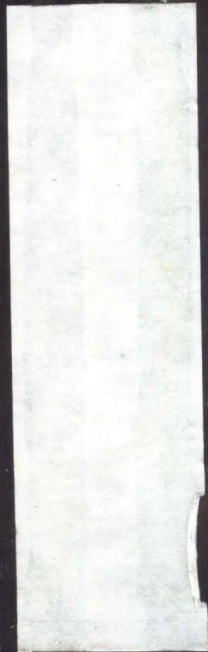


Mini-Micro Systems

A CAHNERS PUBLICATION

OCTOBER 1984

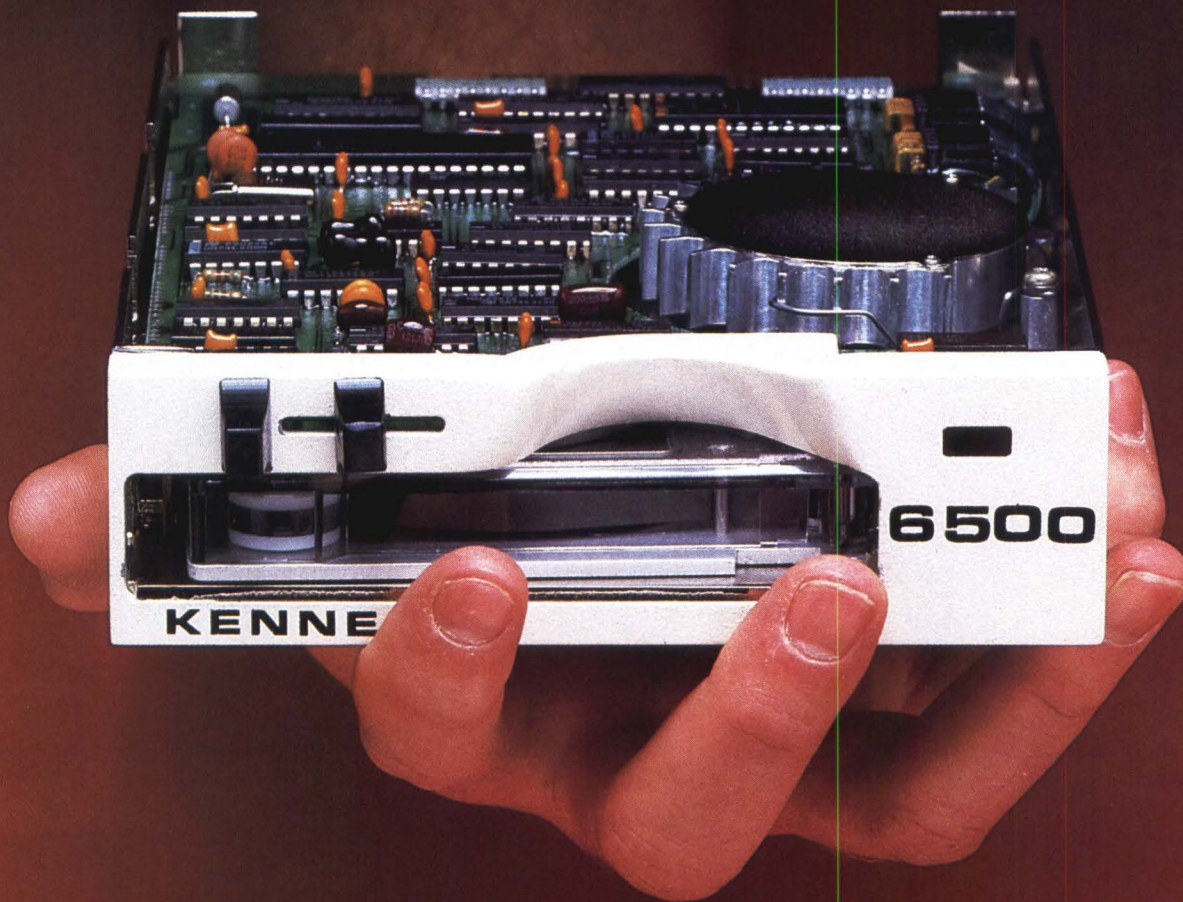


**Modular supermicrocomputer
expands with user needs**

Utility software: Development tools grow up
Disk emulators speed system performance

Introducing Model 6500 —

'the handful'



Kennedy's Model 6500 5 1/4" Cartridge Recorder — it fits in your hand, but it's more than a handful of new and unique features, such as:

- 16 KBYTE Buffer — Model 6500 can transfer data at a burst rate of up to 3 MBYTE/sec., and maintain streaming longer in systems with little buffering.
- 150 MS Ramp Time — Data access time and reposition time is cut in half; and it can better operate in a Pseudo s/s mode.

- Direct Drive Motor — Assures much higher reliability and lower I.S.V.

Finally, and best of all, Model 6500 features a simple mechanical design — loading is simple, moving the tape to the head instead of the head to the tape.

Model 6500 is one big handful of what you've been looking for in a 5 1/4" cartridge recorder. Write or call us.

KENNEDY

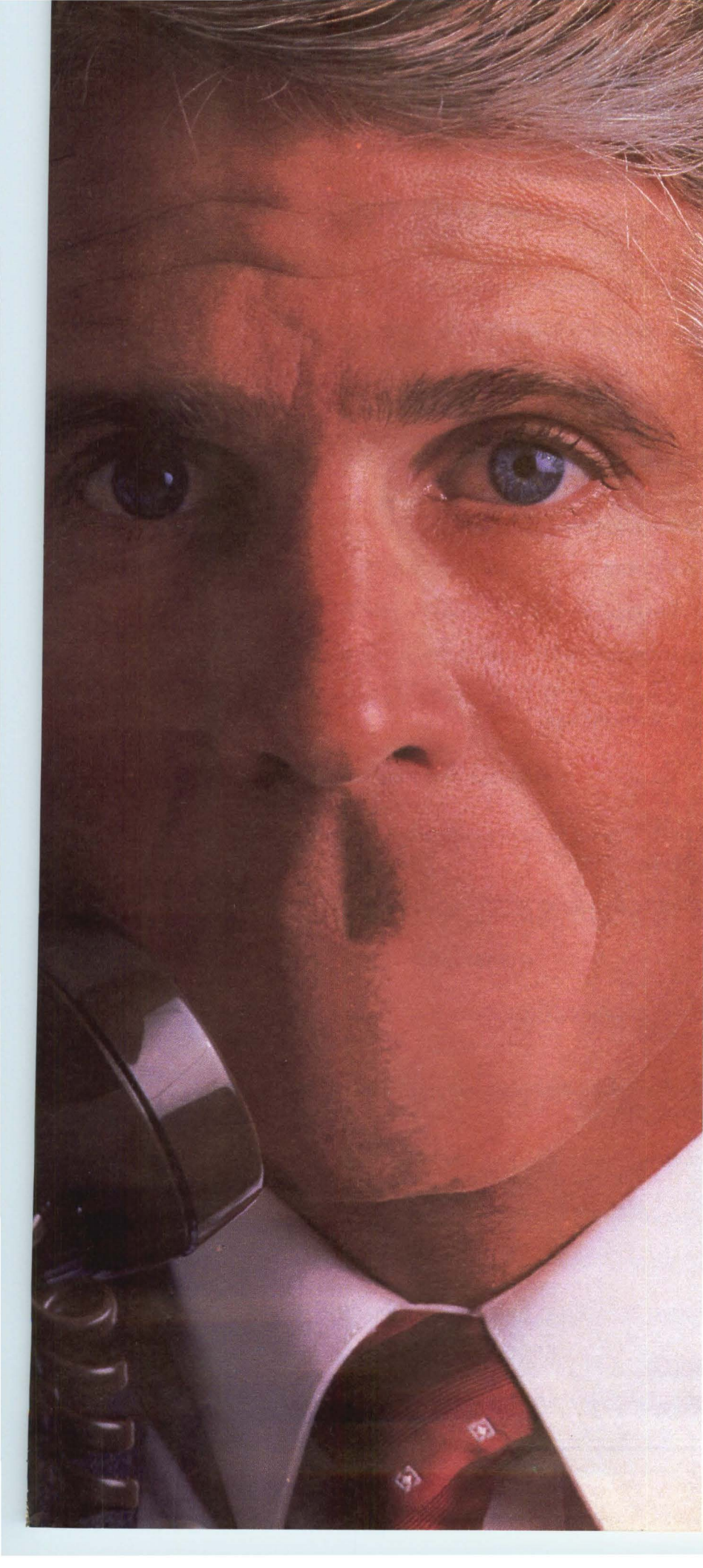
An Allegheny International Company

1600 Shamrock Ave., Monrovia, CA 91016

(818) 357-8831 • ITT TELEX 472-0116 KENNEDY

CIRCLE NO. 1 ON INQUIRY CARD

KENNEDY • QUALITY • COUNT ON IT



The most effective communications medium ever devised is still the human voice.

But now, technology makes voice go farther, faster, more efficiently—with the new VoiceServer™ from DSC.

VoiceServer is the low-cost OEM integration solution for digital voice processing and storage. From a stand-alone voice store and forward “mailbox” for any PBX—to applications like text-to-voice conversion and speaker/command recognition, VoiceServer handles them with plug-in hardware and UNIX-based software. DSC’s Open System Architecture™ means many OEM opportunities for adding value, and long product life cycles.

VoiceServer’s proprietary compression techniques yield high-quality digitized speech at only 8,000 bits per second. Use of standard peripheral interfaces and low-cost long-haul circuits simplifies the design of integrated voice/data systems.

So when you’re thinking business communications, be sure to talk with the experts at Digital Sound.

We guarantee you won’t be left speechless.

WHEN DESIGNING YOUR BUSINESS COMMUNICATIONS SYSTEM, DON'T FORGET THE MOST IMPORTANT PART.

I'm a (check one)

MM 10/84

- Telecommunications OEM or distributor
 Computer or OA manufacturer/reseller

Send me details on the VoiceServer.

