

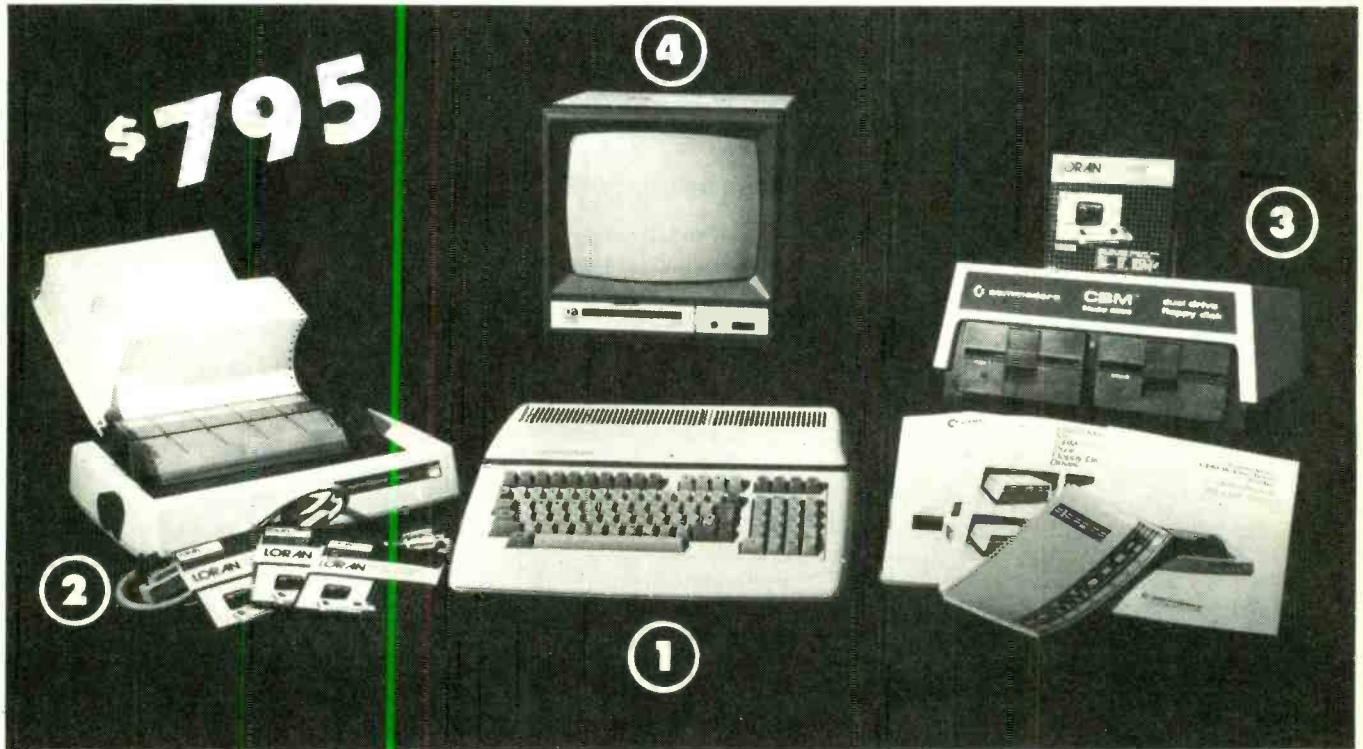
BOX 550, BARRINGTON, ILLINOIS 60010  
Phone 312/382-5244 to order

Circle No. 38 on Free Information Card

NEW 128K — MEGA BYTE DUAL DISK DRIVE — 80 COLUMN

# COMPUTER SYSTEM SALE!

HOME • BUSINESS • WORD PROCESSING



LOOK AT ALL YOU GET FOR ONLY **\$795.**

- |  |            |           |
|--|------------|-----------|
| ① B128 COMMODORE 128K 80 COLUMN COMPUTER           | LIST PRICE | \$ 995.00 |
| ② 4023 - 100 CPS - 80 COLUMN BIDIRECTIONAL PRINTER |            | 499.00    |
| ③ 8050 DUAL DISK DRIVE (over 1 million bytes)      |            | 1795.00   |
| ④ 12" HI RESOLUTION 80 COLUMN MONITOR              |            | 249.00    |
| • BOX OF 10 LORAN LIFETIME GUARANTEED DISKS        |            | 49.95     |
| • 1100 SHEETS FANFOLD PAPER                        |            | 19.95     |
| • ALL CABLES NEEDED FOR INTERFACING                |            | 102.05    |



**TOTAL LIST PRICE \$3717.95**

**PLUS YOU CAN ORDER THESE BUSINESS PROGRAMS AT SALE PRICES**

<b>Programmers Reference Guide</b> List \$29.95 <b>Sale \$24.95</b>	Professional 80 Column Word Processor	LIST \$149.95	SALE \$99.00	SYSTEM PRICE \$49.00	Payroll	LIST \$149.95	SALE \$99.00
	Professional Data Base	\$149.95	\$99.00	\$49.00	Inventory	\$149.95	\$99.00
	Accounts Receivable	\$149.95	\$99.00		General Ledger	\$149.95	\$99.00
	Accounts Payable	\$149.95	\$99.00		Financial Spread Sheet	\$149.95	\$99.00
					Order Entry	\$149.95	\$99.00

**PRINTER REPLACEMENT OPTIONS**

replace the 4023 with the following at these sale prices)

☆ Olympia Executive Letter Quality Printer	LIST \$699.00	SALE \$379.00
☆ Comstar Hi-Speed 160 CPS 15 1/2" Business Printer	\$779.00	\$469.00
☆ Telecommunications Deluxe Modem Package	\$199.00	\$139.00
☆ IEEE to Centronics Parallel Printer Interface	\$179.00	\$139.00

**15 DAY FREE TRIAL.** We give you 15 days to try out this SUPER SYSTEM PACKAGE!! If it doesn't meet your expectations, just send it back to us prepaid and we will refund your purchase price!!

**90 DAY IMMEDIATE REPLACEMENT WARRANTY.** If any of the SUPER SYSTEM PACKAGE equipment or programs fail due to faulty workmanship or material we will replace it IMMEDIATELY at no charge!!

**Add \$50.00 for shipping and handling!!**

**WE DO NOT EXPORT TO OTHER COUNTRIES**

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail! We accept Visa and MasterCard. We ship C.O.D. to continental U.S. addresses only.

**PROTECTO ENTERPRISES** (WE LOVE OUR CUSTOMERS)

BOX 550, BARRINGTON, ILLINOIS 60010  
 Phone 312/382-5244 to order

## CALCULATOR SAVINGS



HP-11C Programmable	\$64.99	82160A HP-IL Module	\$99.99
HP-12C Financial	99.99	82161A Cassette Drive	359.99
HP-15C Programmable	99.99	82162A HP-IL Printer	359.99
HP-16C Hexadecimal	99.99	82164A RS-232 Interf.	249.99
HP-41CV Alpha Progm	189.99	82165A HP-IL Modem	469.99
HP-41CX Extnd Functn	259.99	82169A 80 col Video Int	399.99
82104A Card Reader	149.99	9111A HP-IL Disk Drv	649.99
82143A Printer	299.99	82180A Extnd Functions	59.99
82153A Wand	99.99	82181A Extnd Memory	59.99
HP-97 Desk Progm	599.99	HP-41 System Case	49.99
HP-71B Computer	419.99	Pori-X Tenor to 10 ports	129.99
82700A Card Reader	124.99		
82401A HP-IL Interface	107.99		
82420A 4K Mem for 71B	59.99		
HP-75C Computer	699.99		
HP-75D Computer	929.99		
82700A 8K Mem for 75	149.99		

Call for Low Prices on all Accessories and Software

TI	TI-86 Advanced Programmable, 500 steps	\$59.99
	TI-5511 Scientific Calculator w/ Statistics	59.99
	LCD-Programmer Hexadecimal Converter	59.99
Brother	BP-30 Type-A Graph Typewriter/4-Color Graph Maker	\$239.99
Canon	TYPESTAR-5 Portable Electronic Typewriter	\$189.99
	TYPESTAR-6 Portable Electronic Typewriter 2K Memory	249.99

Sharp	EL-7050 Graphwriter 4-color Printing Calc	\$79.99
	EL-7001 Memowriter with 40 word memories	39.99
	EL-5500 II Handheld Computer/Calculator	79.99
	PC-1250A Pocket-size BASIC Computer	69.99
	PC-1261 Two-line 10K Pocket Computer	159.99
	PC-1500A Expandable 8K Handheld Computer	179.99
	CE-125 Printer/Microcassette for 1250A/1261	139.99
	CE-126P Cassette Interface/Printer for 1250A/1261	79.99
	CE-150 Cassette Interf./Plotter for 1500A	179.99
	CE-158 RS-232C & Parallel Interface for 1500A	159.99
	CE-161 16K Memory Expan with Battery Back-up	139.99

Casio	FX-700P Handheld Computer, 1568 steps	\$59.99
	FA-3 Cassette Adapter for FX-700P	34.99
	FX-12 20-column printer for FX-700P	59.99
	FX-98 Credit Card Solar Scientific Calculator	24.99
	FX-451 Scientific Calculator with Hexadecimal	29.99
	FX-720P Expandable Handheld Computer	79.99
	FX-750P Expandable 4K Handheld Computer	109.99
	SL-800 Film Card	22.99

Use cashier's check, Postal money order, VISA or M/C. Personal checks take five weeks to clear. Add shipping 1% of your order (US 95 min. min). East of Miss. Pk extra 11.50 CA res add 6%. Subject to availability. USA only.

ORDER 800-421-5188 Outside  
TOLL-FREE Information line (213) 633-3262 CA AK HI

**tam's** Tam's Inc. Dept CE-11  
INCORPORATED 14932 Garfield Ave.  
Paramount, CA 90723  
(213) 633-3262

Circle No. 42 on Free Information Card

## Computer Scientist

described above are merely representative of the many kinds of psychological and physiological tests that can be administered with the help of a personal computer. If you want to develop your own tests, consider creating computerized versions of standard paper and ink tests, such as those that measure visual acuity and detect color blindness. Com-

puters with joystick ports can be used to detect galvanic skin response, thereby providing an additional input.

Finally, it's important to realize that psychological and physiological testing are specialized fields. Before using a computer to perform such tests for a fee, you should be aware that federal, state and local regulations may apply. ◇

## HP Unix

(Continued from page 45)

### Performance

I wrote two short programs to test the speed and multitasking performance of the HP-IPC. The first, in which I compared the HP-IPC to the IBM-PC and IBM-PC/AT, was a C language version of Sieve of Eratosthenes. The execution times were:

HP-IPC	4.30 sec
IBM-PC	9.14 sec
IBM-PC/AT	7.31 sec

The second program was a short one that simply loops on a counter and periodically displays the current count to the screen. I wrote this program in order to load multiple copies to test the multitasking performance of the HP-IPC. The final result is that, with six different copies of the loop program loaded, plus the three tasks already running (PAM, the time and date display, and the window management), I encountered no noticeable delay when I entered additional keyboard commands to PAM. However, a curious phenomenon occurred.

Let I mislead anyone with the following discussion, let me say that, to HP's credit, it has provided the most flexibility possible for the window management/keyboard entry environment.

When you give PAM a command to load a program, that program becomes the active window. Thus, subsequent keyboard entries will go to the loaded program's window. To make PAM the active window again, you reselect PAM by simultaneously pressing SHIFT/SELECT (or by pressing the left button on the mouse).

However, since the program running displays to the screen, when it's ready to display it shifts that window back to the top of the display, and the HP-IPC does not shift the PAM window back to the top again until you press another key. Thus, when you type the next keystroke, it looks like the character will go to the program's window, when, in fact, it is then that the window manager shifts PAM back on top to accept the character.

By the time you've loaded a few more programs (reselecting PAM as the active window each time), trying to determine which window your keyboard entry is going to get confusing. The problem is that the on-screen indicator is not as obvious as the window itself and this should be pointed out in the documentation.

The solution HP provides is to allow you to "hide" windows: When you load a program, you can hide it, and no window swapping will occur. When you unhide the window, it comes back, complete with any screen displays generated. I think I would prefer either an automatic swapping back or a more obvious screen indication of which window is scheduled to receive keyboard input over being forced to hide windows. The flexibility is there.

### Summary

The Hewlett-Packard Integral Personal Computer is well-thought-out, solidly built, and well-presented. The relation of its performance to its price amounts to an exciting technological breakthrough. I suspect that the initial buyers will be members of the academic and scientific communities who are already experienced with Unix and who will welcome a low-cost system from a major vendor as well as system developers who are willing to gamble that Unix is, in fact, on its way (and in a big way) into the end-user community.

The problem for system developers is that the basic HP-IPC, as it is shipped (with its low price), simply cannot be used for system development. I could not write the simplest program without an additional 512K-byte RAM card, and I cannot imagine trying to do development without one of the optional hard disk attachments. Although prices are not yet firm, those two items are going to raise the price to around \$8000.

My conclusion is when the system is available, I will look for a client who wants some system work done for an installation using the HP-IPC. Then I will be able to justify purchasing one to do the development. I want one. ◇

## DOUBLES DISK CAPACITY!

Cuts Your Cost 50%!

Now! The back of your 5 1/4" diskettes can be used for data storage even with single head disk drives

- **NIBBLE NOTCH** makes it easy
- Adds the notch needed
- **SATISFACTION OR MONEY BACK**

### NIBBLE NOTCH I

Cuts square notch for Apple, II, II+, IIe, IIc, III, Franklin and Commodore.

only \$14.95\*

### NIBBLE NOTCH II

For use with computers other than those shown above.

only \$21.90\*

### DISK OPTIMIZER SYSTEM

SOFTWARE FOR APPLE, II, II+, IIe, III & Franklin

- 469% FASTER Than Similar Programs!
- Certifies your "NEW" disk 100% Error Free
- Removes Bad Sectors • Adds 36th Track
- Performs Disk Drive Speed Check
- Adds DOS and More

only \$24.95\*

### - SPECIAL PACKAGE PRICE -

### NIBBLE NOTCH I & DISK OPTIMIZER

only \$29.95 for both\*

\*add \$2.00 each order (\$5.00 foreign)

For Postage and Handling

- Florida Residents Add 5% Sales Tax -

**ORDER TODAY!**

Toll Free 1-800-642-2536

FLORIDA: 1-305-493-8355

OR SEND CHECK OR MONEY ORDER TO

**NIBBLE NOTCH COMPUTER PRODUCTS**  
4211 NW 75th TERRACE, DEPT. 8 4  
LAUDERHILL, FL 33319

PATENTED

ALL TRADEMARKS ARE ACKNOWLEDGED

Circle No. 5 on Free Information Card



## Online

(Continued from page 53)

scribers to the Dow Jones Information Service have access to data from corporate disclosure statements filed with the Securities and Exchange Commission, weekly economic data, tables of stock prices and earnings, and projections of major corporation earnings, all for typical prices of \$0.60 to \$1.20 per minute. Other business and economic databases are available through such services as Chase Econometrics.