Name _____

Title _____

Company _____

Division _____

Address _____

City _____

State _____ ZIP _____

Telephone(_____) _____

DSC Digital
Sound
Corporation

We speak the future.

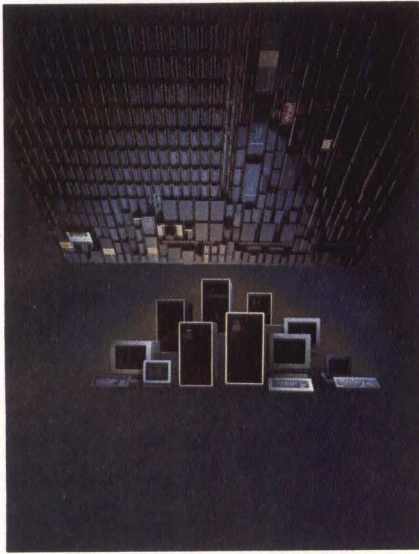
2030 Alameda Padre Serra
Santa Barbara, CA 93103
(805) 569-0700

UNIX is a trademark of AT&T Bell Laboratories.
VoiceServer and Open System Architecture are trademarks of Digital Sound Corporation.

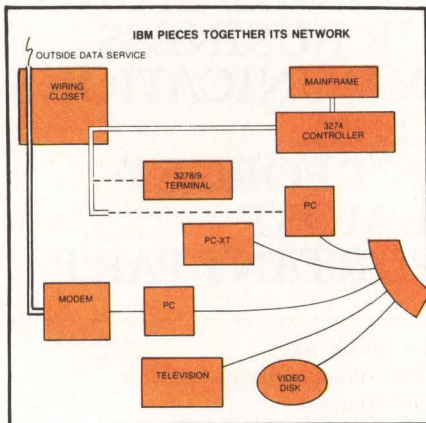
© 1984 Digital Sound Corp.

CIRCLE NO. 2 ON INQUIRY CARD

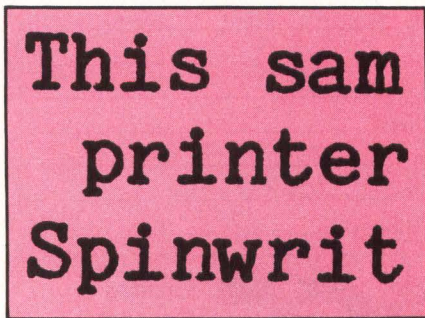
Mini-Micro Systems



p. 31 Art direction and design by Dick Sorel, photography by Rodney Duff. Courtesy of Syte Information Technology Inc.



p. 35 Jazzing up IBM's PC line



p. 59 Innovative printer technologies

MINI-MICRO WORLD News

- 31 Minicomputer handles multiple needs, uses
- 35 IBM expands PC line with supermicro, LAN
- 43 Demand soars for VT220 terminals, DEC and competitors ramp up
- 51 Data General takes IBM PC-compatibility into the portables market
- 59 Diconix, Ferix challenge non-impact printer technologies with innovative designs
- 62 GSA expands computer store program
- 71 Ashton-Tate, Lotus, Informatics link IBM PCs to mainframes
- 74 Programmable servo writer solves portability and cost problems
- 80 Heard on the Hill: Cellular telephones promise efficient data communication

Corporate and Financial

- 85 Hewlett-Packard streamlines to provide complete systems solutions
- 86 Corporate and financial briefs

International

- 91 Advent of venture capital may fuel Taiwan's high technology business
- 95 Can Apple fill a bushel basket with Macintosh software for Japan?

- European News: E1 Release of SNA information is the key result of IBM, European Commission accord
- E2 Europeans ease rules for high-tech exports; United States may tighten its reins
- E6 IBM's Portable is expected to make an aggressive showing in Europe
- E8 Overheard Overseas: Olivetti connection may tarnish AT&T's image in UNIX Europe

INTERPRETER

- 103 Software publishers toughen stand against pirates and pilferers
- 113 Utility software streamlines program development and operation

INTEGRATOR

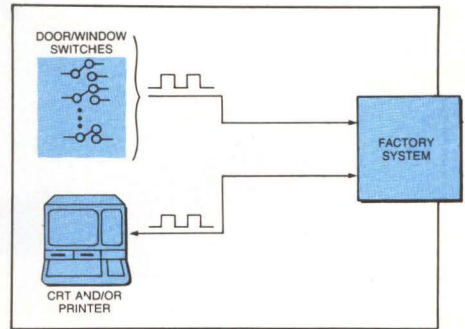
- 125 CMOS provides a cost-effective solution for harsh industrial environments

FEATURES

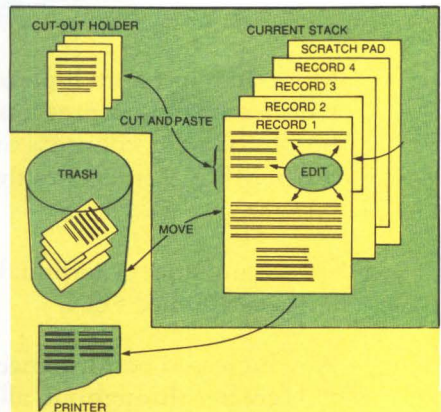
- 137 **Feature Highlights**
- 139 **Disk emulators accelerate computer system performance . . . speeding sluggish disk-response times sixfold**
- 155 **Removable mass storage market sales remain strong . . . magnetic-tape and disk-drive models stay competitive**
- 165 **Stretched-surface-recording boasts attributes of floppies and Winchester . . . combining good performance and low cost to achieve high densities**
- 171 **UNIX-based software introduces Telex to office automation . . . SofTest Inc.'s SofGram can transmit and receive Telex communications over different computers**
- 185 **Graphics boards rejuvenate microcomputer displays . . . vendors strive to keep up with growing market**
- 197 **Database-management software accents flexibility . . . word-oriented package accepts varied data formats and simplifies data retrieval methods**
- 207 **Microcomputer COBOL aids mainframe links . . . micros need no longer serve as mere standalone systems**
- 221 **Versatile OEM module combines laser printing, image scanning and copying functions . . . Fujitsu America Inc.'s M3071 replaces a host of unfunctional office machines**



p. 113 Utility software matures



p. 125 Is CMOS the better choice?



p. 197 DayFlo adds flexibility

DEPARTMENTS

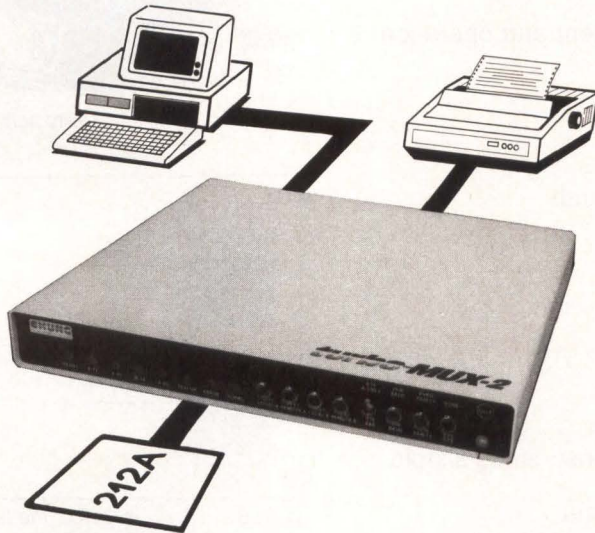
- 4 Editorial Staff
- 9 Editorial
- 13 Letters to the Editor
- 15 Breakpoints
- 232 New Products
- 264 Calendar
- 265 Classified Advertising
- 266 Career Opportunities
- 272 Index to Advertisers
- 273 Mini-Micro Marketplace



MINI-MICRO SYSTEMS (ISSN 0364-9342) is published monthly (with additional issues in spring, summer and fall) by Cahners Publishing Company, Division of Reed Holdings, Inc., 221 Columbus Avenue, Boston, MA 02116. Norman L. Cahners, Chairman; Saul Goldweitz, President and Chief Executive Officer; Ronald G. Segel, Executive Vice President and Chief Operating Officer. MINI-MICRO SYSTEMS is published by the Cahners Magazine Division: J. A. Sheehan, President; William Platt, Executive Vice President. Circulation records are maintained at Cahners Publishing Co., 270 St. Paul St., Denver, CO 80206. Second class postage paid at Denver, CO 80202 and additional mailing offices. Postmaster: Send address changes to MINI-MICRO SYSTEMS, 270 St. Paul St., Denver, CO 80206. MINI-MICRO SYSTEMS is circulated without charge by name and title to U.S. and Western Europe based corporate and technical management, systems engineers, and other personnel who meet qualification procedures. Available to others at the rate of \$55.00 per year in the U.S.; \$60.00 in Canada and Mexico; \$75 surface mail in all other countries; \$120 foreign air mail (16 issues). Special DIGEST issues, \$15.00. Single issues \$4.00 in the U.S.; \$5.00 in Canada and Mexico; \$6.00 in all other countries.

© 1984 by Cahners Publishing Company, Division of Reed Holdings, Inc. All rights reserved.

Five reasons why systems integrators use turboMUX-2.



turbo-MUX-2™

More than just a multiplexer, turboMUX-2 uses advanced data compression to support two 2400 bps, full duplex channels over one 212A data link. TurboMUX-2 integrates these features into any system:

1. Simultaneous terminal and printer operation at 2400 bps FDX.
2. Increased performance for more uses with greater throughput, all at a lower cost.
3. Maximum inquiry application throughput.
4. Automatic error detection and correction.
5. Switch-selectable XON/XOFF and CTS flow control and built-in diagnostics.

TurboMUX-2. It's like getting a free 2400 bps line.

CHUNG
TELECOMMUNICATIONS

4046 Ben Lomond Drive
Palo Alto, CA 94306
(415) 858-2456

CIRCLE NO. 3 ON INQUIRY CARD

STAFF

Vice President/Publisher
S. Henry Sacks

Editor-in-Chief
George V. Kotelly

Managing Editor
James F. Donohue

Assistant Managing Editor
Bruce J. MacDonald

Senior Western Editor: **Jerry Borrell**
San Jose, (408) 296-0868
Senior Editor: **Paul Sniger**
Senior Editor: **Lori Valgr**
Senior Projects Editor: **Rick Dairymple**

Western Editor: **Carl Warren**,
Los Angeles, (213)826-5818
Associate Editor: **Frances T. Granville**
Associate Editor: **Lynn Haber**
Associate Editor/Research:
Frances C. Michalski
Associate Editor: **Tom Moran**,
San Jose, (408)296-0868
Associate Editor: **David Simpson**
Associate Editor: **Marjorie Stenzler-Centonze**,
New York, (516)595-2737
Associate Editor: **Michael Tucker**
Associate Editor: **Jesse Victor**
Assistant Editor: **David Bright**
Assistant Editor/New Products: **Eileen Milauskas**
Assistant Editor/Research: **Pamela Gorski**
Assistant Editor/Research: **Megan Nields**

Contributing Editors:

London: **Keith Jones**, (011-441-661-3040)
Data Communications: **Walter A. Levy**
Computer Architecture: **Efrem Mallach**
Office Automation: **John Murphy**
Frankfurt: **Maureen O'Gara**
Artificial Intelligence: **Steven Roberts**
Washington, D.C.: **Stephen J. Shaw**,
(202)387-8666

Editorial Production

Senior Copy Editor: **Arsene C. Davignon**
Production Editor: **Mary Anne Weeks**
Copy Editor: **Gregory Solman**
Word Processing: **Kathleen Ewing**
Administrative Assistant: **Nancy Norton**

Editorial Services

Sharon Hassell, Terri Gellegos

Assistant to the Publisher: **Linda L. Lovett**

Executive Editor,
Cahners Computer Publications:
Alan R. Kaplan

Art Staff

Art Director: **Vicki Blake**
Assistant Art Director: **Cynthia McManus**
Artist: **Anne Tregay**

Director of Art Dept.: **Norm Graf**

Production Staff

VP Production: **Wayne Hultzky**
Supervisor: **William Tomaselli**
Production Manager: **Lisa Sisterhenm**
Composition: **Diane Malone**

Editorial Offices

Boston: 221 Columbus Ave., Boston, MA 02116. (617)536-7780. **Irvine:** 2041 Business Center Dr., Suite 109, Irvine, CA 92715. **Los Angeles:** 12233 W. Olympic Blvd., Los Angeles, CA 90064. **San Jose:** 3031 Tisch Way, San Jose, CA 95128. **New York:** 33 Arcadia Dr., Dix Hills, NY 11746. **London:** Business Press International, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS, England.

Reprints of Mini-Micro Systems articles are available on a custom printing basis at reasonable prices in quantities of 500 or more. For an exact quote, contact Art Lehmann, Cahners Reprint Service, Cahners Plaza, 1350 E. Touhy Ave., Box 5080, Des Plaines, IL 60018. Phone (312)635-8800.



Our Firebreathers are scorching old performance standards.

Gould's PowerNode™ 9000 blasts through UNIX* benchmarks at 4.5 times the speed of the VAX™ 11/780. Sound impossible? Give us your real production code or benchmarks and let us prove it.

Firebreathing Performance.

Now you can run software development and production at the same time, with highly responsive performance. Tightly coupled dual processors nearly double throughput and virtual memory accommodates large programs. Hardware fixed point and floating point accelerators retain high performance in heavy number-crunching situations. The PN9000 handles mainframe jobs in a multi-user UNIX system or serves as a backend processor in a widely distributed network.

Unique UNIX Software.

Gould's own high performance UNIX-based operating system (UTX/32™)—a unique combination of Berkeley 4.2 with special Bell System V features—makes it easy for you to use your VAX-based UNIX software. This allows easy conversion from your system to the increased power of a Firebreather.

Compatible Family.

Gould's Compatibility Suite is a collection of application software packages that are compatible across the entire PowerSeries™ product line. Use C, Cobol, BASIC, or Pascal languages intermixed. This close-knit processor family offers all the advantages of

a dedicated system plus the lower-cost-per-user option of sharing resources with Gould's standard networking capabilities including Ethernet™. The Firebreathers are the high end of the widest range of UNIX-based systems in the industry.

Gould's Firebreathers are scorching the UNIX market.

**Gould Inc.,
Computer Systems Division**
Distributed Systems Operation
6901 West Sunrise Boulevard
Ft. Lauderdale, Florida 33313
(305) 797-5459

*UNIX is a trademark of AT&T Bell Labs
™PowerNode, PowerSeries and UTX/32 are trademarks of Gould Inc.

™Ethernet is a trademark of Xerox Corporation

™VAX is a trademark of Digital Equipment Corporation

CIRCLE NO. 4 ON INQUIRY CARD



GOULD
Electronics

THE EVOLUTION



PBX
(Switchus interruptus)



LAN
(Linkus limitus)

*IBM is a trademark of International Business Machines, Inc.
VAX is a trademark of Digital Equipment Corp.

OF MAN.™



MAN
(*Connectus perfectus*)

The first step up the data networking ladder was the data PBX. It was good. But not very intelligent.

Then came the LAN. It was quicker and more flexible. But limited to just one office, just one network.

Now there's no reason to monkey around with either a Data PBX *or* a LAN.

Now there's MAN.

MAN: The Multiple Area Network.

MAN links multiple devices, multiple users, multiple networks and multiple locations.

It's the most highly evolved, highly intelligent communications system there is.

Where Data PBXs struggle to provide single connections for slow terminals, MAN makes it easy to access multiple sources from low *and* high speed devices.

Multiple sessions per port let you connect to a VAX,™ then switch easily to an IBM™ mainframe.

And PBXs have a single point of failure. MAN doesn't.

Survival of the fittest.

The LAN was a big step up from the Data PBX. MAN goes way beyond any LAN.

It not only lets you connect all your personal computers, printers, terminals, and mainframes to Ethernet, it lets you link your Ethernet to other Ethernets, remote nets, X.25 public nets, and SNA.

You can even link LANs across Tymnet and Telenet.

And MAN's Terminal Servers, Host Servers, and Gateways have the capacity to serve even the most demanding users like Sperry, NASA, GTE and Contel.

Call 415-969-4400. Or write us at 1345 Shorebird Way, Mt. View, CA 94043. We'll tell you all the reasons you should choose MAN over the competition.

It's the natural selection.

Bridge
COMMUNICATIONS INC.

The Multiple Area Network

CIRCLE NO. 5 ON INQUIRY CARD

50,000 DRIVES DELIVERED



WE'VE BEEN DELIVERING 3 1/2" WINCHESTER DISK DRIVES FOR OVER A YEAR.

Rodime has been setting a new standard in Winchester disk drive storage for more than a year. Its 3 1/2" drive with 5 and 10 megabytes of formatted storage has become the industry leader for sub 4" Winchester disk drives. Rodime has now delivered tens of thousands!

The proven compact drive and proven quantity supplier

With thousands of its 3 1/2" Winchester drives in operation today Rodime has further demonstrated its reputation for reliability, a major design consideration for its 3 1/2" drive, and quality. It has a rugged design with high resistance to shock, an important consideration for portability and for vibration prone environments. Using advanced large-scale integration, the entire electronics for the drive are on a single compact board and there are no adjustments or select-on-test components.

New design horizons

The compact size of Rodime's drive suddenly puts large-scale storage into areas never considered before. The 350 series is one-fourth the volume of a 5 1/4" Winchester drive. And the 250 series, which includes



mounting brackets and a face plate, fits into the same space as a half-height 5 1/4" Winchester offering even further shock and vibration isolation. Now, system designers have a new level of flexibility. One area that has received attention is use with portable computers. Several major portable computer manufacturers have already incorporated Rodime 3 1/2" Winchester disk drives into

their products. There are other equally exciting areas such as desk top computer systems, intelligent terminals, point-of-sale terminals, industrial controllers, telecommunications systems, navigation and guidance systems, and portable instrumentation. In fact, the list of potential uses is only limited by the imagination of the system designer.

A tradition of excellence

In a few short years, Rodime has established itself as a major force within the Winchester disk drive industry. Rodime is one of the few manufacturers that are delivering 5 1/4" Winchester drives with a broad range of capabilities up to 54 megabytes. And is the only manufacturer delivering high-performance 3 1/2" Winchester drives in production quantities.

For the compact 3 1/2" Winchester disk or other 5 1/4" Winchester requirements, look to Rodime. Rodime delivers.

RODIME

Western Sales Office: (714) 770-3085 • **Eastern Sales Office:** (512) 453-5135

Distributors: San Jose, CA (408) 946-8000 • Tustin, CA (714) 730-8000 • San Diego, CA (619) 279-5200, 453-9005 • Chatsworth, CA (818) 700-1000 • Tempe, AZ (602) 244-0900 • Englewood, CO (303) 790-4500
Redmond, WA (206) 881-0850 • Addison, TX (214) 733-4300 • Austin, TX (512) 835-0220 • Sugarland, TX (713) 240-2255 • Burlington, MA (617) 272-9400 • Hauppauge, NY (516) 273-1660 • Fairfield, NJ (201) 227-7960 • Horsham, PA (215) 443-5150 • Columbia, MD (301) 964-0040 • Tulsa, OK (918) 644-8812

CIRCLE NO. 6 ON INQUIRY CARD

© 1984 Rodime, Inc.



Optical disk technology fosters heady market projections

According to Freeman Associates, a Santa Barbara, Calif., management consulting company, the market for optical disk drives intended for data-storage applications is projected to expand significantly from just 600 units shipped worldwide in 1984, at a value of \$9 million, to 2.4 million units in 1990, at a value of \$7.3 billion. The company's study report, "Optical Data-Storage Outlook," further predicts that optical data storage is now approaching market feasibility after more than a decade of technology development. In fact, this development effort should culminate next month at COMDEX/Fall '84 with a few 5¼-inch optical disk-drive introductions. These units will likely be attached to small microcomputer systems.