Online references offer other advantages besides timeline. A crucial one for engineers and scientists is the ability to search data tabulations for properties of materials that meet their requirements. For example, an engineer might need to know what plastics have tensile strengths above a certain level and can withstand temperatures above 250°C. In place of a tedious search through long, printed tabulations, a database search routine could do the job and get results back much faster.

Another type of reference now appearing online is the industry directory, a listing of companies in a particular field, like the *Yellow Pages* classified by their products. Printed versions issued by specialized publishers are widely used, but often the data they contain are months old by the time they are printed, and updates are issued only once a year. Online versions can be updated more often and more quickly. In addition, users can search the online version to find products that meet such requirements as operating power, something impossible or impractical with printed directories.

One new service, VideoLog, offered by VideoLog Communications of Norwalk CT, can be searched for 15 types of data, and covers 2000 product categories in electronics manufactured by over 14,000 companies. Commercial microcomputer software is tabulated online in the Online Microcomputer Software Guide and Directory, produced by Online of Georgetown, CT, and offered on BRS. However, so far no one has taken the seemingly obvious step of producing an online directory of online databases.

### Job Listings

Online employment ads also are becoming popular. A fairly typical approach is taken by CLEO, the Computer Listing of Employment Opportunities, based in Torrance, CA. Companies with openings pay to have descriptions listed. Job-hunters can use their personal computers to browse through the database, at no cost other than that of the communication link. If they find something they like, they can fill out online resumes and

dispatch them via electronic mail to the companies.

Founded in 83, CLEO expanded quickly from its initial California base to cover parts of the East Coast. Job listings tend to be for high-technology professionals, the type of people who would rather search a database than read newspaper help-wanted ads. One big benefit of the online approach is the ease of searching out openings that meet specif-

ic criteria. For example, a job-hunter could find the one opening for a radar-systems engineering manager in the Los Angeles area by an online search, without having to check 40 pages of ads in Sunday newspapers.

### Serving Up the Databases

Typically, organizations that compile databases are not the ones that offer them online. Services such as Dialog and

# MITE is Changing the Way Businesses Talk!



## Is the Sales Report Ready? Then "MITE It To Me!"

With MITE, the industry's most powerful and easy-to-use data communications program, the world of on-line information is as close as your computer. With the power of MITE, you can automatically log-on to your favorite information service, and capture the information for later editing or analysis. Why bother with overnight express delivery services when you can send documents anywhere in the world in seconds. With MITE, you have the choice of several different error checking protocols including the industry

standard XMODEM protocol with CRC and Batch file capabilities. With the addition of the MITE+ Terminal Emulation Module, you can turn your computer into any of over ninety different terminals including a DEC VT100, IBM 3101 or Televideo 950.

MITE is available for over 130 different computer systems (CP/M and MSDOS), including the IBM PC/XT/AT, AT&T 6300, Sanyo 555, Apple Macintosh, DEC Rainbow, Kaypro and Televideo.

Physical Address:  
2615 North Monroe Street  
Tallahassee, FL 32303

**MYCROFT  
LABS INC**

Mailing: P.O. Box 6045  
Tallahassee, FL 32314  
Telephone (904) 385-1141

Circle No. 66 on Free Information Card

## Online

BRS do produce a few databases, but most of the databases they offer are produced by others, private companies, professional societies, and government organizations. Some of the private database suppliers build in elaborate indexing mechanisms to aid specialists using them. For example, IFI/Plenum and Derwent incorporate indexing and reference systems into their patent databases, while the Institute for Scientific Information includes elaborate cross-referencing schemes for scientists trying to identify research trends.

Online services select databases and provide software that handles user requests. Many databases show up on two or more online services—sometimes in different forms. Some services do not keep online all of such gigantic databases as Inspec, for example. Or they break them into two or more files to be searched separately. In some cases the same database goes by different names on different services, which has confused more than one directory compiler. Some compilers of databases also function as online services offering a single database;

examples include CLEO and VideoLog.

Major online services tend to fall into two broad categories: general-purpose and professional. The Source, CompuServe, and Delphi are designed as "information utilities," accessible and usable by almost anyone with a computer. They contain much more than standard databases. Their electronic mail, computer conferencing, and messaging services are very popular. They also offer computer shopping, restaurant reviews, and other consumer information.

Most other online services are intended to serve professional users, and typically require more sophistication and effort—and cost more—than The Source, CompuServe, and Delphi. Major professional services do not concentrate on single areas, but they do tend to have strong points. BRS, Dialog, Pergamon InfoLine, and Orbit from SDC (Santa Monica, CA) are heavy on bibliographic databases. Dow Jones and Chase Econometrics are strong on business and financial reference databases. Mead Data Central concentrates on full-text databases.

The borders between professional and general-purpose online services also are blurring. Both BRS and Dialog offer reduced-price services aimed at somewhat less demanding audiences than their daytime counterparts. And Delphi permits the general-purpose user access to Dialog without having to sign up with Dialog.

The online services world is a small one. Only a fraction of personal computer users is hooked up to even The Source or CompuServe, and the Delphi subscriber list only recently passed 5000. But the field is growing and maturing. Cuadra Associates estimates that the number of databases online is growing 35% a year, while the number of online services is increasing 40% annually. Third-party software vendors are widening the avenues to online services. The Menlo Corp. of Santa Clara, CA, is offering software designed to simplify database access from personal computers. New types of databases are also appearing. One promising one contains software that users can download into their own computers. ◇

## Big Four

(Continued from page 51)

and Investment Services and Dow Jones Quotes. Also invaluable are historical stock quotes, corporate reports for major businesses, and government regulatory information.

*Dialog Information Services*, 3460 Hillview Ave., Palo Alto, CA 94304, 800-227-1927 (in California, 800-982-5838). One of the least expensive databanks available, it's also the world's largest. It has over 200 bases featuring more than 100 publications and 100 million items of information in a virtual sea of disk drives. Dialog features abstracts of articles on every topic from art history

to zoology. It's used mostly by businesses and professionals, the single largest member group being librarians. Once you've found the bibliographic reference you want, you can request a copy of the complete article at a nominal charge, although, according to spokesperson Barbara Gersh, "often the information wanted is already in the abstract."

The company suggests new members enroll in a 1½-day seminar to learn how to use Dialog, a good idea that will pay dividends in reduced access charges.

A second service available is Knowledge Index, online from 6 p.m. to 5 a.m.

weekdays (6 p.m. to midnight Fridays) and 8 a.m. to midnight Saturday, 3 p.m. to 5 p.m. Sunday. A scaled-down version of Dialog, Knowledge Index, features 25 popular databases. Although it's less comprehensive than Dialog, it's also cheaper and easier to call up. Users are mostly professionals with computers at home to peruse professional journals.

Full-text articles by both the Associated Press and United Press International are available. Coming soon is an electronic mail system, which will be a convenience to users of both Dialog and Knowledge Index. ◇

## Videotex

(Continued from page 53)

Why so few subscribers? At current prices, videotex services have little appeal to consumers, suggests Steve Weissman, assistant publisher of *Video-print*, a newsletter published by International Resource Development of Norwalk, CT. Viewtron subscribers must pay \$39.95 a month for a package that includes rental of the Sceptre terminal from AT&T Consumer Products. The Sceptre includes a videotex decoder and a "chicklet" keyboard of the type made infamous by the IBM PCjr.

For about half the purchase price of Sceptre (it sells for \$600-\$800), you can

buy a Commodore 64 computer plus a modem to communicate with online services such as CompuServe, Delphi, and The Source. But Viewtron can't talk with personal computers—it sends signals in the North American Presentation Level Protocol Syntax (NAPLPS), not in the ASCII format used for computer communication. AT&T Consumer Products makes a videotex adapter for personal computers, but it costs as much as Sceptre.

Sceptre terminals also are used by the Gateway videotex system, which Times-Mirror Newspapers began last Septem-

ber in Orange County, a suburb of Los Angeles. Gateway subscriptions cost \$29.95 a month, including terminal rental and 20 hours of service. No subscriber count was available, but it evidently is well under 2000; the \$29.95 price only applies to the first 2000 subscribers, and the company has yet to announce a price for subsequent subscribers.

The latest commercial videotex system in the United States, Keyfax, in the Chicago area, is unique because it can communicate with personal computers as well as with custom-built television adapter terminals that sell for \$349.95.

# Professional Books That Help You Get Ahead—And Stay Ahead!

**PHASE-LOCKED LOOPS**  
by R. G. Best, PHD  
050/503 Pub. Pr., \$32.50 Club Pr., \$25.00

**TRANSDUCERS: THEORY AND APPLICATIONS**  
by J. A. Allocca and S. Allen  
582997-5 Pub. Pr., \$29.95 Club Pr., \$24.95

**ELECTRONICS POCKET HANDBOOK**  
by D. L. Metzger  
582568-6 Pub. Pr., \$9.95 Club Pr., \$6.75

**INTEGRATED CIRCUITS APPLICATIONS**  
by A. H. Seidman  
582860-X Pub. Pr., \$39.95 Club Pr., \$29.95

**OPTICAL COMMUNICATION SYSTEMS**  
by J. Gowar  
582926-6 Pub. Pr., \$44.95 Club Pr., \$32.50

**MICROWAVE SEMICONDUCTOR CIRCUIT DESIGN**  
by W. A. Davis  
583044-2 Pub. Pr., \$47.50 Club Pr., \$35.50

**HIGH FREQUENCY SWITCHING POWER SUPPLIES: THEORY AND DESIGN**  
by G. Chryssis  
109/494 Pub. Pr., \$35.00 Club Pr., \$26.95

**HANDBOOK OF MICROCOMPUTER BASED INSTRUMENTATION & CONTROLS**  
by H. D. Lenk  
582866-9 Pub. Pr., \$22.95 Club Pr., \$18.95

**ELECTRONIC COMMUNICATIONS SYSTEMS**  
by W. D. Stanley  
582834-0 Pub. Pr., \$25.95 Club Pr., \$20.95

**MANUAL OF SATELLITE COMMUNICATIONS**  
by E. Fthenakis  
225/94X Pub. Pr., \$38.00 Club Pr., \$28.50

**MICROPROCESSOR AND MICROCOMPUTER DATA DIGEST**  
by W. H. Buchsbaum  
582835-9 Pub. Pr., \$29.95 Club Pr., \$22.50

**INTERFACING TO MICROPROCESSORS**  
by J. C. Cluley  
114/099 Pub. Pr., \$24.50 Club Pr., \$18.95

**CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS**  
by H. Bierman  
052/433 Pub. Pr., \$36.50 Club Pr., \$27.95

**STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS, 11/e**  
by D. G. Fink & H. W. Beaty  
209/74X Pub. Pr., \$74.95 Club Pr., \$53.95

**ELECTRONICS ENGINEERING FOR PROFESSIONAL ENGINEERS' EXAMS**  
by C. R. Hafer  
254/303 Pub. Pr., \$29.95 Club Pr., \$21.50

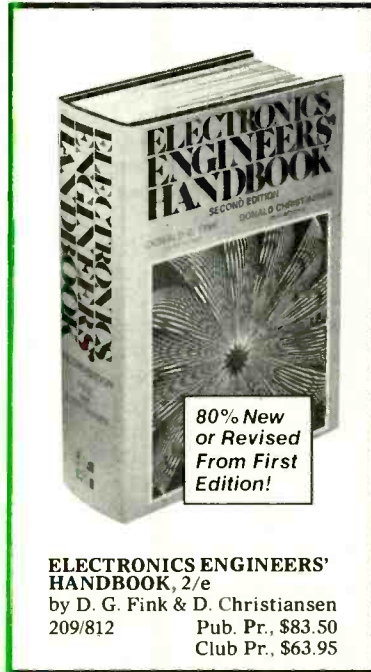
**MODERN ELECTRONIC CIRCUITS REFERENCE MANUAL**  
by J. Markus  
404/461 Pub. Pr., \$76.95 Club Pr., \$57.95

**ANTENNA THEORY: Analysis and Design**  
by C. A. Balanis  
582493-0 Pub. Pr., \$24.95 Club Pr., \$19.95

**ENGINEERING MATHEMATICS HANDBOOK, 2/e**  
by J. J. Tuma  
654/298 Pub. Pr., \$36.50 Club Pr., \$26.95

**HANDBOOK OF SEMICONDUCTOR AND BUBBLE MEMORIES**  
by W. A. Triebel & A. E. Chu  
582376-4 Pub. Pr., \$24.95 Club Pr., \$18.50

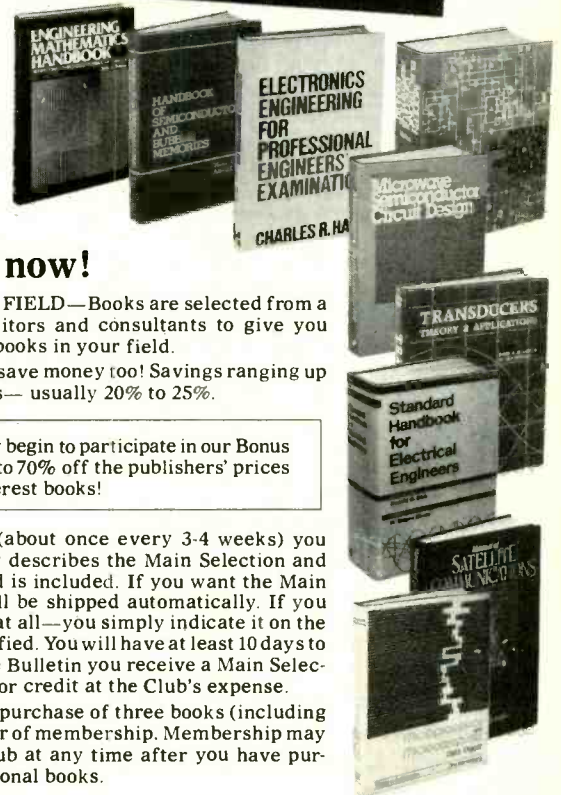
## Join the **ELECTRONICS AND CONTROL ENGINEERS' BOOK CLUB®** and...



**ELECTRONICS ENGINEERS' HANDBOOK, 2/e**  
by D. G. Fink & D. Christiansen  
209/812 Pub. Pr., \$83.50  
Club Pr., \$63.95

- Keep up with current technology
- Sharpen your professional skills
- Be ready for new career opportunities
- Boost your earning power

**New members!**  
Any one of these great professional books for only...  
**\$289** as a premium with your 1st selection!  
Values up to \$83.50



### Why YOU should join now!

- **BEST AND NEWEST BOOKS IN YOUR FIELD**—Books are selected from a wide range of publishers by expert editors and consultants to give you continuing access to the best and latest books in your field.
- **BIG SAVINGS**—Build your library and save money too! Savings ranging up to 30% or more off publishers' list prices— usually 20% to 25%.

**BONUS BOOKS**—You will immediately begin to participate in our Bonus Book Plan that allows you savings up to 70% off the publishers' prices of many professional and general interest books!