But why choose optical disk instead of magnetic disk or tape? Because the seemingly insatiable demand for digital data storage has driven the peripherals industry to build lower-cost-per-megabyte devices as storage-intensive applications continue to gain prominence. Optical disk technology, therefore, meets the following system integration needs:

- Offers gigabyte storage capacities.
- Fills the performance gap between magnetic disk and magnetic tape, but does not replace either one.
- Competes favorably where moderately

fast access times are required and large sequential-data transfers are common.

There are some shortcomings, though. For one, optical products will necessitate the conversion of many software programs and the implementation of new software. For another, non-alterable media might prove a disqualifying factor. More important, however, is the lack of format and interface standards. And yet another hurdle might be market reluctance toward an unproven technology.

Because optical disk technology presents system integrators with these new challenges as to evaluation, selection, integration and application, there is a need for well-researched, in-depth market and product analysis and information. And *Mini-Micro Systems* will meet that need—we will analyze and forecast the market for products that use this new technology. In forthcoming issues, we will also assess promising applications, evaluate technical issues and compare competing data-storage alternatives. And we ask our readers to participate, too. In addition to our expert staff-written articles, each issue of *Mini-Micro Systems* contains contributed features by industry leaders. The combination will result in your leading source of useful information on this important new industry.

George V. Kotelly

George Kotelly
Editor-in-Chief

**YOU WON'T
FIND MANY
SHUGART DRIVES
AROUND
THESE PARTS.**



You find Shugart new generation drives where they were built to be. In all kinds of systems. Under all kinds of conditions. Running. And running and running.

Setting a world standard for quality. A standard that doesn't allow room for failure. Because you don't.

To insure the reliability of your system, we begin with our suppliers. They go through a lot. Learning and qualifying, even building drives themselves.

We also involve our manufacturing engineers. And our quality control experts. From the very beginning. The design stage.

With their full collaboration, every new drive is designed for top quality. Unbeatable reliability. And ease of assembly. Using the fewest number of parts possible.

In other words, the same un-

compromising quality you design into your system is designed and built into every new Shugart drive. Right from the start. So you can count on consistent reliability. For example, 20,000 hours MTBF for new generation Winchesters.

Of course, every Shugart drive is subject to the most stringent testing and inspection at every stage. But inspection doesn't insure quality. At Shugart, we believe there's only one way to insure a reliable product. By eliminating the cause of failure from the product design.

At Shugart, quality is designed in. Not inspected in.

Let us prove it. Call Doug Daetz, our Director of Corporate Quality at (408) 737-3009 for details.

Shugart

Right from the start.

Introducing the PC alternatives for the office and the factory.



For Office Control: ISI's 5160.



For Factory Control: ISI's 6160.

More flexible. More functional. More cost effective.

ISI International (formerly Intersil Systems) introduces two new IBM-compatible systems, one for the office and one for the factory.

Each is PC and XT-compatible in both hardware and software. But both offer significant advantages in flexibility, expandability and cost effectiveness.

Office Control: ISI's 5160.

The ISI 5160 office system looks like, and works like, the PC/XT, and it will run the software its more expensive counterpart will run. So you are assured of broad software availability.

But ISI designed the 5160 to be especially flexible in meeting the needs of different sized offices, with differing (and changing) processing requirements.

Expanding all the way from a single floppy to a fully loaded Winchester system is far easier with the ISI system. In fact, over 60 MB of on-line storage capacity is available. Half-height floppies, 10, 20 and 30 MB Winchester drives, cartridge tape backup, and a 130-watt power supply supports expansion.

The first step was to put all the CPU essentials onto the baseboard, leaving more open expansion slots and greater provision to meet users' changing needs. The standard 5160 system includes all these essential features on the baseboard: 8088 CPU and optional 8087 coprocessor; 128K memory (expandable to 640K); calendar/real-time clock with battery backup; two RS-232C ports; parallel printer port; floppy disk controller and SASI interface.

So for an office system that truly offers room to grow, choose ISI International's 5160 office system.

Factory Control: ISI's 6160.

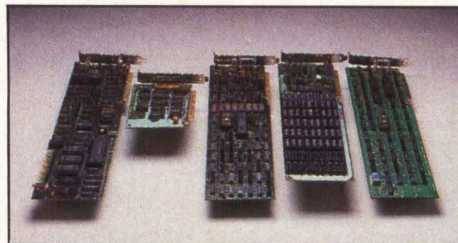
The ISI 6160 is essentially the same easily expandable processor as the 5160, featuring the same PC and XT-compatibility, but with important additional features that make this the ideal system for factory applications.

For example, it's 19" rack-mountable RETMA enclosure is ruggedly designed and manufactured, and features fan cooling with positive airflow to eliminate hot spots; changeable filters for extra protection from contamination; and a key-lockable cover for limited access to power and reset switches, as well as to the shock-mounted disk drives.

Both the 5160 and the 6160 offer MS-DOS* and GW-Basic;* in addition, the 6160 factory system offers VRTX†; a multitasking kernel that permits you to run real-time, interrupt-driven control applications.

For operation in a more office-like setting, the 6160 can be dressed up in its own "office" style cabinet, just like the 5160. But underneath, it will still be the most versatile, expandable, functional computer available to run factory control applications.

For more information on either the ISI 5160 office system or the ISI 6160 factory system, call us in the West at (408) 743-4442, in the East at (201) 272-3920, or in the Midwest at (513) 890-6450.



ISI International also offers an expanding array of adapter cards for use with ISI International systems, as well as IBM and other PC-compatible systems.



INTERNATIONAL

1275 Hammerwood Avenue
Sunnyvale, California 94089, (408) 743-4442
European headquarters, Paris (1) 878.42.25.

*MS-DOS and GW are trademarks of Microsoft Corporation.
†VRTX is a registered trademark of Hunter & Ready, Inc.

Letters

DOMAIN'S FISCAL MUSCLE

To the editor:

I am writing in reference to the informative article on the thin-film media industry which appeared in the May issue (MMS, May 1984, Page 129). The article contained two errors about Domain Technology.

At the time the article was written, Domain had an equity base exceeding \$11 million—obtained through two rounds of venture capital financing—though the article reported only \$4 million. In May, Domain closed a third round of venture financing, and concurrently expanded its credit lines. Domain's total equity now exceeds \$19.8 million, and total available credit exceeds \$14 million.

A second correction—Domain is in the process of expanding its sputtering facility and is, therefore, a major contender not only in the plated media market (as reported in the article), but also in sputtered media.

We appreciate the opportunity to bring your readers up to date on recent developments at Domain.

Kate Spohr
Account Executive
New Venture
Communications
Palo Alto, Calif.

STANDARDIZING WITH THE BEST

To the editor:

In your article on LAN standards (MMS, July 1984, Page 36) you quote Mike MacNaughton as indicating "I'd be surprised if any [small- or medium-sized companies] will meet the standards that are coming out of NBS." He obviously did not look at the list of vendors that have passed NBS testing.

Charles River Data Systems is not a large vendor (even medium-sized may be an optimistic representation), but we were at NCC in the Boeing Booth passing data with the best of them (or at least the biggest). Small vendors need standards *more* than the larger vendors. It is the point that allows us and our customers to get the facilities we need without having to do it all ourselves. This applies to networks (when I don't want to write the software on the other vendor's system to support my proto-

col), buses (to adopt new interfaces quickly), [and] operating systems, so we can get the critical applications software.

It doesn't take any more effort or cost to implement standards—just a commitment to be standard and to "do it right."

James Isaak
Director of Product Marketing
Charles River Data Systems Inc.
Framingham, Mass.

MULTIUSER SURVEY

To the editor:

You have done your readers and Molecular Computers a disservice in your June 15 survey of multiuser system (MMS Computer Digest). You have created the appearance that the Molecular SuperMicro series is among the most expensive multiuser system on the market when, in fact, it is among the least expensive.

The base retail price of the eight-user SuperMicro 8 is \$5,995 (not \$16,135) and the base retail price of the 32-user SuperMicro 32X is \$18,995 (not \$66,755). How can you compare the price of a fully loaded Molecular with a stripped-down Altos or Alpha Micro or Hewlett-Packard? You have not specified terminals (which could cost from \$400 to \$2,000) or printers (which could cost from \$400 to \$5,000).

A better method of comparison would be to specify the base price of the system, along with the incremental cost of adding each additional user. Or alternatively, specify the price of the systems in a comparable (say 4- or 8-users) configuration.

John J. Maurer
Iowa Computer Services Ltd.
Ames, Iowa

Editor's response:

MMS prints the price and configuration information provided by the computer manufacturer. In this instance, Molecular Computer provided us with "fully-configured" prices rather than "base" price. Manufacturers choose different ways to express their prices. As to using base prices, the problem is there is no "standard" configuration to which manufacturers comply. Our tables serve only as guidelines; price and configuration information is best obtained directly from the manufacturer's sales representatives.

SCREEN FORMATTER

(Or FORMS MANAGER)



VAX.PDP.IBM-PC
PRO.RAINBOW

- MORE POWERFUL THAN FMS
- LESS PROGRAMMING THAN TDMS
- TERMINAL INDEPENDENT
- COMPUTER EFFICIENCY
- OPERATOR PRODUCTIVITY
- EXACTLY THE SAME ON MANY DIFFERENT COMPUTERS
- POWERFUL DATA VALIDATION
- INTERACTIVE SCREEN PAINTER



VIKING FORMS MANAGER

VAX, PDP, PRO, RAINBOW are trademarks of Digital Equipment Corporation. IBM-PC is a trademark of International Business Machines Corporation.

CALL:

(918) 745-6550

VIKING
Software Services

2815 E. Skelly Dr., Suite 816
Tulsa, OK 74105

CIRCLE NO. 9 ON INQUIRY CARD



OEM alert: The new Perkin-Elmer 3205 packs supermini performance into a micro price tag.

Introducing the Perkin-Elmer 3205. Now OEMs and system integrators can provide 32-bit supermini computing power at micro system economics, without making any compromises.

No micro system can approach the per-terminal cost advantages of the Perkin-Elmer 3205 supermini. Or the migration paths. Or offer access to a common database.

No supermini system can touch the Perkin-Elmer 3205 proven price/performance statistics.