- **CONVENIENCE**—12-14 times a year (about once every 3-4 weeks) you receive the Club Bulletin FREE. It fully describes the Main Selection and alternate selections. A dated Reply Card is included. If you want the Main Selection, you simply do nothing—it will be shipped automatically. If you want an alternate selection—or no book at all—you simply indicate it on the Reply Card and return it by the date specified. You will have at least 10 days to decide. If, because of late delivery of the Bulletin you receive a Main Selection you do not want, you may return it for credit at the Club's expense.

As a Club member you agree only to the purchase of three books (including your first selection) during your first year of membership. Membership may be discontinued by either you or the Club at any time after you have purchased the first selection plus two additional books.

### MAIL THIS COUPON TODAY

McGraw-Hill Book Clubs  
**Electronics and Control Engineers' Book Club®**  
P.O. Box 582, Hightstown, N. J. 08520

Write Code No. of the \$2.89 selection here

Write Code No. of First Selection here



Please enroll me as a member and send me the two books indicated, billing me for the \$2.89 premium and my first selection at the discounted member's price, plus local tax, shipping and handling charges. I agree to purchase a minimum of two additional books during my first year of membership as outlined under the Club plan described in this ad. A shipping and handling charge is added to all shipments.

Signature \_\_\_\_\_

Name \_\_\_\_\_

Address/Apt. \_\_\_\_\_


City/State/Zip \_\_\_\_\_

This order subject to acceptance by McGraw-Hill. All prices subject to change without notice. Offer good only to new members. E33710



# ★ FOCUS ★

**HEWLETT PACKARD**



HP 12C Financial	84.95
HP 15C Scientific	84.95
HP 16C	84.95
HP 41 CV	229.95
HP 41 CX	169.95
HP 71B	379.95

**FLOPPY DISK RIOT WITH THIS AD ONLY!**

* TDK MID	10/15.95
Fuji MID	10/17.95
Maxell MID	10/18.95
Memorex/Mid	10/15.95
Nashua MID	10/14.95
Verbatim SS/DD	10/21.95
TDK MD2D	10/29.95
Maxell MD2D DS DD	10/23.95
Fuji DS/DD	10/22.95
IBM DS/DD	10/29.95

**ZENITH**

ZTX 11 user friendly personal information terminal and auto dial modem **379.95**

**Commodore 64**



**\$184.95**  
w/ purchase of Peripheral

**NEC PC 8201**

NOW THE AFFORDABLE DELUXE PORTABLE COMPUTER **\$299.95**

**apple computer**

APPLE IIc ~~188.95~~  
WITH IIC MONITOR ~~139.95~~  
IIC STAND ~~188.95~~  
now ~~188.95~~  
All for only **\$988.95**

**SANYO**

ALMOST IBM COMPATIBLE AT A FRACTION OF THE COST!

MBC 555-2  
16 Bit 8088 CPU 128K (expandable to 256K)  
2 320K double sided disk drives  
MS DOS System  
Parallel Printer Port  
**\$999.95**

**MODEMS**

HAYES SM-300	209.95
HAYES 1200	439.95
HAYES 1200B FOR IBM	417.95
HAYES Micro Modem IIE for Apple w Term Program	247.95
NOVATION J-CAT	109.95
NOVATION 103 SMART CAT	189.95
ANCHOR SIGNALMAN Mark XII 1200	289.00

**\$2000 WORTH OF FREE SOFTWARE w/ PURCHASE**

MS DOS Basic Wordstar  
Calstar Easy Writer I  
Intostar Spell Star & Mail Merge

**Call Toll Free 1-800-223-3411**

For information and all N.Y. State orders, please dial (718) 871-7000. All items subject to availability and price changes. Mail and phone orders C.O.D. Master Charge Visa Accepted Shipping handling extra. Everything Factory Fresh 10 day Money Back Guarantee (less shipping). Not responsible for geographical errors! Focus Electronics, 4523 13th Ave., Brooklyn, NY 11219 718-871-7000

ALL PRICES IN THIS AD FOR MAIL ORDER ONLY  
Circle No. 69 on Free Information Card

## Videotex

Personal-computer users can access the videotex database with a \$59.95 software package, but they will get only ASCII text, not the full-color graphics in the NAPLPS format. Subscribers can buy a \$14.95 basic package that includes 5 hours of online time, or a more inclusive \$29.95 package with 15 hours online; neither includes terminal rental. No subscriber count was available for the system, which only began November 1. It is operated by Keycom Electronic Publishing of Schaumburg, IL, a joint venture of Centel (the former Central Telephone Co.) and Honeywell.

### What's in Store

Other videotex systems are in the planning stages, and videotex developers are maintaining a brave public front. One skeptical observer is Weissman, who predicts, "Viewtron, as it currently exists, won't last into 1986". Gary Arlen, publisher of the Washington-based newsletter, *International Videotex/ Teletext News*, is more optimistic, but he believes a mass market for videotex is still two years away. He also points out that the definition of videotex is changing to include online information services, such as CompuServe, which make no pretense at offering graphics and are aimed at users of personal computers.

Some signs of change already are clear. A Viewtron spokeswoman said, "Knight-Ridder is committed in 1985 to explore the personal computer market and to develop applications for Viewtron in the business community." AT&T has sold several videotex systems for business use, including one that will serve as a directory to a 50-story office building under construction in Dallas and another that Monmouth County, NJ, realtors will use to show houses.

Videotex may never fulfill the visions of the early developers, who saw it as a tool to make it easy for anybody to use the power of the computer. Menu-driven services and flashy color graphics have yet to demonstrate a compelling appeal. The coming of the microcomputer has made obsolete visions of vast networks of dumb terminals tapping into mainframe. Yet the microcomputer is also creating a demand for interactive information services, not just online databases, but also electronic messaging and other interactive communication services. As new software makes micro computers easier to use—without hobbling their efficiency—some of the goals of early videotex developers may be met in ways far different from what they had imagined, and the "videotex" label may take on a much different meaning. ◇

## Jane

(Continued from page 37)

The few times that I was stumped I found quick relief in Jane's 236-page manual. When I needed to look up the meaning of a particular icon, I found fast help in the Picture Index section in the back of the book. Indeed, the manual is well-done, although it tends to oversimplify. But the writing is kept to a concise minimum, and an ample number of screen shots is provided.

When the manual isn't near, you can use Jane's built-in help feature. Just click the large question mark located in the top menu bar, and you're asked what subject you need help in. As usual, you use the mouse to click on the subject you want covered. To find out more about the camera icon, for instance, position the pointer over it and click the mouse button. The help program is on a separate disk, so you're asked to swap disks. After a moment, the tutorial begins.

What's unique about Jane's help feature is that you're not given a dry dissertation of the facts, but an enjoyable animated show. With the camera as an example again, the tutorial begins by moving the image of the camera around the screen as text appears describing the purpose of the camera—as a tool to copy text to other parts of the document. It then explains how to use the camera.

Jane's help feature is context-sensitive. Let's say you choose help while using the Janecalc application. The discussion of the camera is limited to duplicating cells in the worksheet. Ask for help about the camera while using the Janewrite application, and Jane shows you how to cut and paste text in a word processing document.

Jane sounds like an ideal personal productivity program, and in many ways it is. But, alas, in many ways it isn't. Jane suffers in many ways that may or may not be critical, depending on your application and needs.

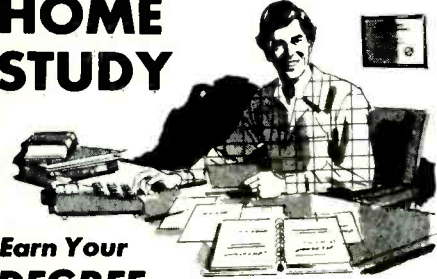
### Where Jane Falls Short

Everything Jane displays on the screen is a graphic image, even text (which the program shows in pseudo 80-column format, even with a 40-column Apple). Needless to say, this can slow down any program. To move from the top of a 1-page word processing document to the bottom, for example, can take as long as 20 seconds. The screen, or at least a part of it, is redrawn each time you scroll up, down, right, or left.

Jane's help feature can be handy and informative, but it often gets in the way. Whenever you ask for help on a particular subject, you must sit through the cute animation. If what you want to know is at the end of the movie, you may have to

## Put Professional Knowledge and a COLLEGE DEGREE in your Electronics Career through

## HOME STUDY



## Earn Your DEGREE

No commuting to class. Study at your own pace, while you continue your present job. Learn from Grantham easy-to-understand lessons, with help from your home-study instructors.

You can earn your B. S. Degree in the Grantham electronics degree program, offered by independent home study and accredited by the NHSC Accrediting Commission.

Our free bulletin gives details. Write for *Bulletin E-85*

**Grantham College of Engineering**  
10570 Humbolt Street  
Los Alamitos, California 90720

wait a minute or two for it to roll around. Too bad there's no speed key so you can put Jane into super-drive and go fast-forward through the parts of the help presentation that you aren't interested in. Arktronics claims that the Commodore 64 version, which should be out by the time you read this, will have this feature.

Although Jane will work with a one-drive Apple, it's best to use two drives. With a single-drive Apple IIc I had to start the program with the grey program disk (all of Jane's disks are color coded), then swap in the black data disk when I opened one of the documents. Jane had me juggle the two disks back and forth a few more times as it loaded the document and started word processing.

When it came time to get help, I inserted the yellow help disk. When I finished with the help session, I had to swap the black and grey disks into the drive a few more times. In short, I found that Jane is a little rough on patience when it is used with a single-drive computer. A two-drive system makes life with Jane much more palatable.

Perhaps Jane's most serious short-

#### Specifications

**Product:** Jane

**Mfr:** Arktronics Corp  
PO Box 4190  
Ann Arbor, MI 48106  
313-769-7253

**Price:** \$125

**Requirements:** Apple II+, IIe, or IIc;  
64k memory; Apple-Mouse II, Koala Pad or joystick. Two drives, printer recommended.

coming is its general lack of power; the program isn't meant for large jobs. Jane's word processor, for example, which has most of the standard word processing features, like right and left justification, boldfacing, underlining, and search and replace, can't handle documents larger than about 25 pages. You'll have to break up longer documents into several pieces.

The largest worksheet you can build with Jane is 20 columns wide by 24 rows deep, barely enough for a typical personal loan analysis or income tax spreadsheet. Janecal, unlike many available

spreadsheet programs, doesn't use column and row numbers, which, of course, limits its versatility. Editing a worksheet becomes difficult.

Jane's list management application, Janelist, is an electronic version of a Rolodex file. While it is perfect for keeping track of names or the items in a household inventory, this approach to computerized list management is limited. It might be easier and cheaper to spend \$2 on a 3 x 5" index file and jot down names and addresses the old-fashioned way.

#### All in All

Jane is a welterweight personal productivity tool that's designed to be easy to learn and use. Its sophistication lies not in computing power, but in its design, based on the metaphor of a desktop. If you need greater power, don't bother with Jane. You need something like a 1-2-3 or a Context MBA. If, however, you need a handy, easy-to-read program and don't require lots of computing muscle, Jane could answer your needs. ◇

ALL PC OWNERS/USERS  
HOME & BUSINESS, USA

  
western union

  
western union

  
western union

**BCN** BUSINESS  
COMPUTER  
NETWORK

1200 BAUD MODEM COUP

Complete PC Communications Package for **Under \$200**

**SMARTLINK II** MODEM

Auto-dial / Auto-answer / Hayes commands / 2-year warranty  
PLUS

**SUPERSCOUT** COMMUNICATIONS AND  
ONLINE DATABASE ACCESS SOFTWARE  
PLUS

**A YEAR'S SUBSCRIPTION** TO DIALOG, BRS, NEWSNET, COMPUSERVE  
AND MANY MORE ONLINE DATABASES WITH NO INITIAL FEES

PLUS

WESTERN UNION 

One Keystroke Access / No Monthly Minimums  
PLUS

A 3-MONTH FREE TRIAL SUBSCRIPTION TO

**LinkUp** MAGAZINE

CALL 24 HOURS 1-800-466-6255 • In Wyoming 1-800-442-0982

CIRCLE NO. 2 ON FREE INFORMATION CARD

## ProKey

(Continued from page 36)

nient to have a single-key macro or redefine a key, you simply go ahead and do it without leaving that program.

To program a key on the fly you need only depress the ALT and "=" keys, which blocks keyboard entry to the applications program while opening ProKey's definition function. A reverse video prompt line indicates the selected key and its new definition. Anything entered on the keyboard is stored as a macro or a new key function until the ALT and "-" keys are depressed, which closes the definition function, removes the prompt line, and opens the path from the keyboard to the applications program.

If you want to clear a definition or restore a previous definition, you simply enter the old definition or a null through the ALT=/ALT- procedure. If you want to save the redefined layout for use at another time, you easily can save it to disk as a "definition file."

The only keys that cannot be defined directly through ProKey are ALT, CTRL, SHIFT, NUM LOCK, CAPS LOCK, SCROLL LOCK, and the "'" (back apostrophe, which is ProKey's escape key). However, even these keys can be redefined with a utility called Layout that's supplied with the program.

### Layout

Layout presents a labeled pictorial of the keyboard on the screen. Pressing a key highlights the matching screen symbol and causes its label to blink; pressing a second key substitutes it for the first key and causes it to appear in the pictorial. Layout permits any key to be redefined as any other key.

In this way the PC's unusually placed

left SHIFT can be interchanged with the adjacent "vertical line/reverse slash" key to provide the standard U.S. left and right shift locations. Unlike ProKey, Layout redefines the entire key; the key functions cannot be split between lower- and uppercase.

Layout keyboard definitions can also be saved as disk files that can be automatically installed at bootup or called up whenever needed.

Although Layout is an extremely powerful utility, it has a major limitation that, to RoseSoft's credit, is clearly spelled out in the documentation: Layout must be the first program loaded into RAM; if it isn't, it doesn't work. For example, if Quadram's RAMdisk software is loaded first, Layout won't be able to load its definition file. If Layout is loaded first, Quadram's RAMdisk software will erase the program from memory because it causes a reboot. The only exception we've found so far is Tecmar's Memdisk (RAMdisk) program, which is transparent to Layout. Memdisk can be loaded first to create a disk emulator without interfering with Layout.

Layout is also dependent on the computer's ROM and will not work with the ROMs used in some IBM clones and compatibles. It is also sensitive to the particular version of the ROM used in the IBM computers. Because of these limitations, RoseSoft provides the program not as a part of ProKey, but as an extra convenience. The company will provide IBM PC users with the correct version of ProKey for their computers if the original fails to work, but does not guarantee that the Layout utility can be used with IBM clones and compatibles.

Another unusual utility supplied with ProKey creates a "one-finger mode," which permits you to press any of the "shift" keys (CTRL, ALT or SHIFT) and another key in sequence rather than simultaneously. For example, instead of interrupting a program by depressing the CTRL and C keys together or CTRL and BREAK, you could press CTRL first and then C or BREAK. Even ProKey's ALT= command could be entered as ALT followed by "=".

The recommended way to use ProKey and its utilities is to create an AUTOEXEC.BAT (batch) file that automatically loads the software when the computer is booted. The autoloader can also include definition files for Layout and ProKey so that the computer comes up fully configured to run the applications software.

ProKey is provided with a set of well-prepared macro "starter sets" for WordStar, dBase II, 1-2-3 and VisiCalc that are not only useful in themselves but can serve as excellent guides to what you can do on your own. The Layout utility has pre-defined files for a Dvorak keyboard, a standard IBM PC keyboard, and a standard Eagle keyboard—which covers most types you might use.

The documentation is sparse, but well prepared. It's short and to the point.

Though ProKey is initially supplied on a copy-protected disk, RoseSoft will substitute an unprotected copy to registered users.

Overall, the package is excellent. It is unusually easy to use, doesn't get in the way of the applications software, and doesn't seem to have any bugs, other than the possible ROM incompatibility of the Layout utility. We like it. ♦

## Turbo Pascal

(Continued from page 38)

tiveness of the language, it can be a disadvantage for commercial software developers. They might find it troublesome to sell sets of procedures and functions that they have created as language extensions or program development tools, such as data access techniques or screen generators. Since precompiled modules cannot be "linked" to user applications with Turbo, developers would have to supply source code, something they may be unwilling to do.

Another problem we noted is that Turbo sometimes identifies programming errors inaccurately. The cursor on occasion moved to a point that did not correspond to the error. It doesn't happen very often, but it is disconcerting.

In addition, the error-trapping feature

at run-time may frustrate someone who is accustomed to handling scores of errors within the program. A programmer cannot stop execution of a program and print the contents of variables and then resume execution, as in interpretive BASIC. Some versions of Pascal, such as Digital Research's Pascal MT+, let you do this type of debugging. Turbo would be much improved if later versions offered such a feature.

### Other Features

Turbo comes with a comprehensive reference manual. Although the layout of the manual is rather ordinary, the text is clear and usable, and the table of contents and index are complete. While it is instructive, it is not really a tutorial. It

assumes some knowledge of Pascal and explains only the major features of the language. Someone who knows BASIC or some other programming language could learn a great deal by reading this manual and studying the sample Turbo programs.

Turbo Pascal has other ways to make life easier for the programmer. Their convenience, however, is at the expense of significant deviation from standard Pascal, which compromises the user's ability to port programs to other operating systems. But, since there are Turbo versions for CP/M-80, CP/M-86, MS-DOS, and PC-DOS, most, but not all, Turbo features can be ported across these operating systems.

Borland International also distributes

## Turbo Pascal

a set of procedures, called the Tool Box, for file indexing, sorting, and the like. These are distributed in uncompiled source code. Not only are these useful tools, but their distribution as source code makes them both instructive and modifiable.

While the Tool Box came in too late for us to evaluate it thoroughly, we did notice that the file-indexing features seem complete and up-to-date. In particular, the file indexing could be very useful for creating database applications. Indexing allows the programmer to access data in predetermined sequences, such as in alphabetical or code number order, without the need for sorting. The Tool Box manual contains a lucid introduction to file indexing. The explanations, along with the source code, should prove valuable to persons seeking to learn how indexing works.

### Turbo in Real Life

We purchased Turbo Pascal and used it to fulfill a contract to write a set of programs. It was a great experience. We did a lot of programming in a short time even though we were learning Turbo's nuances as we went along. In addition to executing normal programming functions, we were able to make operating system calls easily and utilize inline assembly code. The compiled code executed fast and flawlessly. Some reviewers have implied that Turbo is not a good language for large or complex applications because a compiled program can only occupy 64K bytes. We, however, didn't find this limitation significant. Turbo supports chaining with common variables and has the most easy to use overlay system we have seen. In addition, Turbo's procedures for dynamic allocation of variable space allow all of available memory to be used for application data. The result is that Turbo is adequate for such memory-intensive applications as spreadsheets and word processors.

### What It All Means

Fast compilers have been a standard feature of mainframe computers for years. Borland International has brought similar power to microcomputers and has integrated it into a complete interactive programming system. Turbo will not be the only interactive compiled language for microcomputers, but its arrival has eliminated forever the inverse relationship between speed of execution and speed of programming. Whether or not Turbo Pascal ends up a dominant language, we think it has lifted micro-computer programming languages to a new level. ◇

## Powerful in circuit emulation, priced well within your grasp. That's NICE.™

NICE may be only 3" square and 1/2" thick, but it hands you full speed, real-time emulation—over 50 emulation functions, software breakpoints, all memory addresses and all I/O ports.

Just plug NICE directly into the target MP socket and any RS232 terminal for system development, troubleshooting, debugging or testing... at home, in the lab or in the field.

And NICE hands you all this performance, portability and versatility for only \$498... the best emulator price/performance ratio on the market, hands down.

Call in your order today using your VISA or MasterCard number: (800) NICOLET outside CA, or (415) 490-8200 in CA. Or send you:

check or money order to NICE, Nicolet Paratronics Corporation, 201 Fourier Avenue, Fremont, CA 94539. \*Payment by check, money order, VISA or MasterCard. NICE is a trademark of Nicolet Paratronics Corporation. \*Z80 is a trademark of Zilog, Inc.

**NICE Nicolet**

**EMULATORS NOW AVAILABLE—  
NICE 80, NICE 8085, NICE 8088  
AND THE NSC800**

Circle No. 6 on Free Information Card

## DON'T BLAME THE SOFTWARE!

Our Isolators eliminate equipment interaction, clean up interference, curb damaging power line spikes and lightning bursts.



### ISO-1 ISOLATOR

3 isolated sockets; quality spike suppression; basic protection. . . \$81.95

### ISO-3 SUPER-ISOLATOR

3 dual isolated sockets; suppressor; commercial protection. . . . \$122.95

### ISO-17 MAGNUM ISOLATOR

4 quad isolated sockets; suppressor; laboratory grade protection. . \$213.95

**ESP Electronic Specialists, Inc.**

171 S. Main, Natick, MA 01760 (617) 655-1532

Toll Free Order Desk 1-800-225-4876  
MasterCard, VISA, American Express

Circle No. 51 on Free Information Card

Now available to everyone!

## Computel Publishing Society

a unit of the Computer System presents...

Subscribe now—and become an official member! A subscription to Computel brings all of these exciting entitlements for the duration of the membership:

The one you've all been waiting for!

**Computel™**

PUBLISHED MONTHLY

ONE YEAR SUBSCRIPTION \$14.00

CANADIAN: \$18.00 FOREIGN: \$24.00

(SAMPLE COPY: \$1.00) (BACK ISSUE: \$2.00)

- The Membership Print Certificate—an honorable looking medallion worth framing, created by the Computel staff to signify membership in the Computel System!
- Hundreds of WHOLESALÉ and below-wholesale priced electronic gift items available for your own personal use or for use with the Computel Merchandise Distribution Plan—a marketing technique for your own business!
- Group discounts when buying computer systems, supplies, and components with the other members of the Society, from huge discounts and factory allowances that we are constantly seeking as they occur!
- Discounted prices on computer hardware and software purchased through the Society at worldwide outlets!
- A comparison of the computer systems and equipment on the market BEFORE you make an investment, through Computel's advisory panel of members whose dedication and your locality will assist you on where to buy and where to get help!
- A multi-national magazine bulletin board for students, teachers, management personnel, Computer Hackers, Phone Phreaks, and anyone interested—spanning the world of Computers, Electronics, and Communications, joining the hobby and the profession in a spectacular display of creativity you won't want to miss!
- FREE advertising in Computel for members who wish to trade or sell their equipment, leave messages, or just want to find out what's going on with other members—we will publish almost anything you submit to us!

### WHAT ARE Bits & Bytes AND

### Tips & Rings AND HOW DO THEY AFFECT YOU?

COMPUTEL—the complete SOURCE for everyone. You can now do the things you've only heard about, right in the privacy of your own home. You too will be in control with your computer and your telephone! This is the only multi-national computer/phone bulletin board publication of its kind available anywhere. Indispensable reference for Phreaks and Hackers. Learn how to do what you've only heard about, and have fun doing it too! It's not illegal, it's not immoral, it's just downright different! We'll show you how to get all kinds of computer programs FREE. We'll show you the inside story of big business systems—their quirks and flaws—and how to remain up to date with vital occurrences within the industry. Experiment with computer and telephone systems, interface them, learn how they work, how to repair them, what they do... and how to get them to work for YOU! Computel is the publication designed for everyone who has an intense curiosity about the phone company and how she works, and how the vulnerability of the computing industry sometimes doesn't. Come and join the thousands who already know what Computel has to offer—the guarded, sensitive, valuable information around which our society thrives—information that you just won't find elsewhere! This publication is an absolute must for everyone interested! Valuable, money-making opportunities available also! Join the Computel Society NOW! Start the New Year with a blast! Start it with Computel!

• Check • Money Order • Postage • Cash

The History of Computing	\$14.95
The History of the Telephone	\$16.95
The Phone Phreaks' Guide to Computers	\$19.95
Telephone Engineering Course	\$24.95
Computer Repair—Do it Yourself and SAVE!	\$24.95

ALL 5 REPORTS PLUS A SUBSCRIPTION TO COMPUTEL: \$69.00.

Computel Publishing Society

6354 Van Nuys Blvd., 161-CG / Van Nuys, CA 91401-2696

Don't miss out. Subscribe now!

Circle No. 87 on Free Information Card



## The Quick Silver Fox™ Jumps Over The Big Blue Dog.

We really hate to pick on the big guys but compared to the Silver Fox your basic IBM-PC™ is an overpriced dog.

### 256k RAM

Why? Well, for starters, your basic Silver Fox comes with 256k of RAM which acts like a disk drive so that more of your software is accessed at the speed of light rather than the speed of a mechanical drive head.

### 1.6 Megabytes

You also have more than twice as much software to access because the Silver Fox comes with dual 800k disk drives for a total of 1.6 Megabytes. Yet the Silver Fox can read and write to all popular PC formats.

### Free Silverware

1. MS-DOS
2. HAGEN-DOS™
3. M-DISK
4. WordStar™
5. EasyWriter
6. DataStar
7. ReportStar
8. FILEBASE
9. CalcStar
10. Color Graphics Basic
11. MailMerge
12. SpellStar
13. 25 Games, graphics and utilities

The best free software bundle in the business, and the Fox will run some programs written for the IBM-PC like dBase II and Multiplan, and programs written for Sanyo's new MBC-550 series.

### Reliability

Because the Silver Fox is born on a totally automated production line in Japan it is inherently more reliable than

systems built by hand. The Fox is burned and tested for 14 days in Japan, and further tested after final assembly here in the good old U.S.ofA.

### One Year Warranty

The Silver Fox is built better so we can back it with a limited, one-year warranty, four times longer than IBM. We're Scottsdale Systems and since 1980 we've shipped over \$10,000,000 of microcomputer equipment directly to microcomputer users.

Because we deal directly with users, we think we have a better idea of what you want. So the Silver Fox includes graphics with twice IBM's resolution, a printer port, a keyboard with a big return key, and a 12", high-resolution monitor as standard equipment.

Of course, you could spend \$4729 at Computerland for an IBM-PC that will perform almost as well as a Silver Fox. But why bother when you can call

**1 (602) 941-5856**  
and get your

**\$1398**

to perform like \$4729?

For additional information call 1 (602) 941-5856, or write Scottsdale Systems, 617 N. Scottsdale Road #B, Scottsdale, AZ 85257

IBM PC price is based on a phone quote from the Mesa, AZ Computerland on July 30, 1984. Price included 256k RAM, dual 360K drives (800K's weren't available), software, and a graphics monitor.

Trademarks: Silver Fox and Hagen-DOS, Scottsdale Systems Ltd. IBM-PC, International Business Machines Corporation, Wordstar, Calcstar, Mailmerge, SpellStar, and InfoStar, Micropro International, MS-DOS, Multiplan, MicroSoft Corporation, Filebase, EWDP Software, Inc. dBASE II, Ashton-Tate.

Ordering Telemarketing only, all prices are for cash. F.O.B. Scottsdale, price subject to change, product subject to limited supply. Visa, Mastercard add 3%. AZ residents add 6%. Returned merchandise subject to a 20% restocking fee. Personal company checks take up to 3 weeks to clear. No C.O.D.'s or A.P.O.'s.

## Ultraterm (Continued from page 33)

revisions of older software have parameters that allow them to be configured for Ultraterm. Just as they did with Videoterm, Videx sells special preboot disks for AppleWriter and VisiCalc, to take advantage of all Ultraterm's extended display capability.

### A Bit about the Hardware

Much thought has gone into the design of both the hardware and firmware on Ultraterm. Anyone who's familiar with Videoterm will be happy to hear that one of the annoying features of that card's firmware has been corrected. Both Videoterm and Ultraterm use CONTROL-A as a soft toggle for upper/lower case and convert CONTROL-K to a "[." While this change is useful for the upper-case-only keyboards of the Apple II and II+, it causes trouble with a program like WordStar, for example, which makes extensive use of both CONTROL-A and CONTROL-K. Short of burning a new EPROM or rewriting the BIOS for the software, there was nothing to do with Videoterm.

In Ultraterm, the same traps are in the firmware, but a back door has been added. If the card sees a lower-case character, both character filters are branched around since the card assumes you have a lower-case keyboard.

### Documentation

The manual gives you all the information you could possibly want about the operation of Ultraterm. There are a listing of the firmware, a complete schematic drawing of the circuit, and detailed explanations of the various jumpers and switch settings. One novel feature of the card is that you can set a series of dip switches to control the default setting for modes and attributes.

The manual has instructions for using the card with DOS, CP/M, and Pascal. Moreover, if you request it, Videx will send you a programmer's guide that tells exactly how to address the various registers in the CRTC (Cathode Ray Tube Controller), the special microprocessor at the heart of the card.

### Conclusions

Videx is a small company that cares. If you contact them with any problem or question, you'll find they go out of their way to be helpful. In this case, I feel that satisfaction is guaranteed—the Ultraterm display is incredible.

Although the card carries a list price of \$379, it can be found discounted by as much as 50%. As the most advanced video display available for the Apple II+, it is one of the best deals in town. ◇



## Multi-User Micros (Continued from page 75)

out in advance. The importance of this process cannot be overemphasized, since it can seriously affect the acceptance of the new system within the organization and hence the degree to which the system enhances organizational productivity and efficiency.

With so many complicated issues at stake, new MUS users can hardly be expected to anticipate every potential problem, particularly should their needs expand and change.

In the face of so many factors, comprehensive support from both manufacturers and dealers should be a prime concern.

The support from the manufacturer should include a commitment to supply replacement and upgrade hardware at reasonable prices for the life expectancy of the machine. An extended warranty program is usually a good indication of long-term support. The manufacturer also provides effective training for dealers so that they can make necessary repairs and be aware of changes and improvements in the equipment.