Small investment. Big potential.

A basic 3205 costs just \$6,169* and includes a 1/2 megabyte of memory, eight communications lines, floating point and a lot more. There's even a microprocessor handling just

communications support that has more power than you get in most complete microcomputers.

The 3205 can be expanded to 4 megabytes of memory, 16 communications lines and 1.2 gigabytes of disk storage. And every configuration in the broad 3205 range offers a choice of operating systems: our own Real Time OS/32 or one derived from the UNIX** operating system.

Fully configured value.

50 megabytes of fixed/removable Winchester disk memory, 8 communications ports and a full complement of related capabilities are included in a fully configured 3205 computer for only \$15,469*. That lets you supply powerful computer systems your customers can afford to buy.

The support you need.

Perkin-Elmer has been an OEM supplier for over 15 years. We know how to support you. We have a worldwide service network, powerful, quality software, reliable hardware and the terms and conditions you need.

Mini/Micro/Maximization.

The Perkin-Elmer 3205 gives you the small purchase price of micro systems, and the power, growth potential and common database advantages of supermini systems.

For the complete story, call or write the Perkin-Elmer Corporation, Two Crescent Place, Oceanport, N.J. 07757. **1-800-631-2154.** In N.J., 1-201-870-4712.

*OEM quantity 100, U.S. only.
**UNIX is a trademark of Bell Laboratories.

PERKIN-ELMER

The science and computer company.
Where solutions come first.

CIRCLE NO. 10 ON INQUIRY CARD

Breakpoints

ELECTRONIC 'ACCESS KEY' TIGHTENS SYSTEM SECURITY

Startup company Gordian Systems Inc., Palo Alto, Calif., has developed what it considers to be a practical, low-cost solution to system security. The company's first product, to be introduced this month, is a thumb-sized "access key" that must be held up to a CRT screen in order for a user to gain system access. The key consists of custom circuitry, optical sensors, a five-year lithium battery, a clock and a calendar. When the key is held up to a screen, it optically reads certain information, combines it with other pre-programmed information in its own circuitry and generates a unique password. The password is then displayed on the key's LCD and the user types the password into the system on the keyboard. Volume price is less than \$10 per key.—D. Bright

HEWLETT-PACKARD UPGRADES HP150 WITH WINCHESTER, HIGH-CAPACITY FLOPPIES

Hewlett-Packard Co. early this month planned two upgrades to its HP150 personal computer. The Touchscreen Personal Computer doubles the floppy disk storage of the HP150 by incorporating double-sided, 710K-byte, 3½-inch drives from Sony Corp. The Touchscreen MAX Personal Computer has one 710K-byte microfloppy and a 15M-byte internal Winchester disk drive. HP has upgraded its user manuals for the new models, bundled word processing and the Personal Card File programs, and added icon-driven configuration software. Suggested U.S. retail prices will be \$3,495 for the Touchscreen Personal Computer and \$5,495 for the Touchscreen MAX.—T. Moran

TIME RUNS OUT FOR BUSINESS SOLUTIONS INC.

Business Solutions Inc. (BSI), Kings Park, N.Y., the four-year-old software company that produced The Incredible Jack and Jack2 integrated programs, ceased operating last month. The company is now negotiating with potential buyers of its assets, according to David Gavrin of Windcrest Partners, New York, a major investor in BSI. Gavrin cited "an inability to penetrate the IBM market with the dollars available" as a key reason for the company's problems, together with failing to establish a large enough dealer base. A major venture capital deal fell through this summer. BSI has sold more than 12,000 packages of its Jack software.—M. Stenzler-Centonze

OPTICAL DRIVE FOR PERSONAL COMPUTERS, UNDER \$1,000 FOR OEMS

An optical disk drive with a full-height 5¼-inch form factor for personal computers reportedly will be demonstrated privately to potential OEM customers on November 15 by Information Storage Inc., Colorado Springs, Colo. A company spokesman says the software drivers have already been written for PC-DOS and MS-DOS. The drive provides 100M bytes of write-once storage and should be priced less than \$1,000 in OEM quantities. Other features include a data-transfer rate of 2.5M bits per second and a maximum access time of 200 msec. Evaluation units are scheduled to be available in the first quarter of next year, and volume shipments should follow in the fourth quarter.—K. Jones

Breakpoints

VERBEX VOICE RECOGNITION TERMINAL RUNS WITH IBM PC

Verbex Corp. early this month planned to announce its \$4,900 Verbex 4000 speaker-dependent, continuous-voice recognition terminal for the IBM PC. Although the Bedford, Mass., company is a recognized leader in its chosen technology, it has had little success marketing a larger, more intelligent model, the \$25,000 Verbex 3000, with a maximum vocabulary of 360 words. The 4000 has a vocabulary of 100 words and a claimed minimum-accuracy level of 98 percent against background noise as high as 85 dB. It connects to the IBM PC via a standard RS232C port. The unit should soon interface with Digital Equipment Corp. VAX superminicomputers and Hewlett-Packard Co. 1000 and 3000 minicomputers.—D. Bright

COMPUTERVISION ADDS COLOR WORKSTATIONS

Computer-aided design/computer-aided manufacturing (CAD/CAM) leader Computervision Corp., Bedford, Mass., has added two high-resolution models to its range: the CDS 3420 and CDS 3421. Both workstations feature raster-scan technology, 900-pixel-by-1152-pixel resolution and support for 16 colors out of a palette of 4,096. The \$51,600 CDS 3421 is designed for standalone applications, and the \$42,800 CDS 3420, which includes an Ethernet controller, is designed for networking applications. Volume shipments should begin late this year.—D. Bright

SPECTRAGRAPHICS ADDS IBM 5080 EMULATION, SOLID MODELING SOFTWARE

Spectragraphics Corp., San Diego, is coming out with a firmware upgrade to its System 1500 Multi-Station for IBM 5080 workstation emulation. Scheduled to be available at the end of this month, the upgrade will be offered to System 1500 owners for \$3,000. Spectragraphics will also offer the SynthaVision solid modeling software from Mathematical Applications Group Inc., Elmsford, N.Y., and Automatic Dynamic Analysis of Mechanical Systems from Mechanical Dynamics Inc., Ann Arbor, Mich.—T. Moran

MEGAVAULT PUSHES 8-INCH WINCHESTER CAPACITY BEYOND 300M BYTES

Megavault Corp., Woodland Hills, Calif., plans to ship in the first quarter of next year the model MV-300 8-inch Winchester disk drive with 331.8M bytes of storage. The price will be \$4,200 in 100-unit quantities. Another model, the MV-660, planned for the second quarter, doubles the capacity to 660.4M bytes. The price will be \$8,000, also in 100-unit quantities. The drives use seven platters and are available with either a Storage Module Device (SMD) or Small Computer Systems Interface (SCSI). The company also plans to provide the Intelligent Peripheral Interface-2 for the MV-660.—C. Warren

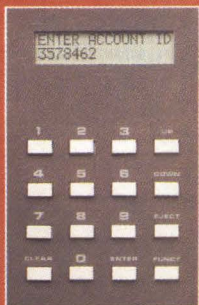
SEQUOIA BUILDS MODULAR FAULT-TOLERANT SYSTEM RUNNING UNIX

Three-year old Sequoia Systems Inc., Marlborough, Mass., has finally announced its first product: the modular, multiple MC68010-based Sequoia System. The system, which runs UNIX, is designed to compete against Tandem Computers Inc. and Stratus Computer Inc. in the burgeoning fault-tolerant computer market. The system can be expanded from two to 64 processors, tightly coupled via an 80M-byte-per-second bus; from 4M bytes to 256M bytes of RAM; and from two MC68000-based I/O channels to 96

Can You Print On All Of These Documents?



The CRADEN DP4 positions and prints on any document . . . automatically.



That's why it's no longer necessary to convert existing documents to continuous forms or limit your system capabilities. A single DP4 can be used for both rapid matrix printing and quality text output.

Our two line alphanumeric display allows your system to prompt an operator, who can then respond via the keypad. Several serial interfaces are included for easy connection to any system.

We have established a reputation for product quality and maintenance-free reliability with major OEM's. If you have a unique printing problem, contact Craden and discover how responsive a vendor can be.



CRADEN
PERIPHERALS
CORPORATION

204 Cooper Center, Pennsauken, NJ 08109 Telephone: (609) 488-0700 Telex: 759716

CIRCLE NO. 11 ON INQUIRY CARD

SAMSON™



NOTHING GIVES UNIX* MORE MUSCLE THAN SGS' NEW SAMSON™.

Want to unlock more of the capabilities of UNIX? Want the best UNIX-based cost-per-megabyte system in the industry? Then you want the power of Samson.

Backed by more than a quarter of a century of technological strength, SGS' 32/16-bit multi-user, multi-task, virtual memory Samson packs large-mainframe power in a compact, rack-mountable cabinet. Standard features include a 70MB Winchester disk with the only 67MB formatted cartridge back-up warranted for interchangeability, plus the strength to support up to 34 ports.

Multibus* compatible, dual-bus, dual-port memory, 10-slot chassis.

Samson is more than muscle. It is designed for speed, flexibility and expandability. System architecture is based on industry-standard Multibus, enhanced by SGS' new P2 dual-bus structure (SAM-BUS™).

Samson permits the main processor to converse with memory, while allowing the other intelligent Multibus controllers direct access to memory (DMA) via the Multibus (P1) connector. Each bus can address the system's full 16MB range. The result is exceptionally high-speed

operation and significantly improved throughput without the need for cache memory architecture.

32/16-bit Intelligent Serial I/O Controller.

Samson's Intelligent I/O incorporates the same 32/16-bit microprocessor strength as the master CPU. The microprocessor allows software originally handled by the CPU, to be executed directly by the I/O firmware, further increasing overall system speed and throughput. This, coupled with the compatibility of the powerful Z8030* Serial Controller, make the I/O extremely flexible.

Powerful system- oriented software.

Total in-house expertise allows SGS to be system oriented — not just hardware or software. In fact, SGS is one of the few hardware vendors to port the full version of UNIX and to develop its own programs.

One SGS package, M.E.N.U.™, guides users through UNIX and the wide range of other powerful user-friendly programs available on Samson. These include a sophisticated word processor, electronic spreadsheet, TELEX PLUS™ (a package for automatically sending and receiving telex messages), IBM 3780*, APPGEN*, Ethernet*, UNIFY*, RM/COBOL*, SMC-BASIC and "C".

Meets today's demanding OEM and user needs, tomorrow's challenges.

Samson incorporates the most commonly used OEM "standards" including UNIX, MULTIBUS AND ETHERNET. Compatibility with an exceptionally wide range of products means OEM's can negotiate with numerous manufacturers for the best available peripheral values.

In fact, both OEM's and end users can count on increased UNIX performance now and in the future because SGS has unlocked the strength of Samson.

Get all the powerful facts on SAMSON — the historical breakthrough. Call Jim Sullivan: 602/867-6245. Or write SGS Semiconductor Corporation, 1000 East Bell Road, Phoenix, Arizona 85022.

Call today 602/867-6245



® Technology and Service

*UNIX is a trademark of Bell Laboratories
**RM/COBOL is a trademark of Ryan-McFarland Corp.
**APPGEN is a trademark of Software Express
**IBM 3780 is a trademark of Int'l. Business Machines
**Z8000 is a trademark of Zilog, Inc.
**Telex is a trademark of Western Union
© Multibus is a registered trademark of Intel Corporation
**Ethernet is a trademark of Xerox Corporation
**UNIFY is a trademark of UNIFY Corporation
**TELEX PLUS, M.E.N.U., SAM-BUS and SAMSON are trademarks of SGS Semiconductor Corporation

CIRCLE NO. 12 ON INQUIRY CARD

Breakpoints

channels, with 256 ports per channel. Sequoia officials claim the system runs UNIX System V and Berkeley 4.2 applications simultaneously. Prices start at \$290,000; each additional processor is \$40,000 and each 2M bytes of RAM is \$20,000.—D. Bright

DILOG ADDS COMMUNICATION BOARDS FOR DEC PDP/VAX MINICOMPUTERS

Distributed Logic Corp. (DILOG), Anaheim, Calif., is providing Digital Equipment Corp. (DEC) Unibus communications with its model CU160 asynchronous communications controller. The \$3,000 board multiplexes 16 channels for terminals, printers, modems or serial communications equipment. It emulates DEC's DH11 asynchronous communications multiplexer for the PDP-11 and the DMF32 multifunction controller for the VAX via onboard firmware.—C. Warren

TELEVIDEO'S INCOME SLIDES 84 PERCENT

TeleVideo Systems Inc.'s net income fell 84 percent for the third quarter, ending in July, to \$994,000 from \$6.1 million for the same quarter last year. Sales dropped to \$40.8 million from \$44.6 million a year earlier. Company representatives said the decrease was in line with earlier projections and blamed market uncertainty over IBM price cuts for lower sales of the company's IBM PC-compatible products.—T. Moran

HARRIS OFFERS UNIX SYSTEM V ON ITS MODIFIED VOS OPERATING SYSTEM

Harris Corp.'s version of UNIX System V that is under development is more than UNIX running on top of a native operating system. Harris modified its proprietary VOS superminicomputer operating system, adding UNIX features such as system calls, subroutines, and libraries, so that VOS and UNIX share the same kernel. Beta testing for the product should begin in December.—D. Bright

TECH FILES: A QUICK LOOK AT INDUSTRY DEVELOPMENTS

MICRO FILES: The increasing availability of 256K-bit dynamic RAM chips has allowed **Apple Computer Inc.**, Cupertino, Calif., to announce a 512K-byte version of its Macintosh microcomputer several months earlier than expected. The "Fat Mac's" retail price of \$3,195 includes MacWrite and MacPaint software. In addition, Apple reduced the price of the original 128K-byte Macintosh to \$2,195. This month, customers who purchased the earlier version for \$2,495 will be able to buy a dealer-installed memory upgrade to 512K bytes and the two software packages for \$995.—T. Moran

TERMINAL FILES: **Hitachi Denshi America Ltd.**, Woodbury, N.Y., has introduced the 14-inch model CU-1420 and 12-inch model CU1220 terminals, which should be available this quarter. Designed for biomedical and graphics applications, the monitors have a horizontal resolution of 540 lines and a dot-pitch size of 0.31 mm. Prices have not been set.—C. Warren

To enhance CRT images, **Vivid Systems Inc.**, Palo Alto, Calif., has introduced the Limelight computer projector. Limelight connects to any personal

Breakpoints

computer and projects a bright monochrome green image as large as 10 feet. Resolution is more than 700 lines. A special lens system can focus the image at its center and corners, and stretch it horizontally or vertically. The Limelight weighs 22 pounds, and measures 8 by 12 by 24 inches. Its price is \$3,950.—C. Warren

COMMUNICATIONS FILES: Ungermann-Bass Inc., Santa Clara, Calif., has expanded its Net/One local area network with the NIU-130 network interface unit, which halves the cost of the Net/One interface. It enables two RS232 user devices to be connected to a Net/One network. The price is \$1,400, and the unit should be available next month.—M. Stenzler-Centonze

RANDOM DISK FILES: Intel Corp., Santa Clara, Calif., plans to release a number of controller chip sets over the next 18 months. A company spokesman says the chip sets are for system integrators that plan products using the Small Computer Systems Interface (SCSI) and the Enhanced Small Disk Interface (ESDI). The sets should use two VLSI chips, and require the addition of analog circuitry. The chips will be programmable.—C. Warren

Adaptec Inc., Milpitas, Calif., is unveiling the model ACB-3530 tape controller. The controller, priced at \$400 for 1,000-unit purchases, is scheduled for delivery next month. It provides Small Computer Systems Interface (SCSI) to Quarter Inch Cartridge (QIC)-36 interfacing, and can be formatted to QIC-24 specifications. The 3530 also reads QIC-11 formats. An onboard 8K-byte buffer supports continuous streaming operations.—C. Warren

Sysgen Inc., Fremont, Calif., is offering the Small Computer Systems Interface (SCSI) to Quarter Inch Cartridge (QIC)-36 multifunction disk/tape model SC4500 controllers for the IBM PC. The SC4500 is available in two models that control either a 10M-byte cassette drive or a 20M-byte or 45M-byte streaming cartridge drive. The OEM price is \$295. System level software can be licensed from Sysgen for \$12 per controller.—C. Warren

SOFTWARE FILES: The latest version of **Oregon Software Inc.'s** Pascal-2 compiler is being released this month for use on Digital Equipment Corp.'s (DEC) VAX and MicroVAX systems. It runs under DEC's VMS, RT-11, RSX, and TSX-Plus operating systems. The Portland, Ore., company's Pascal-2 supports data types that conform to the International Standards Organization's standard. License fees begin at \$4,950.—C. Warren

NOTES FROM OVERSEAS: The European computer industry suffered a blow last month when Denmark's premier manufacturer, 20-year-old **Christian Rovsing**, suddenly declared bankruptcy after failing to pay its 1,200 employees. The company's British subsidiary also was placed in receivership. The \$60 million communications and networking company, whose largest customer is American Airlines, reportedly failed to negotiate a last-minute rescue package with its institutional investors.—M. O'Gara

LINE PRINTER COMPARISON CHART

STANDARD FEATURES	CIE TERMINALS CI-300	CIE TERMINALS CI-600	DATAPRODUCTS B-300/600	PRINTRONIX P-300/600
LOWEST PRICE	X	X		
L Q PRINTING	X	X	X	
COMPRESSED PRINT	X	X		
GRAPHICS RESOLUTION				
60 x 72	X	X		X
120 x 72	X	X		X
200 x 144	X	X		
200 x 288		X		
BOLDFACE PRINTING	X	X		
SLANTED PRINTING	X	X		
CHAR. ENLARGEMENT	X	X		
INT'L CHARACTERS	X	X		

This printout proves we out-print the competition.

The chart above tells a telling story about our CI-300 and CI-600 Matrix Line Printers. Feature for feature, they out-print Dataproducts® and Printronix®—and at a lower cost. Our printers can accommodate many types of applications and computer systems. They provide both multimode printing and graphics plotting. Graphics resolution on the CI-300 and CI-600 printers is the highest available on a line printer in their speed class, with excellent graphics quality for business, scientific and

barcode applications. Barcode applications are easily developed with optional graphics card. Interfacing is not a problem either. RS232-C Serial, Centronics® and Dataproducts Parallel, and IBM-compatible interfaces accommodate most types of computer systems.

The printers' sturdy design and small number of moving parts make them extremely dependable, and easy to maintain as well.

The CI-300 and CI-600 are the Matrix Line Printers with the versatility built in. And they're available immediately. To find out more, just write or call CIE Terminals, 2505 McCabe Way, Irvine, CA 92714. (714) 660-1421.

Call toll-free 1-800-854-5959.
In California, call toll-free 1-800-432-3687.

CIE TERMINALS
A CITECH ELECTRONICS COMPANY



®Dataproducts is a registered trademark of Dataproducts Corp.
Printronix is a registered trademark of Printronix Corp.
Centronics is a registered trademark of Centronics Data Computer Corp.
©1984 CIE Terminals.

CIRCLE NO. 13 ON INQUIRY CARD



IF IT WEREN'T FOR UNIX WE NEVER COULD HAVE BUILT THE PYRAMIDS

Ordinary computers, yes. But not a Pyramid Technology 90x.

After all, here's a supermini not just capable of running UNIX,[™] but born to run it. And run it up to four times faster than the most popular UNIX host. For a lot less money.

The secrets of this Pyramid are a thorough understanding of UNIX, a few fundamentals of RISC (Reduced Instruction Set Computer) theory, more registers than 30 VAXs, and a 32-bit proprietary architecture that outperforms a roomful of micros.

All combined to speed up UNIX just where it likes to slow down.

For example, gone are 85% of performance-robbing memory references. The endless parameter shuffling of yesterday's technology has been replaced with a hardware register window. Even context switching takes less than one percent of the CPU's time.