The next level of support comes from the dealer. The dealer's role is so critical that some manufacturers strictly limit dealerships to only those who meet rigorous standards and undergo comprehensive training.

Although these standards will protect both the manufacturer and the user, they can tend to limit sales and necessitate higher pricing.

In general, a good MUS dealer should not only have expert knowledge of the workings of the product but also considerable experience in selecting, customizing and creating application software for a MUS environment.

One very important area that should not be ignored is training. Many dealer/consultants may be excellent technicians and run reputable businesses, but they may not be very good at training new users in the intricacies of managing a complicated MUS. New users should make sure that adequate training is available and that the dealer has a reputation for providing it.

### Toward the Future

What's coming up for the multi-user microcomputer industry? The big story is, of course, the impending entry of the giants into the marketplace. A major move by IBM or ATT to attack the growing demand for low-cost, effective MUSs would revolutionize and legitimize the market and probably impose some *de facto* standards. We can almost certainly look forward to some relevant announcements soon. ◇



# Active

## YOUR ELECTRONIC COMPONENTS CENTER

### TOP QUALITY, CURRENT DATE CODE PRODUCTS

7400			
ACT #		Pkg'd Qty	Pkg Price
05500	7400	3	1.10
05512	7404	5	1.85
05592	7475	2	1.00
05640	74121	2	1.00

74 ALS ADVANCED LS			
ACT #		Pkg'd Qty	Pkg Price
05A01	74ALS00	3	1.15
05A13	74ALS04	3	1.15
05A37	74ALS20	3	1.15
05A70	74ALS74	2	1.00

Did you receive our new 1985 catalog?

NAME.....  
ADDRESS.....  
CITY.....  
STATE.....  
ZIP CODE.....

MAIL COUPON TO:

USA: P.O. Box 9100  
Westborough, Mass. 01581  
CANADA: 5651 Ferrier St.  
2CE Montreal, Quebec H4P 1N1

74LS			
		Pkg'd Qty	Pkg Price
05770	74LS00	4	1.20
05776	74LS02	4	1.20
05780	74LS04	4	1.20
05848	74LS74	3	1.00
05888	74LS123	2	1.30

74F ADVANCED SCHOTTKY			
		Pkg'd Qty	Pkg Price
05F01	74F00	2	1.00
05F05	74F04	2	1.00
05F07	74F08	2	1.00
05F17	74F74	2	1.10

74S			
		Pkg'd Qty	Pkg Price
05S04	74S04	2	1.00
05S08	74S08	2	1.00
05125	74S74	1	.55
05329	74S138	1	1.25

74HC HIGH SPEED CMOS			
		Pkg'd Qty	Pkg Price
16100	74HC00	3	1.20
16105	74HC04	3	1.25
16130	74HC14	1	.89
16200	74HC244	1	1.50

ACT #		Pkg Price
9300 TTL		
9368PC		2.65
9374PC		2.65
9314PC		1.60
9324PC		1.40

Mail orders shipped within 48 hours STORES OPEN AT 8:00 am

MICROPROCESSORS			
ACT #		Pkg Price	
12001	6502	7.13	
12005	6522	10.50	
12010	6551	16.25	
12014	6802	11.25	
12017	6821	4.45	
12021	6850	4.80	
41002	Z-80A-CPU-PS	6.39	
41004	Z-80-P10-PS	5.50	
12053	8088DC	39.50	
12029	8224	12.50	
12038	8284APC	12.36	
12041	8212	3.39	
12073	68000	71.95	
12074	68230	27.39	

LINEAR			
ACT #		Pkg'd Qty	Pkg Price
06011	317UC	2	1.50
06017	324PC	3	1.15
06114	358TC	3	1.10
06116	555TC	3	1.00
06118	556PC	2	1.10

INTERFACE			
28145	SN75150P	1	.75
28150	SN75154N	1	.72
28225	SN75477P	2	1.55
28235	SN75492AN	2	1.00

CMOS			
08340	4011BPC	4	1.00
08545	4066BPC	3	1.00
08725	4538BPC	1	1.00
08375	4016BPC	3	1.00

REGULATORS			
09210	78L05AWC	3	1.00
09220	7805UC	2	1.00
09370	7905UC	2	1.10
09425	7915UC	2	1.10

LEDs			
13268	LED-209A (Red-5MM)	6	1.19
13056	LED-220 (1 1/4"-Red-5MM)	7	1.00
13271	LED-211 (1 1/4"-Green-5MM)	5	1.00
13277	LED-224 (1 1/4"-Yellow-5MM)	5	1.00

OPTO COUPLERS			
13193	MCT2E	2	1.79
13067	4N26	2	1.79
13184	4N35	1	1.00
13072	MOC3010	1	1.19
13202	MOC3011	1	1.29

TOLL FREE: 1-800-343-0874

#### ORDERING INFORMATION

Use only the ACT # when ordering. Some packages contain multiples other than one. Please note that these multiples will not be broken.  
Pkg'd Quantity is One (1) unless otherwise indicated.

MAIL ORDER: (U.S.)  
P.O. Box 9100  
Westborough, Mass. 01581  
Toll Free 1-800-343-0874  
(outside Mass. only)  
MAIL ORDER: (Canada)  
Toll Free 1-800-361-5884

STORE LOCATIONS:  
133 Flanders Rd.  
Westborough, Mass.  
(617) 366-9684  
13107 Northup Way  
Bellevue, Wash.  
(206) 881-8191

7400

74F00

NEW

74ALS00

Table of 7400 series components including NAND gates, inverters, and logic chips with part numbers and prices.

Table of 74F00 series components including NAND gates, inverters, and logic chips with part numbers and prices.

Table of 74ALS00 series components including NAND gates, inverters, and logic chips with part numbers and prices.

Digitalker™

DT1050 — Applications: Teaching aids, appliances, clocks, automotive, telecommunications, language translators, etc.

DT1050 Digitalker™ \$34.95 ea. MM521404 Processor Chip \$14.95 ea.

DT1057 - Expands the DT1050 vocabulary from 137 to over 260 words. Includes 2 ROMs and specs. Part No. DT1057 \$24.95 ea.

MICROPROCESSOR COMPONENTS

Table of microprocessor components including microprocessors, ROMs, and RAMs with part numbers and prices.

74LS

Table of 74LS series components including NAND gates, inverters, and logic chips with part numbers and prices.

8000/8000 SERIES

Table of 8000/8000 series components including microprocessors, ROMs, and RAMs with part numbers and prices.

8000/8000 SERIES

Table of 8000/8000 series components including microprocessors, ROMs, and RAMs with part numbers and prices.

INTERSIL

Table of Intersil components including precision timers, comparators, and logic chips with part numbers and prices.

30009 1983 INTERSIL Data Book (1366p) \$9.95

74HC High Speed CMOS

Table of 74HC High Speed CMOS components including NAND gates, inverters, and logic chips with part numbers and prices.

74S/PROMS\*

Table of 74S/PROMS\* components including static CMOS NAND gates, inverters, and logic chips with part numbers and prices.

8000/8000 SERIES

Table of 8000/8000 series components including microprocessors, ROMs, and RAMs with part numbers and prices.

8000/8000 SERIES

Table of 8000/8000 series components including microprocessors, ROMs, and RAMs with part numbers and prices.

74C-C/MOS

Table of 74C-C/MOS components including CMOS NAND gates, inverters, and logic chips with part numbers and prices.

CA—LINEAR

Table of CA—LINEAR components including operational amplifiers, comparators, and logic chips with part numbers and prices.

DISK CONTROLLERS

Table of disk controllers including floppy disk controllers and hard disk controllers with part numbers and prices.

SPECIAL FUNCTION

Table of special function components including timers, comparators, and logic chips with part numbers and prices.

LINEAR

Table of linear components including operational amplifiers, comparators, and logic chips with part numbers and prices.

\$10.00 Minimum Order - U.S. Funds Only

Shipping - Add 5% plus \$1.50 Insurance

Send S.A.E. for Monthly sales flyer!



1355 SHOREWAY ROAD, BELMONT, CA 94002

2/85 PHONE ORDERS WELCOME (415) 592-8097 Telex: 176043

Spec Sheets - 30¢ each

Send \$1.00 Postage for your

Free 1985 JAMECO CATALOG

Prices Subject to Change

30003 1982 Nat. Linear Data Book (1922 pgs.) \$11.95





# Computer Mart

RATE: Ads are " by 3". 1 insertion: \$435.00. 6 insertions: \$900.00 ea. 12 insertions: \$865.00 ea. Closing date: 1st of the 2nd mo. preceding cover date. Send order and remittance to Computer Mart, Computers & Electronics, 1 Park Ave., N.Y., N.Y. 10016. Direct inquiries to: Lois Price (212) 503-5115. For Customer Service (212) 503-5115. For Customer Service, call (212) 503-4506.

Now we can make any computer sing as well as talk, for only \$269.



As featured in Garcia's Circuit Cellar, BYTE Magazine, September, October 1982

### Microvox.

MICROVOX is a completely self-contained professional voice quality text-to-speech synthesizer. MICROVOX may be easily interfaced to any computer modem RS-232C serial or parallel output device.

- 6502 Microprocessor based text-to-speech algorithm
- SC-01A phoneme based speech synthesizer
- 64 crystal controlled inflection levels
- 3000 character buffer
- RS-232C and parallel port interfaces
- On board power supply
- Music and sound effects capability

MV01 Microvox Assembled & Tested \$349.00  
MV02 Microvox, complete kit \$269.00



To Order: Call Toll Free 1-800-645-3479 In N.Y. 1-516-374-6793

MICROMINT, INC.  
561 Willow Avenue  
Cedarhurst NY 11516



## LIONHEART

BUSINESS AND STATISTICAL SOFTWARE  
Explanatory Books, Compiled Software

- Exploratory Data Analysis \$ 75
- Experimental Statistics \$115
- Business Statistics \$135
- Forecasting and Time-Series \$115
- Business and Economic Forecasting \$135
- Monte Carlo Simulation \$125
- Linear and Non-Linear Programming \$ 75
- Decision Analysis Techniques \$ 85
- PERT and Critical Path Techniques \$ 75
- Optimization \$ 80

MS-DOS, CP/M, Apple DOS 3.3, Macintosh

### BASIC LANGUAGE UTILITIES (MS-DOS)

- BASIC COMPILER \$150
- PreBASIC \$ 75
- MEMORY \$ 75
- STRUCTURE \$ 75

- QWERTY Word Processor (MS-DOS) \$100

VISA, MasterCard, Check

LIONHEART  
PO Box 378  
Alburtz, VT  
05440  
(514) 933-4918

## 6502 Single Board Computer and 5 Volt Switching Power Supply

6502 Single Board Computer with 16K CMOS RAM, sockets for two 2532 EPROM 8K. Real time calendar clock using MM58167, one RS232 serial port using a 6551ACIA and four parallel ports



using two 6522VIA. Uses a single 5 volt power source at 600MA, 5.5 x 7 inches. Assembled and tested. \$389.00

### 5 volt, 1 amp Switching Power Supply

with floating battery backup circuit. Input 115VAC or 10 to 15VDC, 3 x 7 inches PCB. Assembled and tested. \$79.00

Custom Programming Group, Inc.  
47-2A Marchwood Road Exton, PA 19341  
(215) 363-8840

CIRCLE NO. 100 ON FREE INFORMATION CARD

## COMPUTER T-SHIRTS

FOR HOME, SCHOOL, AND OFFICE!

The ULTIMATE Software! A MUST for all computer lovers!

BRIGHT GREEN I.L.C.D. LETTERS CUSTOM SILKSCREENED ON 50/50 BLEND

HIGH TECH DESIGN! Five popular styles to choose from

Order Today! Only \$8.95 ppd

Made in U.S.A. Simply select Style and Color below

- LET'S SEEK PEEK & POKE #1: White #1 Pink #2 Blue #3
- TAKE A BYTE OUT OF ME #2: Green #4 Gray #5 Red #6
- I'M USER FRIENDLY #3: Black #7
- HAPPINESS IS A PROGRAM THAT WORKS #4: Black #7
- ♥ COMPUTERS #5: CUT SIZES S M L XL

Please send me  
Shirt \_\_\_\_\_ Color \_\_\_\_\_ Size \_\_\_\_\_  
Use additional sheet if necessary

COMPUTER NOVELTY CORP  
P.O. BOX 2964  
FREEPORT TEXAS 77541  
Enclose \$8.95 ppd each. TX Res. 6% tax

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

© CnC

CIRCLE NO. 101 ON FREE INFORMATION CARD

## A great new book by Glossbrenner! HOW TO GET FREE SOFTWARE

Just \$14.95, we pay postage if you state where you saw this ad.

★ ★ ★ ★ ★ ★ ★ ★

SAMPLE PUBLIC DOMAIN DISK \$8. Has 8 plus nice programs in either CP/M or MS-DOS. (Please state computer format and type of system, not Atari, Commodore, Northstar or Victor.)

Sheepshead Software™  
P.O. Box 486  
Boonville, CA 95415  
(707) 463-1833

CIRCLE NO. 101 ON FREE INFORMATION CARD

Thanks to YOU We're Growing with YOU and your Computer



LEO ELECTRONICS, INC.  
P.O. Box 11307  
Torrance, CA 90510 1307  
Tel 213/212-6133 800/421-9565  
TLX 291 985 LEO UR

We Offer . . . PRICE . . . QUALITY . . .  
PERSONAL SERVICE

### 64K UPGRADE

9 Bank (IBM PC)	\$43.65	(150ns)	\$41.85	(200ns)
4164 (150ns)	\$4.85 ea.		\$4.65 ea.	
8 Bank (other PC)	\$38.80	(150ns)	\$37.20	(200ns)
4164 (150ns)	\$4.85 ea.		\$4.65 ea.	
256K "Mother Saver" Upgrade (150ns)	\$36.00 each			
6116P-3	\$4.40	2732	\$3.95	
2716	\$3.20	2764	\$7.00	
TMS 2716	\$4.95	27128	\$24.00	

We accept checks, Visa, Mastercard or Purchase Orders from qualified firms and institutions. U.S. Funds only. Call for C.O.D. California residents add 6% tax. Shipping is UPS. Add \$2.00 for ground and \$5.00 for air. All major manufacturers. All parts 100% guaranteed. Pricing subject to change without notice.