It's amazing what hardware architects can do, given the chance. It's almost as startling as what our software wizards did.

They crafted OSx, a dual port of Berkeley's 4.2 BSD and Bell's System V. Because you can switch environments at will, no UNIX port offers more capabilities. With absolutely no loss

of compatibility.

Well, almost.

We do admit to one feature not compatible with other UNIX systems. Our single-source support.

One telephone number instantly connects you to both hardware and software experts. In-house pros, who spend their energy pointing you towards solutions. Not pointing fingers at each other.

So no matter how you see your requirements shaping up, contact Pyramid Technology, 1295 Charleston Road, Mountain View, California 94043. Or call (415) 965-7200.

Because when it comes to running UNIX, a Pyramid looks good from any angle.

 **PYRAMID
TECHNOLOGY**

Breakpoints

For two years **Olivetti SpA**, Ivrea, Italy, has been itching to get into the retail computer business in Europe. Recently, it purchased 31.6 percent of British franchiser Tabs Ltd. for \$1.5 million. Tabs has about 60 franchises in the United Kingdom that sell about \$40 million annually of IBM PCs, Olivetti M24s, ACT Apricots, Sirius microcomputers, and Tabs' PDQ IBM PC-lookalike. Tabs managing director Terry Poole says Tabs should have 100 British outlets by the end of this year. Olivetti's interest in Tabs was piqued by Tabs' desire to add the Olivetti/AT&T 3B computer line to its retail outlets by Easter. There is speculation now that Olivetti might expand its Arizona-based MicroAge store chain, in which it has a 48.8 percent interest, into Europe.—M. O'Gara

Also on the acquisition trail is **ITT Corp.**, which has just purchased a 37.6 percent share of Holland Automation International BV (HAI), The Netherlands, for an undisclosed sum. HAI's forte is the HAI*BAS operating system, which has an integrated BASIC language and the HAI* applications programs that can be run on most popular microcomputers in the United States and Europe. ITT is believed to be looking to HAI as a springboard into Europe for ITT's software distribution business.—M. O'Gara

Joint development initiatives by European software companies already addressing the fledgling market for **Ada** programming products won't get much of a hoped-for financial boost. The projects will receive financial support worth only about \$5 million over the next two years from the Commission of the European Communities. Four to five times that amount was desired by the Commission's Information Technology Task Force. A Commission spokesman blames the Community's overall shortage of funds.—K. Jones

Sord Computer Corp., Tokyo, is preparing to incorporate a software sales company, tentatively called the Image Partner Corp., this fall. The enterprise will focus on UNOS, the UNIX-compatible operating system from Charles River Data Systems Inc., Natick, Mass. Sord uses the operating system for its 32-bit M685 computer. The new sales affiliate will represent an 80 percent investment by Sord and a 3 percent investment from eight venture capital companies.—I. Kakehashi

C. Itoh Data Systems Company, Tokyo, is promoting a Japanese version of the IBM MVS/DECnet gateway system for IBM-to-DEC data transfer. The system, developed by ICS Inc., Fremont, Calif., is priced in Japan at \$150,826 (36.5 million yen). The system provides an interface for 8M-byte-per-second communication to IBM machines and 10M-byte-per-second communication to DEC machines, converting signals to make the IBM machines look like nodes on DECnet. DEC users in turn can draw from IBM databases with DEC commands; no special software translation is required. C. Itoh does not expect a large market the first year, but compatibility should become an important selling point for IBM- and DEC-lookalike equipment.—I. Kakehashi

Breakpoints

In response to pressure from the South Korean government, **NEC Corp.**, Tokyo, has agreed to a venture in which the Samsung Electron Devices Co. in Korea will assemble NEC's personal computers, bank teller machines, and general-purpose office minicomputers from parts supplied by NEC. The Korean government has restricted imports to encourage domestic industry. IBM Corp. and Fujitsu Ltd. are expected to increase their Korean operations in line with the government's policy.—I. Kakehashi

Matsushita Electric Industrial Co., Osaka, Japan, recently introduced the TQ-2300 optical disk file system that can record or play moving or still images and two-channel stereo sound. Priced at \$14,463 (3.5 million yen) in Japan, the system applies the optical Kerr effect, in which materials change their structure when laser heat is applied. The file system uses a spiral tracking method with a track pitch of 1.6 microns rather than the 2.5 microns used on the earlier still-only equipment. The disks can store 24,000 still-image frames or 13 minutes and 30 seconds of moving images. The TQ-2300 includes an RS232C interface for use with computers and other I/O equipment for recording and replay. Next month Matsushita plans to ship a playback-only machine, the TF-2400F, priced at \$3,512 (850,000 yen) in Japan.—I. Kakehashi

Fujitsu Ltd. and Design Automation Inc., are developing the FC-AD11 personal computer computer-aided design system. The system is a two-dimensional drafting product based on Fujitsu's FM-11BS 16-bit microcomputer fitted with a mouse input device and an X-Y plotter. The price is expected to be about \$9,421 (2.28 million yen) in Japan.—I. Kakehashi

NEC Corp., should introduce a second round of V Series microprocessors next summer. The new chips will use the same CMOS construction and 2-micron patterns of earlier V Series chips. They should have a self-contained, four-channel DMA controller with 1M-byte addressing, and can be plugged into seven external interrupts. There are three 16-bit timers, and full-duplex serial sending and receiving capabilities for asynchronous data. The company also is working on the V60, a chip with a 16-bit external data bus and 32-bit internal processing, and the V70, a chip with a 32-bit external bus and 32-bit internal processing.—I. Kakehashi

Five of Taiwan's largest electronics manufacturers expect to begin producing 5¼-inch half-height 10M-byte hard disk drives early next year. Each of the five—**Tatung Co.**, **Sampo Corp.**, **Cal-Comp Electronics Inc.**, **Vidar-SMS Co., Ltd.**, and **Far Eastern Electric Industry Co., Ltd.**—participated in a recent hard disk drive development project directed by Taiwan's Electronics Research and Service Organization, a government-sponsored R&D facility. The five will market the project's drive, which has a recording density of 9,100 bits per inch and a track density of 345 tracks per inch.—C. Hintermeister

HERE TODAY HERE TOMORROW

Reliability.

The essential ingredient that OEMs and systems integrators need for today and tomorrow. Without it, you can't generate business.

Which is why CompuPro's System 816™ answers your needs.

Survival of the Fittest.

This micro is The Essential Computer. It not only outperforms the competition, but also operates in extreme environments for virtually an unlimited number of applications.

Just one look at our specs and you know the System 816 will be around for a long, long time. And because the System 816 is structured on the IEEE 696/S-100 bus you can select the appropriate components, independently, in any combination. Even use boards for graphics and other unique applications.

One of the Strongest Warranties.

And since only the strong survive, we housed

the System 816 in a rugged metal enclosure . . . and backed it with one of the industry's longest warranty coverages: From 12 to 24 months.

To find out more about how the System 816 outlasts and outperforms anybody else, call **(415) 786-0909** and ask for an OEM/systems integrator application package and our 1984 catalog.

You'll find CompuPro will be just as essential tomorrow as we are today.