## NEW THE SMART BOX

- Makes your personal computer a control station for BSR devices.
- Can send and receive all 256 channels.
- Communicates over existing AC power lines.
- Compatible with any computer equipped with an RS-232 port.
- Affordable. \$294.00 Direct from Hydrus

HYDRUS 6218  
Cedar Springs  
Dallas, TX 75235  
(214) 350-8766

CIRCLE NO. 102 ON FREE INFORMATION CARD

## TOROIDAL POWER TRANSFORMERS

Small size • Low noise • Easy mounting

Made in U.S.A.  
Custom sizes: 15VA-3,000VA at 50/60 Hz  
40 standard transformers with 117V-60Hz primaries in stock for 20VA, 40VA, 70VA, 100VA, 150VA, 340VA, 600VA  
Call or write for data sheets



Size	Secondaries** Volts/Amps	Price Each		
		1	2-4	5-24
40VA	2x8.5V/2.35A	\$26.10	\$22.00	\$19.60
OD-2.8"	2x12V/1.67A	26.10	22.00	19.60
H-1.3"	2x15V/1.33A	26.10	22.00	19.60
Wt. 1.1 lbs	2x18V/1.10A	26.10	22.00	19.60
	2x24V/.83A	26.10	22.00	19.60
	Multivoltage**	31.60	27.30	24.60
100VA	24V/4.15A	\$29.10	\$24.80	\$22.10
OD-3.7"	2x8.5V/5.8A	30.00	25.70	23.00
H-1.4"	2x12V/4.15A	30.00	25.70	23.00
Wt. 2.2 lbs	2x15V/3.3A	30.00	25.70	23.00
	2x18V/2.8A	30.00	25.70	23.00
	Multivoltage**	37.00	32.50	29.50
340VA	220V/1.55A	\$48.20	\$41.90	\$36.20
OD-4.5"	2x24V/7.08A	49.10	41.90	37.10
H-2.3"	2x30V/5.67A	49.10	41.90	37.10
Wt. 5.3 lbs	2x33V/5.15A	49.10	41.90	37.10

\*\* Dual secondaries may be used separately, in parallel or in series.  
\*\* For 5V and +12V or 5V and -15V regulated DC.  
Terms: VISA, MASTERCARD, COD or money orders—  
UPS charges added.

301-464-2100 TOROID CORPORATION OF MARYLAND  
5000 Laurel-Bowie Rd., Bowie, MD 20715-4037

CIRCLE NO. 103 ON FREE INFORMATION CARD

## DISCOUNT COMPUTER EQUIPMENT

LOWEST PRICES on Printers, Disk Drives, Software, and Other Computer Equipment! EPSON, Star Micronics, Okidata, Tandon, TEAC, & Many Others.

For a free catalog call

918/825-4844



918/825-4844

Small Business COMPUTERS

# MICROSETTE

## 5/8-Inch DISKETTES

Single or double sided, all double density (SSDD, DSDD), in box(es)

ITEM	10 PACK	50 PACK
SSDD	\$15.00	\$70.00
DSDD	20.00	90.00

## CASSETTES

Error-free computer grade. With label and box.

C 10	7.50	32.50
C 20	9.00	39.00
C 60	11.00	50.00
C 90	15.00	70.00

UPS Shipping included in continental USA - California customers add taxes

**MICROSETTE CO.**  
275 Santa Ana Court  
Sunnyvale, CA 94086  
(408) 737-8441

CIRCLE NO. 104 ON FREE INFORMATION CARD

# FREE CATALOG!

Just let us know and we'll mail you a FREE *Creative Computing* Catalog—16 pages filled with books, buyer's guides, magazines, and more!

To get your FREE catalog, write to: *Creative Computing* Catalog, Dept NA1X 39 East Hanover Ave., Morris Plains, NJ 07950.

## 20 PROGRAMS on 2 cassette tapes

for 16K  
TS1000,  
TS1500,  
& ZX81  
only  
\$19.95.



\*for TS2068, C-64, VIC-20, ATARI, TI99/4A, CoCo & MC-10 only \$29.95

Save money, learn about the exciting world of home computing and have fun doing it with the new HOME-PAC™

The HOME-PAC™ with 21 page user manual covers educational, graphics, recreational, home finance and utility applications. Great tool for learning to program in BASIC. Programs are listable and manual includes section on modification tips.

**10 DAY MONEY BACK GUARANTEE**

Please add \$2.00 shipping and handling to order.

Simplex Software, Dept CE2

62 Crestview Drive  
Willingboro, NJ 08046

MC, VISA & Checks Accepted  
Orders & Inquiries State Computer Type  
Dealer Inquiries Invited

CIRCLE NO. 109 ON FREE INFORMATION CARD



## FLOPPY DISK DRIVE DIAGNOSTIC

Do it yourself and save time and money. No special training needed.

All tests made WITHOUT REMOVING DRIVES. Additional equipment not needed. Our kit also includes users guide that shows how to do the drive adjustments.

OUR DRIVE DIAGNOSTIC WILL HELP YOU PREVENT COSTLY DATA ERRORS.

APPLE II® DRIVE DIAGNOSTIC ..... \$119  
KAYPRO® DRIVE DIAGNOSTIC ..... \$119

Sheephead Software™  
P.O. Box 486  
Boonville, CA 95415  
(707) 463-1833

Phone orders Mon.-Sat., 9 a.m. to 9 p.m., Pacific Coast Time.  
MASTER/VISA Card or C.O.D., add \$2.  
Calif. add 6%. UPS Blue Label add \$5.

CIRCLE NO. 105 ON FREE INFORMATION CARD

## Now available for the computer experimenter!

### COMPUTER CONNOISSEUR'S DELIGHT!

NOW BE IN CONTROL WITH YOUR COMPUTER — THE ONLY PUBLICATION OF ITS KIND WRITTEN FOR THE USER. DISCOVER THE SECRETS AND LEARN THE VERSATILITY OF MODERN COMPUTER COMMAND CONTROL CONCEPTS. EXPERIMENT WITH COMPUTER AND TELEPHONE SYSTEMS. INTERFACE THEM. LEARN HOW THEY WORK, WHAT THEY DO, AND HOW TO GET THEM TO WORK FOR YOU! A COMPLETE TELEPHONE ENGINEERING COURSE IS INCLUDED IN MONTHLY CHAPTERS. BRINGING YOU THROUGH STEP, CROSSBAR, ESS, BUBBLE, AND ATOMIC SWITCHING SYSTEMS. EXCLUSIVE COVERAGE IN BIOLOGICAL COMPUTING SYSTEMS. TODAY'S COMPUTERS AND TELEPHONES ARE THE FUTURE. THIS PUBLICATION IS AN ABSOLUTE MUST FOR EVERYONE INTERESTED.

UNPUBLISHED MATERIAL

WMT

COMICS

DIRECTORY LISTING NET-WORKS

AC-CODES CODES

**Computel** PUBLISHED MONTHLY

ONE YEAR SUBSCRIPTION \$14.00 (SAMPLE COPY \$1.00)  
SUBSCRIPTION & 2 PROGRAMS \$20.00

Small Card Only. \$100 & COMPUTEL (3 issues) \$14.95 (1 year) \$120.00 (3 years) \$360.00 (1 year) \$120.00 (3 years) \$360.00

The one you've all been waiting for

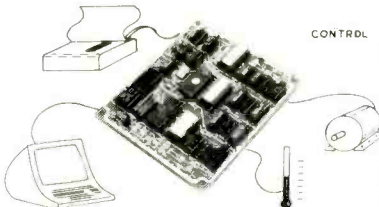
NOW AVAILABLE — Learn how to repair telephones and telephone systems. How they work, in monthly installments with the magazine for 1982.

COMPUTEL—the complete SOURCE for everyone. You can now do the things you've only heard about, right in the privacy of your own home. Indispensable reference to phreaks and hackers. Learn how to get all kinds of computer programs FREE. Get the inside story of big business systems—their quirks and flaws—and remain up to date with vital occurrences within the computer industry. Computel is a publication designed for everyone who has an intense curiosity of computer systems, containing a wealth of hard to find information, codes, and numbers. Published monthly.

Computel Publishing Society  
6354 VAN NUYS BL., # 161-E/VAN NUS, CA 91401

CIRCLE NO. 107 ON FREE INFORMATION CARD

## DEVELOPMENT CONTROL



### SBC88 DEVELOPMENT AND CONTROL SYSTEM WRITE IT - RUN IT - ROM IT

A single board computer development and control system that is so simple to use, you will be developing applications programs the first day!

- Choice of Basic or Forth in ROM
  - 8 channel, 8 bit analog to digital converter
  - Two 8 bit input ports
  - Two 8 bit output ports
  - Time of day
  - 8088 16 bit uP
  - Onboard EPROM programmer complete program development
  - 7 current sinking outputs rated at 500 mA, 50 VDC
  - BSR link available
  - Up to 32K of user memory
  - Assembled and tested \$279 Kits start at \$119
- Vesta Technology, Inc. 1777 S. Belaire St. Suite 211  
Denver, CO 80222 (303) 759-4998

CIRCLE NO. 110 ON FREE INFORMATION CARD

## BUY/SELL USED COMPUTERS WITHOUT RISK!!!

Newsletter with ads to buy or sell used hardware. \$12 yr. Ads \$15. Ads submitted with subscription are at half price for total of \$20 for ad & subscription.

Buyer selects ad, sends purchase price to Computer Swap Shop; who holds it in escrow, notifies Seller who ships to Buyer. Buyer has 7 days to examine, if not satisfied, returns equipment to Seller and gets money back. If O.K., Seller receives sales price less small commission. Must be a member to buy or sell.

**NO RISK ! BONDED**  
COMPUTER SWAP SHOP, INC.  
P.O. BOX 2988  
DELRAY BEACH, FL 33444

CIRCLE NO. 106 ON FREE INFORMATION CARD

## ★MICROCOMPUTER★ BUSINESS SOFTWARE

MEDICAL MGMT...  
DENTAL MGMT...  
INSURANCE AGENT  
LEGAL BILLING....  
PROPERTY MGMT..  
AND MUCH MORE !

UNIVAIR INTERNATIONAL  
9024 St. Charles Rock Road  
ST. LOUIS, MISSOURI 63114

(314) 426-1099

CIRCLE NO. 108 ON FREE INFORMATION CARD

## BUILD YOUR OWN COMPUTER!!

68000 BASED MULTI-BUS COMPATIBLE KIT

4 BOARD SET INCLUDES:

- 1 6 SLOT MOTHER BOARD
- 1 CPU CARD
- 1 1.0 with UPD /65 FLOPPY CONTROLLER
- 1 128K RAM CARD

SCHEMATICS PARTS LIST & ASSEMBLY DRAWINGS

KT 1001 COMPUTER KIT (FLATBOARDS ONLY)	\$ 189.99
KT 1004 COMPUTER KIT (UNTESTED BOARDS POPULATED)	\$ 899.99
KT 1002 COMPUTER KIT (DOCUMENTATION ONLY)	\$ 35.00
KT 1003 PAL FOR RAM BOARD	\$ 16.99
KT 1005 CP-M FOR KIT (INCLUDES BIOS)	\$ 350.00

WE CARRY A COMPLETE LINE OF ELECTRONIC COMPONENTS SEND FOR A FREE CATALOG !!!



NICORN ELECTRONICS  
10010 CANOGA AVE. UNIT B 8  
CHATSWORTH CALIF. 91311  
(818) 341 8833

CIRCLE NO. 111 ON FREE INFORMATION CARD

**NEW**  
**GUITAR CHORD COMPUTER**



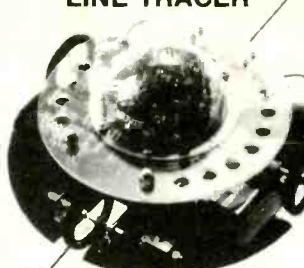
Quick. Think of 3 ways to play a D flat 9th chord? Give up? The **GUITAR CHORD COMPUTER** shows you all three in less than 10 seconds. Virtually every guitar player can use one of these. Here's what it will do: **CHORDS** Major, Minor, Dominant, Augmented, and Diminished. **SCALES** Major, Harmonic Minor, Melodic Ascending, and Melodic Descending. **ALTERNATES!** **INVERSIONS** 3 and 4 alternates are shown for most chords (Easiest to play is displayed first). **TRANSPOSE** Up or down by half-steps, 6th, 7th, 9th **CHORDS** Displayed at the touch of a button. Play better and easier guitar in minutes. Order yours today! **No. CC-2 Guitar Chord Computer**. \$59.95 (plus \$2.50 postage & handling). Ask for your free catalog.

**CHARGE TO VISA OR MC TOLL-FREE**  
1-800-654-8657 9AM to 5PM CST MON-FRI

**PAIA Electronics, Inc.**  
1020 W. Wilshire, Oklahoma City, OK 73116 (405)843-9626

CIRCLE NO. 112 ON FREE INFORMATION CARD

**LINE TRACER**



**ROBOT KITS**  
**Exciting & Educational**

Our kits are not only educational but fun to assemble and operate. Assemble in 1 or 2 evenings. 7 different kits to expand your mind, from \$24.95 to \$74.95. To order **LINE TRACER** model #MV913W send \$39.95 + \$3.50 shipping (NY Res. add tax) to **BUYUS, INC.**, Dept. CE285, 10 White Birch Dr., Ossining, NY 10562. VISA or MasterCard (914)762-4799.

CIRCLE NO. 113 ON FREE INFORMATION CARD

**BYTE ME**



Quality silkscreened T in your choice of color and size modes.  Blue  Red  Black  SM  MED  LG  X-LG

Send \$10 (includes postage & handling) per shirt to **ZERO ONE**, 8306 Wilshire Blvd., Suite 141, Beverly Hills, CA 90211 (CA Residents add 6% sales tax)

**Please allow 4-6 wks for delivery**

**SOFTWARE FOR THE FRIENDLY USER**

CIRCLE NO. 114 ON FREE INFORMATION CARD

**Marymac INDUSTRIES** 800-231-3680  
**Pan American ELECTRONICS** 800-531-7466

**Radio Shack TRS-80's**

People you Trust to give you the very best!



- Lowest Price
- Reliable Service
- Quality Products

22511 Katy Fwy., Katy (Houston) Texas 77450  
(713) 392-0747 Telex 774132

CIRCLE NO. 115 ON FREE INFORMATION CARD

**THE BUYERS GUIDE**

**THE MASTER DIRECTORY OF PRODUCTS FOR THE IBM PC, PC XT, PCjr AND MOST COMPATIBLES!**

AVAILABLE AT YOUR LOCAL NEWSSTAND AND COMPUTER STORE.

**COMMODORE 64 INTERFACING BLUE BOOK**

Written by a college professor in a friendly and informative style, this book is a gold mine of practical information on how to build a variety of useful interfaces for your computer. Over 30 projects including cassette interface, printer interface, expansion bus, light pen, RS-232 interface, more user ports, thermometer, speech synthesizer and two other voice projects. A/D and D/A converters, 5 telephone interfaces including a sophisticated voice mail project, motor controllers, AC power control, logic analyzer, capacitance meter, spectrum analyzer, home security system and many more. \$16.95 postpaid. Foreign orders add \$3 for AIR MAIL shipping.

**VIC 20 INTERFACING BLUE BOOK**

30 hardware interfacing projects for the VIC 20. Similar to the 64 book above. See what your VIC can do with a little interfacing. \$14.95 postpaid

**MICROSIGNAL PRESS**  
Dept B, P.O. Box 388 Goleta, CA 93116

# Computers & ELECTRONICS

# MARKETPLACE

**CLASSIFIED RATES:** Per Word, 15 Word Minimum. **COMMERCIAL:** \$5.00. **PERSONAL:** \$3.00. **EXPAND-AD®:** \$7.50. Ads set in all bold type @ 20% premium. Ads set with background screen @ 25% premium. **DISPLAY:** 1" x 2 1/4", \$605.00. 2" x 2 1/4", \$1,165.00. 3" x 2 1/4", \$1,675.00. **GENERAL INFORMATION:** Frequency rates and prepayment discounts available. Payment must accompany order except credit card—Am. Ex., Diners, MC, VISA (include exp. date)—or accredited ad agency insertions. Copy subject to publisher's approval; must be typewritten or printed. First word set in caps. Advertisers using P.O. Boxes MUST supply permanent address and telephone number. Orders not acknowledged. They will appear in next available issue after receipt. Closing date: 1st of the 2nd month preceding cover date (e.g., Mar. issue closes Jan. 1). Send order & remittance to: Classified Advertising, **COMPUTERS & ELECTRONICS Magazine**, 1 Park Avenue, New York, NY 10016. To Charge your ad to a major credit card, call Lois Price at (212) 503-5115. For Customer Service, call (212) 503-4506.

## FOR SALE

**GOVERNMENT** and industrial surplus receivers, transmitters, snooper scopes, electronic parts, Picture Catalog 25 cents. Meshna, Nahant, Mass. 01908.

**ELECTRONIC CATALOG.** Over 4,500 items. Parts, & components. Everything needed by the hobbyist or technician. \$2.00 postage & handling (United States Only), refundable with first \$15.00 order. T & M Electronics, 472 East Main St., Patchogue, NY 11772. (516) 289-2520.

**POLICE CODE UNSCRABLERS,** lets you hear the coded messages of Police, Fire and Medical channels; plus other scanner accessories, satisfaction guaranteed. DNE Inc., Rt. 7, Box 257-A, Hot Springs, AR 71901. (501) 623-6027.

**PRINTED CIRCUIT BOARDS,** your artwork. Quick delivery. Reasonable. Atlas Circuits, Box 892, Lincolnton, NC 28092. (704) 735-3943.

**FREE CATALOG** of special function IC's and quality components. Goldsmith Scientific, 720 E. Industrial Park Dr., Manchester, NH 03103.

**CABLE TV products.** Jerrold, Hamlin and Oak, send \$3.00 to **ADDITIONAL OUTLET CORP.**, 1041 W. Commercial, Ft. Lauderdale, FL 33309.

**LOWEST POSSIBLE PRICES ANYWHERE!** Computers Hardware—Software—Printers. Audio, Video, Car Stereo. **ELECTRIFIED DISCOUNTERS**, 996 Orange Ave., West Haven, CT 06516. MC/VISA. (203) 937-0106.

**CABLE TV EQUIPMENT,** Tuneable Notch filters for "Beeping" Channels. Information \$1.00. D.K. VIDEO, Box 63/6025 CE, Margate, Florida 33063 (305) 752-9202.

**MICROWAVE ANTENNAS COMPLETE WITH WARRANTY** from the original manufacturer. Three styles Daisey, Parabolic, and Yaggi. We also repair all down converters and power supplies. S.A.P. 3531 W. Glendale Ave., Phoenix, Arizona 85021. (602) 973-9117.

**CABLE TV EQUIPMENT, JERROLD HAMLIN, OAK,** all types. We also have Jerrold SB-3 in kit form. All instructions included. Dealer inquiries invited. S.A.P. 3531 W. Glendale Ave., Phoenix, Arizona 85021. (602) 973-9117.





TUBES: "Oldies". Latest. Supplies, components, schematics. Catalog Free (stamp appreciated). Steinmetz, 7519-PE Maplewood, Hammond, Ind. 46324.

## PERSONALS

MAKE FRIENDS WORLDWIDE through international correspondence, illustrated brochure free. Hermes-Verlag, Box 1021P, Honolulu, Hawaii 96727.

ORIENTAL SINGLES seeking cultural exchange, friendship, sharing, marriage. WRITE: CHERRY BLOSSOMS, Box 1021P, Honolulu, Hawaii 96727.

BEAUTIFUL PHILIPPINE LADIES—Desire Friendship, Correspondence, Marriage!! Photos, Descriptions, \$1.00. Transcor-B, Box 2321, Manila, Philippines 2801.

CORRESPONDENCE TO ASIA FOR LASTING, RELATIONSHIP. Free information. AAWS-CE, Box 2777, Orcutt, CA 93455-0777.

ORIENTAL BEAUTY SEEKS ROMANCE! Warm, loving, sincere, lonely. Thousands residing USA, worldwide, all ages. FREE PHOTO ALBUM! Pacific, Suite 18D, 8033 Sunset, Hollywood, CA 90046.

## INSTRUCTION

UNIVERSITY DEGREES BY SPECIAL EVALUATION of existing credits and Job Experience. Fast, inexpensive. Call (614) 863-1791. Or write: EVALUATION, Box 13151-A2, Columbus, Ohio 43213.

REPAIR ELECTRONIC ORGANS—Revised home study course covers all current makes and models. Free booklet. Niles Bryant School, P.O. Box 20153, Sacramento, CA 95820.

LEARN WHILE ASLEEP! HYPNOTIZE! Astonishing details, strange catalog free! Autosuggestion, Box 24-ZD, Olympia, Washington 98507.

EARN \$800+WEEK! Get your "F.C.C. Commercial Radiotelephone License" at home. "Free" details. COMMAND, D-100, Box 2223, San Francisco 94126.

UNIVERSITY DEGREES! Economical home study for Bachelor's, Master's, Doctorate. Prestigious faculty counsels for independent study and life experience credits. Free information—Richard Crews, M.D. (Harvard), President, Columbia Pacific University, 1415 Third St., Dept. 2D52, San Rafael, CA 94901; Toll Free (800) 227-1617; Ext. 480; California: (800) 772-3545, Ext. 480.

ELECTRONIC LAB KITS. Made to order for schools, colleges, and vocational training. Call or write Mr. Foley ... American Microsemiconductor, 133 Kings Road, Madison, NJ 07940, (201) 377-9566.

COLLEGE DEGREES without classes. Professional counseling plus application(s) assistance. Counseling, Box 60185, Washington, D.C. 20039. (201) 723-1715.

## FOR INVENTORS

### INVENTORS! IDEAS HAVE VALUE!

Ever think of an idea, forget it and see it later on the market? Many people don't forget, act quickly and are rewarded by American Industry. Write down your idea! We offer free disclosure registration and initial consultation regarding your idea's potential value. Call or write without delay for your free information package.

AMERICAN INVENTORS CORPORATION  
82 Broad St., Dept. CE  
Westfield, MA 01086  
413-568-3753

A Fee Based Marketing Company  
Offices Coast to Coast

INVENTIONS, IDEAS, NEW PRODUCTS WANTED! Industry presentation/national exposition. Call TOLL FREE 1-800-528-6050, extension 831.

PATENT PROTECTION. Searches, Applications, Licensing. Free Advice. Silicon Valley Patents, 3732 Oakes, Hayward, CA 94542. (415) 886-4440.

## BUSINESS OPPORTUNITIES

MECHANICALLY INCLINED individuals desiring ownership of Small Electronics Manufacturing Business—without investment. Write: BUSINESSES, 92-K1 Brighton 11th, Brooklyn, New York 11235.

ERASE DEBTS with little-known law—create wealth!! Details FREE—Wealth Kit, No. EE2, Billings, NY 12510.

BORROW \$300-\$30,000 INTEREST FREE! Keep indefinitely! Free Details. Write: American, 1601 Main, Plainfield, Indiana 46168.

BUMPER STICKER PRINTING DEVICE. Cheap, simple, portable. Free details. Bumper, POB 22791 (PE), Tampa, FL 33622.

FREE BROCHURE. Repair air conditioning, refrigeration. Tools, supplies, full instructions. Doolco Inc. 2016 Canton, Dallas, Texas 75201.

BORROW \$30,000 without interest! All eligible. Repay anytime. Free details! Infohouse-CE, 808 Post, San Francisco, CA 94109.

MULTI-CHANNEL microwave antennas. Highest quality, low prices, dealers welcome. D.T. compact \$38.00; P.T.-1 \$48.00; SR-1 \$65.00; D.T. Grid \$69.00; PTS-33 \$75.00. All units complete! Daisy Tenna, Box 42010, Phoenix 85080. 1(800) 874-9033.

MAIL ORDER OPPORTUNITY! Start profitable home business without experience or capital. Information free. Mail Order Associates, Inc., Dept. 558, Montvale, NJ 07645.

\$3,000. a month spare time income with your computer! Free details. DIGATEK CORPORATION, 2723 West Butler Drive, Suite 20B, Phoenix, AZ 85021.

EARN EXTRA INCOME with your microcomputer. Super opportunities! Free details. Scitec, Box 02038, Columbus, OH 43202.

\$360.00 WEEKLY/UP. MAILING CIRCULARS! No quotas. Sincerely interested, rush stamped envelope: National Division, Box 15877-E1 San Diego, CA 92115.

WANT TO MAKE \$50,000? Send stamped envelope for information. N-Ovations, Box 1805B, Hampton, VA 23669.

\$100,000 YEARLY!!! Assemble "PROFESSIONAL" GIANT SCREEN PROJECTION TV'S—"Don't be fooled by imitations!"... "Build the best with lenses and screens utilized by Sony, Zenith, Sylvania, and Magnavox!"... Simple construction!... Illustrated information and complete parts catalog 2.00... Money back guarantee!... POLIVISION, 187-Y Cypress St., Throop, Pa 18512.

ATTENTION COMPUTER OWNERS! Incredible incomes using any computer. Our book reveals exciting at home opportunities. \$7.00. NCS, 15 Cochran Dr., New Castle, PA 16105.

PROJECTION TV MAKE-\$\$\$'s assembling Projectors... Easy... Results comparable to \$2,500 projectors. Your total cost less than \$20.00. PLANS, 8" LENS & Dealers information \$17.50... Illustrated information FREE... Macrocoma-CFX, Washington crossing, Pennsylvania 18977. Creditcard orders 24 Hours (215) 736-2880.

DEALERS NATIONWIDE TO SELL FIRST CLASS security product. In great demand in school systems, universities, hospitals and businesses. Direct inquiries to: POB 438014, Chicago, IL 60643.

## DO-IT-YOURSELF

TELEPHONE SYSTEMS at wholesale prices. Catalog \$3.00, refunded with order. DTC, P.O. Box 15046, Daytona, FL 32015.

## REAL ESTATE

500 OFFICES... 45 STATES! 30,000 listing on computer, 16,000 under \$50,000! Free printouts and regional catalogs! UNITED FARM AGENCY, 612-EP West 47th, Kansas City, MO 64112. Ph: 1-800-821-2599, in MO 1-800-892-5785.

## INSURANCE

SAFWARE. If your computer is important to you, insure it! SAFWARE provides full replacement of hardware, media and purchased software. As little as \$35.00 a year for comprehensive coverage including fire, theft, power surges, earthquake, water damage, auto accident. Call 8 to 8 Mon. through Sat. SAFWARE, The Insurance Agency, Inc., 2929 North High Street, Columbus, OH 43202. (800) 848-3469 (nat). (614) 262-0559. (OH).

THIS MAGAZINE IS  
AVAILABLE IN MICROFORM  
DIRECT INQUIRIES TO:

MICRO PHOTO DIVISION

BELL & HOWELL

OLD MANSFIELD ROAD  
WOOSTER OH 44691  
Contact Christine Ellis  
Call toll-free (800) 321-9881  
In Ohio, call (216) 264-6666 collect

## GOVT'D SURPLUS

IS IT TRUE YOU CAN BUY JEEPS FOR \$44 THROUGH THE U.S. GOVERNMENT? Get the facts today! Call (312) 742-1142 Ext. 4649.

## EMPLOYMENT OPPORTUNITIES

ELECTRONICS/AVIONICS EMPLOYMENT OPPORTUNITIES. Details FREE. Aviation Employment Information Service, Box 240E, Northport, New York 11768.

TECHNICIANS. Journeymen to \$40,000+. Apprentices to \$32,000+. Jobs Across US. Learn where! O&M Research, Dept. P, Box 879, Shingle Springs, CA 95682.

CALIFORNIA'S SILICON VALLEY. Current job listings. Engineers, technicians, programmers, assemblers, many more. Complete information and listings \$3.00. Calwest, Dept. 10A, PO Box 3516, Santa Clara, CA 95055.

## BOOKS & MAGAZINES

**SATELLITE TV VIEWERS**  
Get the most complete weekly listings.  
Send \$1 for sample copy.

**Satellite TV Week**  
"P.O. Box 308Z, Fortuna, CA 95540"  
800-358-9997 (U.S.) • 800-556-8787 (Callf.)  
707-725-2476 (all others)

**Interested in home satellite TV?**  
Learn how it works, what services are available, how to buy a system and more through the new booklet *Tuning In To Satellite TV*. Clip out this coupon and send it with your name and address, and \$1.00 for postage and handling to:  
**Tuning In To Satellite TV**  
CommTek Publishing Company  
P.O. Box 2228, Dept. J  
Hailey, ID 83333

PUBLISHERS' OVERSTOCKS. BARGAIN BOOKS 2,000 titles, all subjects! Free catalog: Hamilton, Box 15-D, Falls Village, CT 06031.

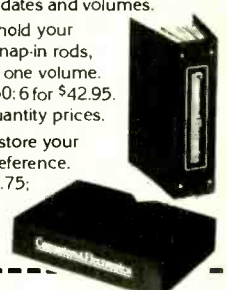
## Shelf Conscious?

Now you can organize your copies of  
**Computers & Electronics**

Now your magazines can be a handsome addition to your decor, well organized, and easy to find, thanks to these durable library-quality cases or binders. They're made of luxury-look leatherette over high-quality binders board. And both styles are custom-designed for this or any magazine you save, with size, color, and imprint selected by the publisher. FREE transfer foil included for marking dates and volumes.

**Magazine binders** hold your issues on individual snap-in rods, comping them into one volume. \$7.95 each; 3 for \$22.50; 6 for \$42.95. Mixed titles OK for quantity prices.

**Open-back cases** store your issues for individual reference. \$6.95 each; 3 for \$19.75; 6 for \$37.50. Mixed titles OK for quantity prices.



Computers & Electronics  
P.O. Box 5120, Philadelphia, PA 19141

Please send:  Cases  Binders  Quantity

Computers & Electronics  
(Other titles):

ENCLOSED IS \$\_\_\_\_\_ \* Add \$1.00 per order for post. & handling. Outside USA add \$2.50 per unit ordered. Send U.S. funds only. CHARGE ORDERS accepted for American Express, VISA, or MC. PHONE TOLL FREE 800-526-0790. NJ only 201-540-0445. BY MAIL include credit card name, #, and exp date. MINIMUM CHARGE ORDER \$10.

Print Name \_\_\_\_\_

Address \_\_\_\_\_

City/State/Zip \_\_\_\_\_

\*PA residents add 6% sales tax.

**ADVERTISERS INDEX**

RS no.	ADVERTISER	PAGE no.
2	Active Electronics .....	99
	Business Computer Network ...	95
	Classified Advertising .....	103-107
	Cleveland Institute of Electronics, Inc .....	18-21
60	Commodore .....	25
67	CompuServe .....	17
	Computel Publishing Society .....	97
39	The Computer Book Club ...	81-83
10	Conroy la Pointe .....	26-27
14	Digi-Key Corp. ....	101
7	Dow Jones .....	7
51	Eastman Kodak .....	Cover 2, 1
	Electronic Specialists .....	97
69	Focus Electronics .....	98
	Grantham College of Engineering .....	94
8	Hayes Microcomputer .....	5
26	Heath Co. ....	29-31
41	IBM Corporation .....	14-15
49	IBM Corporation .....	34-35
12	Inmac .....	85
21	Jameco Electronics .....	100
22	JDR Microdevices .....	102
23	J & R Music World .....	85
20	Leading Edge .....	2
	McGraw Hill Book Club .....	91-93
	McGraw Hill Continuing Education Center .....	39-41
65	Meca .....	Cover 4
4	Microstuf, Inc. ....	Cover 3
66	Mycroft Labs, Inc. ....	89
	NRI Schools .....	8-11
5	Nibble Notch Computer Products .....	88
6	Nicolet Paratronics Corp. ....	97
38/40	Protecto .....	86-87
	Radio Shack .....	79
	Scottsdale Systems .....	98
42	Tam's Inc. ....	88

**Flat Panel Displays**  
 (Continued from page 69)

side, which is in the rear of the display, contains rows and columns of electrodes that are sequentially scanned and energized. However, on the front side of the priming plate are a transparent dielectric layer and transparent ac sustaining electrodes, which are pulsed in synchronism with the dc column electrodes (Fig. 2).

When the gas between an energized row and column electrode pair fires on the dc side, some of the ionized gas moves through the corresponding hole in the priming plate and fires the gas on the ac side. Due to the surface charge

**With rare exceptions,  
 if a GPD works at all,  
 every pixel will light**

that builds up in the dielectric layer, the gas on the ac side is sustained even after the gas on the dc side is extinguished. The advantage of the PlasmaGraphics approach over conventional ac gas discharge displays is that it uses much simpler drive circuits: Only 40 drivers and 132 panel-to-driver connections are required to address 120,000 individual pixels.

Nippon Electric Company (NEC) has an interesting fully populated gas discharge display that combines the long life and graphics capabilities of ac technology with the simple addressing of dc displays. Like the PlasmaGraphics hybrids, NEC's displays use a simple X/Y addressing scheme in which a row is energized and the columns sequentially scanned. Currently, World Products (Sonoma, CA), which is the exclusive U.S. distributor, offers NEC displays in a 256 × 512-pixel format that's ideal for a standard 25-line × 80-column computer display. However, within a few months, 640 × 200, 640 × 400, and 350 × 720 formats should also be available.

**The Electroluminescent Alternative**

ELDs are based on the Destriau effect, named for its French discoverer, G. Destriau. In essence, light can be generated by suspending phosphor materials—usually zinc sulphide doped with copper or manganese—in an insulator and placing it in an intense ac field between a pair of capacitor-like electrodes. The voltage required to generate light depends on the material and its thickness, but can be as little as 20 V for very thin film phosphors. A typical monochrome ELD consists of the active phosphor layer sandwiched between a pair of insulating layers, which are in turn sand-

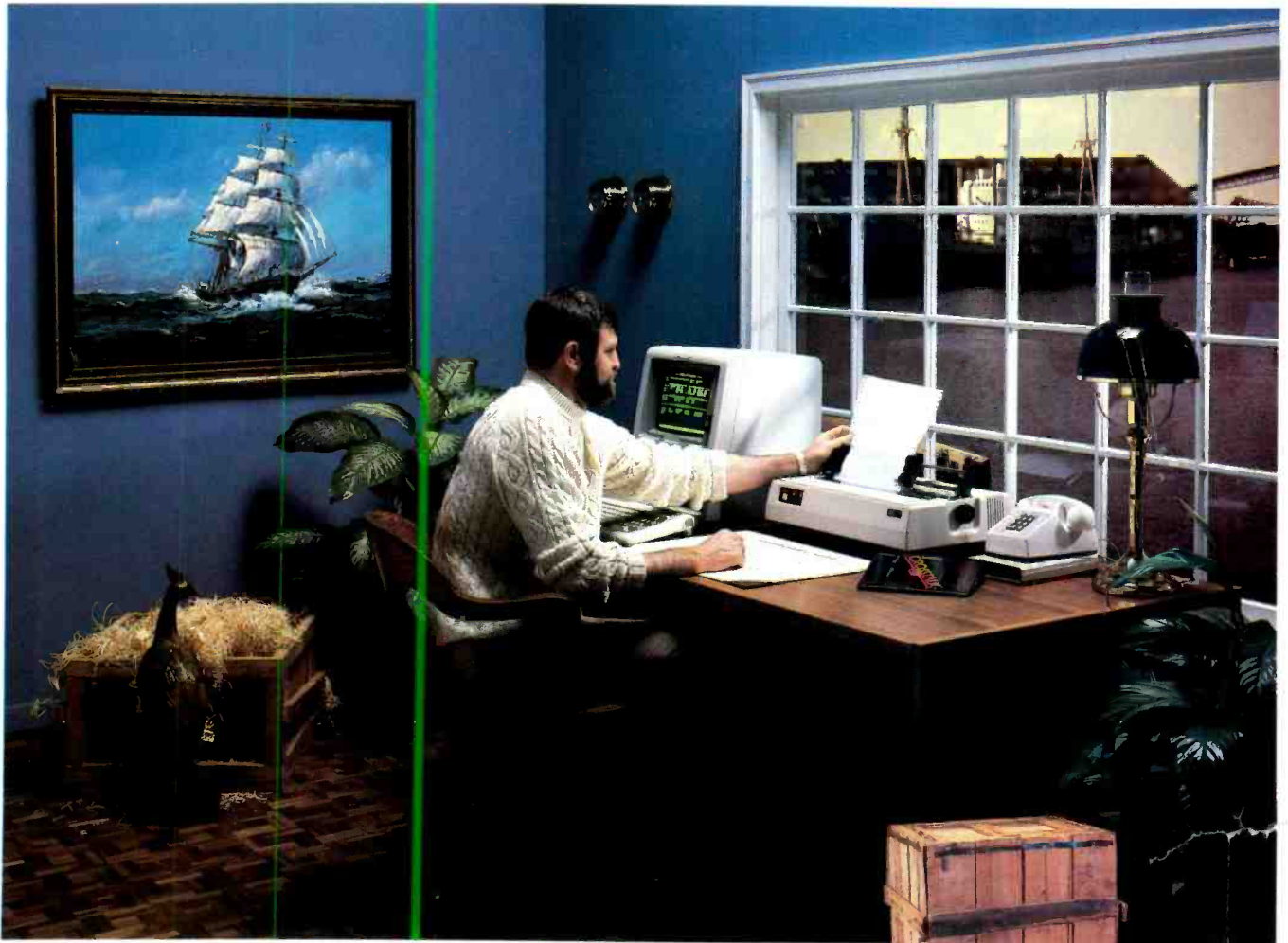
wiched between a pair of electrodes. As with GPDs, the front electrode is usually a transparent coating, and the rear electrode is usually etched metal.

The color of the light generated depends, of course, on the phosphor material used. Green and yellow are the most common. Amber is also produced. Multicolor displays can be fabricated by adding more sections of electrode-insulator active layers with phosphors that emit different colors. In fact, Planar Systems (Beaverton, OR) has already developed the necessary phosphor materials for a full-color ELD and is now developing a full-color monitor for the U.S. Army.

Planar Systems also offers in its Model EL 6648M the only large fully populated ELD that is readily available, although Sharp and Lohja, a Finnish company, have announced similar products. The EL 6648M generates 131,072 pixels, arranged in a 256 × 512 format, and can display 25 lines × 80 characters or high-resolution graphics in a 3.84" × 7.68" active area.

The choice between gas discharge and electroluminescence depends on the application. Both offer thin cross sections and displays with pixels in fixed locations that eliminate the geometric distortion common to CRTs. Also, GPDs and ELDs are always in focus. With rare exceptions, if a GPD works at all, every pixel in it will light. Because the light from an ELD depends on a very thin phosphor layer, the display's performance depends on the uniformity of the layer's thickness and the absence of pin holes or contaminants that result in dark spots. But while GPDs produce only one color, ELDs can be made to produce multiple colors. Moreover, ELDs tend to weigh less than GPDs.

GPDs currently "own" the market for emissive flat panels, but ELDs should capture a large share of it in just a few years. According to a study from Arthur D. Little, the compound growth rate through 1992 for ELDs will be 81%, while for GPDs it will be only 53%. Part of that growth will be due to ELD's multi-color capabilities, and part to a lowering of prices. Right now, ELD technology is in its infancy. Manufacturing capacity and know-how are much more limited than for GPDs. With time, however, both will expand and the price gap will close. Planar System's EL 6648M, for example, is expected to cost \$775 in quantity late this year, but only about \$200 by the end of 1987. Which of the methods will win out in the end is still uncertain, but one thing is clear. The future of display technology belongs to flat panels. ◇



## International Connections

With the industry's most popular data communications program, the world is at your command.

An import/export office in New Jersey can instantly check the London market for current dollar exchange rates ... send Hong Kong an updated production schedule ... print-out the week's sales results from the Dallas branch.

There's virtually no limit to how far you can reach with your microcomputer, ordinary telephone lines, and CROSSTALK.

Even if your own business and personal needs are closer to home, you'll appreciate CROSSTALK's compatibility with a wide user base ... smart terminal characteristics ... total modem control ... and the ability to capture data at a high speed for later off-line editing. CROSSTALK has extras you may not find in other programs. Data capture to memory buffer (and on-line display). Protocol error-checking file transfer. Modem/telephone hangup, and display of elapsed time of call. Command file power and flexibility. Remote takeover and operation. And much more.

There is a CROSSTALK version for almost every CP/M, CP/M-86, or IBM DOS based microcomputer system. See your dealer, or write for a brochure.



# CROSSTALK™

**MICROSTUF**®

1000 Holcomb Woods Parkway / Roswell, Georgia 30076

CROSSTALK is a trademark of Microstuf, Inc.. CP/M and CP/M-86 are trademarks of Digital Research, Inc.. IBM is a trademark of International Business Machines, Inc.

Circle No. 4 on Free Information Card

# "MANAGING YOUR MONEY<sup>™</sup> alone is enough reason for many, many people to buy a computer."

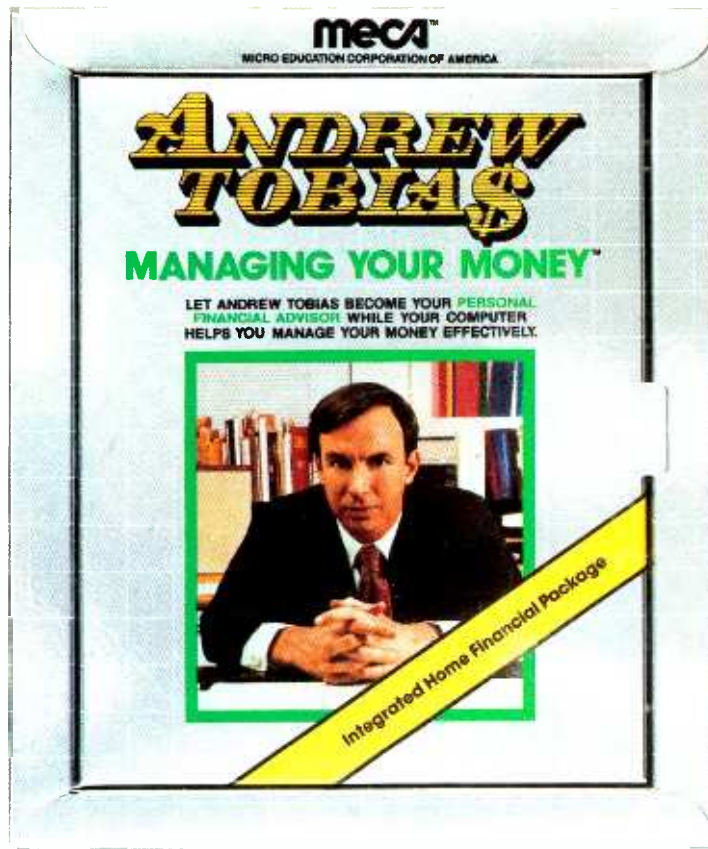
HENRY KISOR, CHICAGO SUN-TIMES, SEPTEMBER 9, 1984.

"MANAGING YOUR MONEY is, simply, the finest personal financial management program on the market."

PERSONAL SOFTWARE MAGAZINE, JULY, 1984.

"The first fully-integrated financial program that really makes a computer for the home worth the money."

SEYMOUR MERRIN  
COMPUTER WORKS OF CT.



Disk version for IBM PC XT, Compaq and now for PCjr with 256 K. Cartridge version available for PCjr at IBM authorized dealers

"What the home computer market needs most is software good enough to make people use the machines they buy. A new program by Andrew Tobias may well be one for the money."

FORBES, APRIL 9, 1984.

"It's a joy to use and deserves to be in every household that owns a personal computer."

COMPUTERS & ELECTRONICS, NOVEMBER, 1984.

**The only financial software you'll ever need. The easiest financial software you'll ever use.**

It's seven programs in one. It prepares your budget and balances your checkbook.

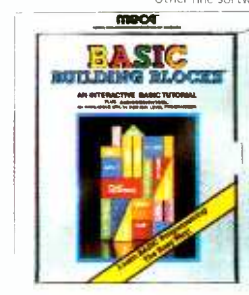
It calculates your net worth. It helps manage your stock portfolio. It calculates your taxes. It estimates your life insurance needs. It analyzes loans and helps you do retirement planning.

It reminds you of important dates. No need for a big, bulky manual.

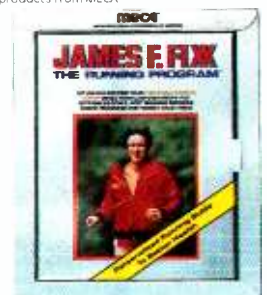
With MANAGING YOUR MONEY<sup>™</sup> all the help you need is constantly on-line, on the computer.

And everything is integrated so you only need to enter data once.

Other fine software products from MECA



For Atari, Apple and IBM



For IBM

Available where fine software is sold

## meCA<sup>™</sup>

Software that makes your personal computer worth having.<sup>™</sup>

©1984 • MICRO EDUCATION CORPORATION OF AMERICA • 285 RIVERSIDE AVENUE, WESTPORT, CT 06880 • (203) 222-1000