CompuPro®

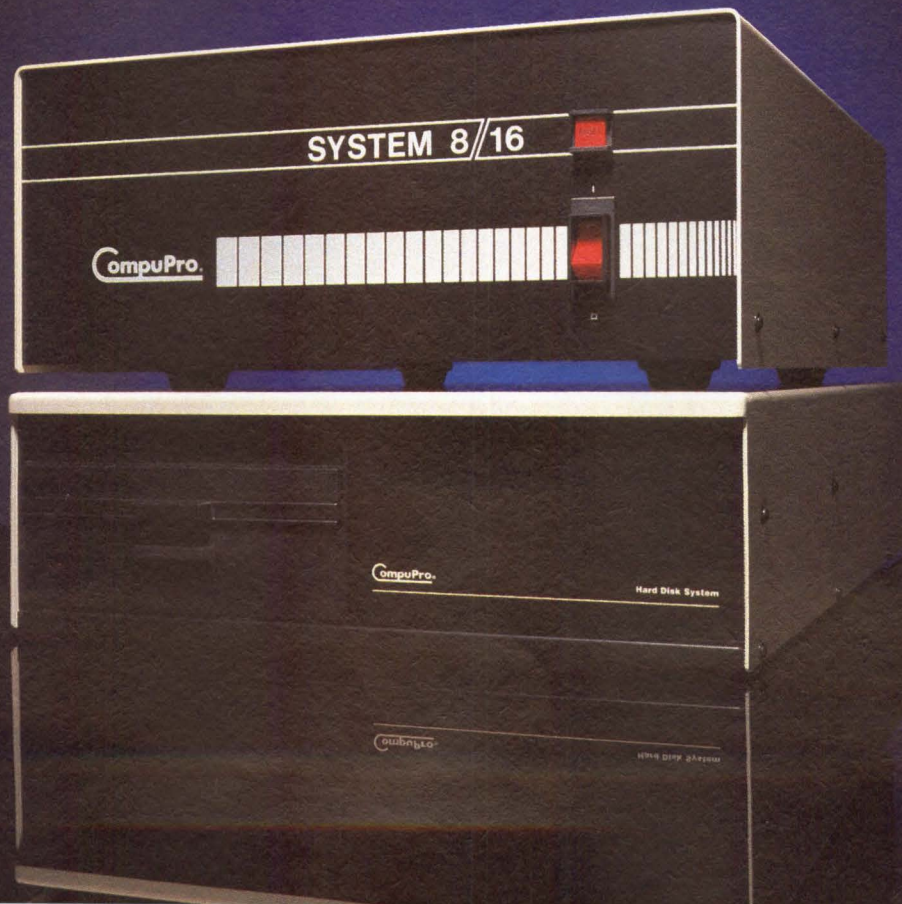
A GODBOUT COMPANY

3506 Breakwater Court, Hayward, CA 94545

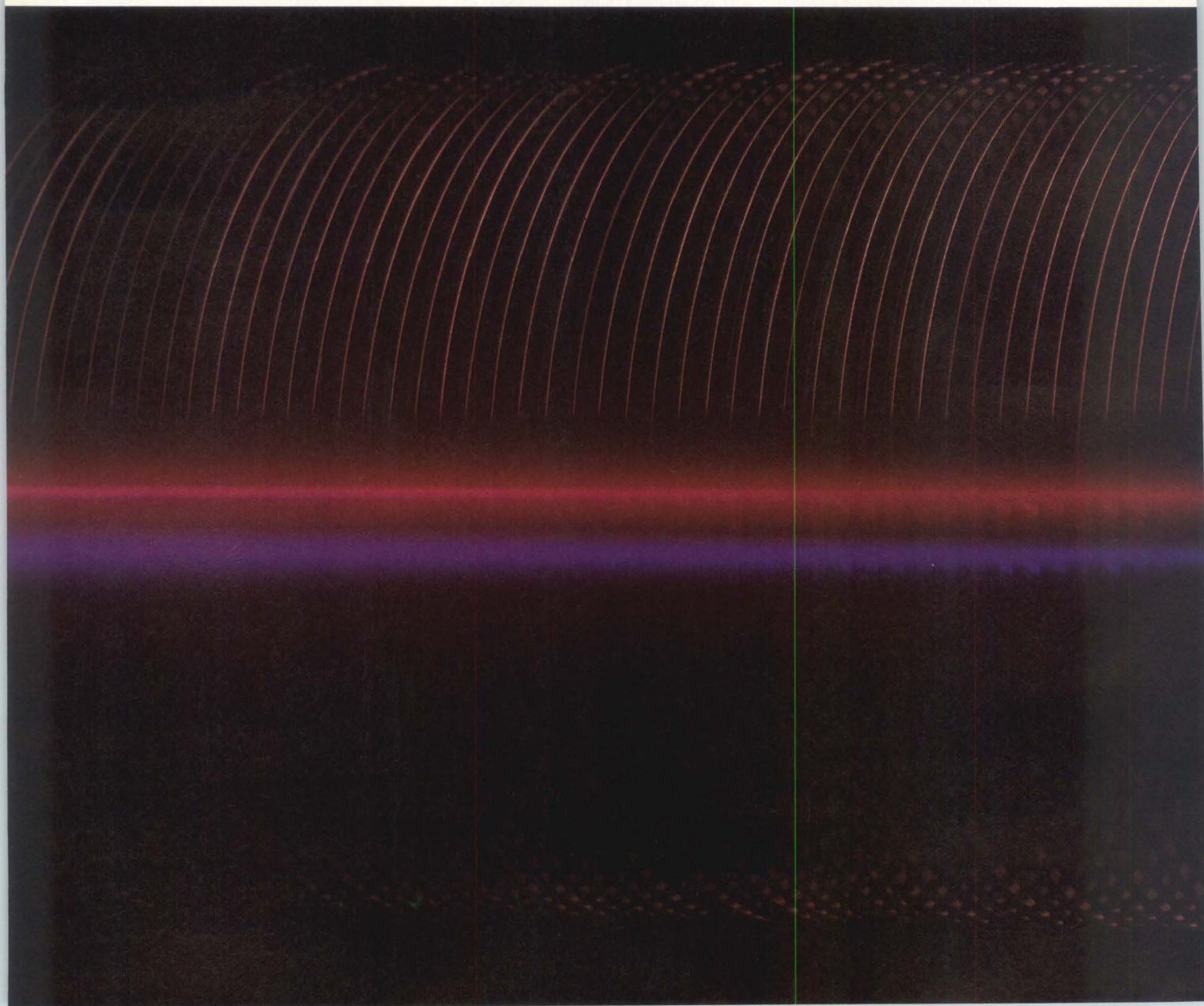
System 816 and The Essential Computer are trademarks of CompuPro. System 816 front panel design shown is available from Full Service CompuPro System Centers only. ©1984 CompuPro

CIRCLE NO. 14 ON INQUIRY CARD

The Essential Computer™



**WHEN IT COMES TO
THIN FILM MEDIA,
YOU EITHER HAVE IT
OR YOU DON'T.**



We do. The ALAR™ metallic thin film disc. Available when you need it. In the sizes you need it in, including sub 5¼ inch.

WE'RE COMMITTED TO YOUR FUTURE. Over the last two years we've committed \$30 million. Three large scale, automated facilities. Over 120,000 square feet of manufacturing space. Depend on us. To ship more than 3½ million discs in 1985. And twice that number by 1986.

LEARNING BY DOING. We pioneered the application of thin film to Winchester disk drives. And refined it to near perfection over the last five years. A high throughput, high quality, cost effective process. Rigidly controlled, with each and every disc certified.

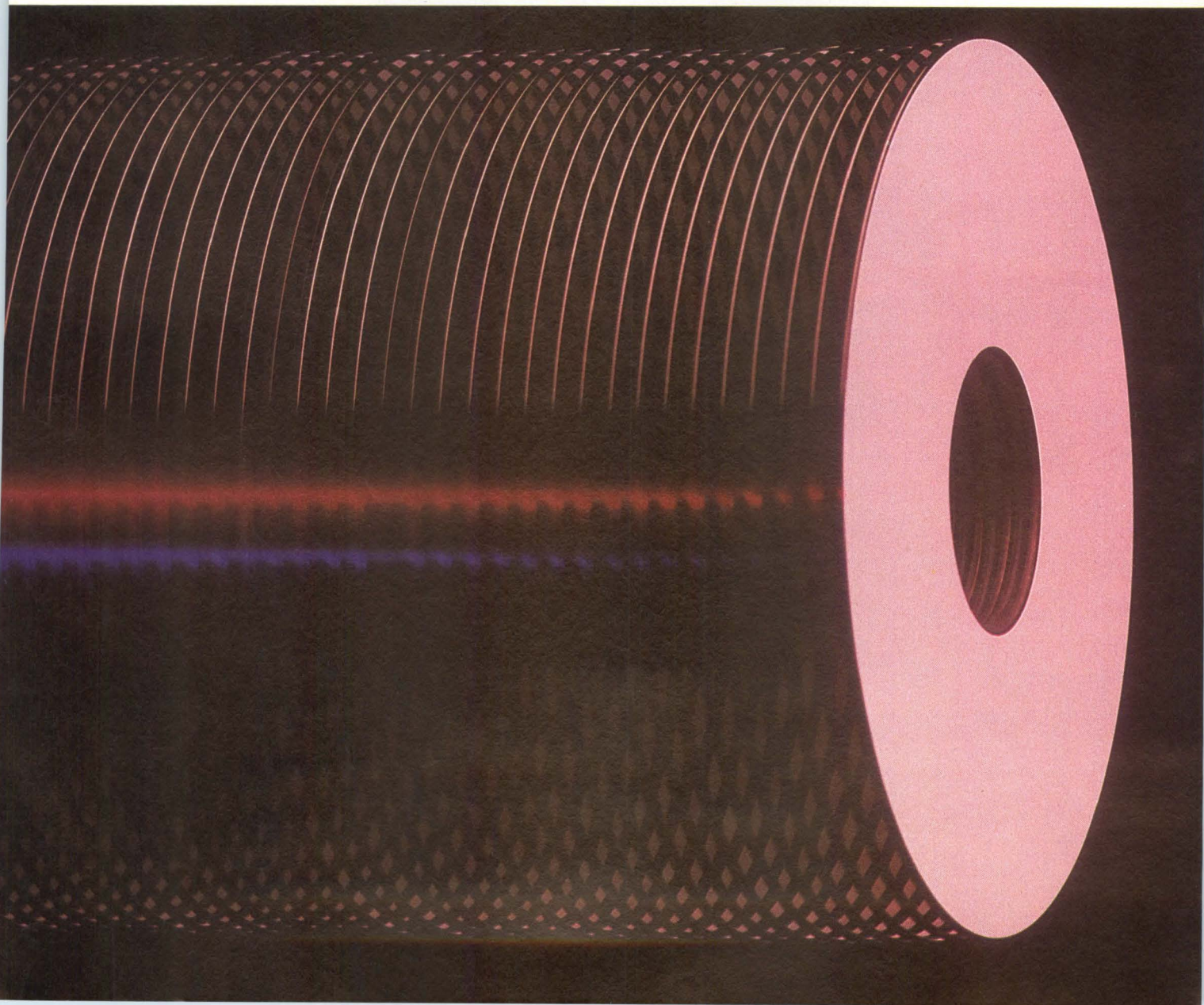
EXPERIENCE COUNTS. We have it. Since 1979 we've shipped over one million ALAR discs. Working today in over 300,000 personal, portable and business computer systems.

RIDE ON OUR SHOULDERS. No one has more media to put in the systems you're building today or those you're planning for tomorrow. We've made the investment. We've refined the process. We have the experience. So ride on our shoulders. We're the ones with the solid foothold at the leading edge. Ampex. Disc Media Operations,
960 Rincon Circle, San Jose CA 95131 (408) 945-5600 Telex 348464.

AMPEX
Ampex Corporation • One of The Signal Companies 

WE'RE THE HEAVYWEIGHTS IN THIN FILM MEDIA.

ALAR is a trademark of Ampex Corporation. Copyright 1984 Ampex Corporation.



Only One Company Makes Interfacing

Q-BUS

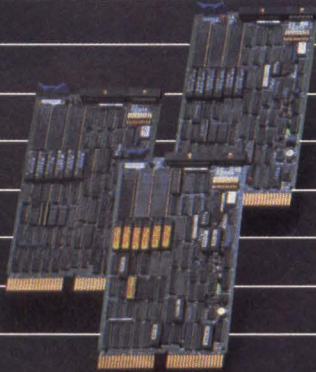


8" & 14" WINCHESTER—SMD I/O
• RL01/RL02, RP02/RP03, RK06/RK07
& RM02/RM05/RM80 emulations

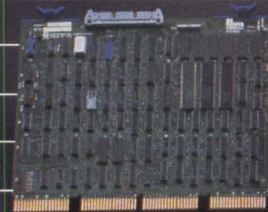
Q-BUS



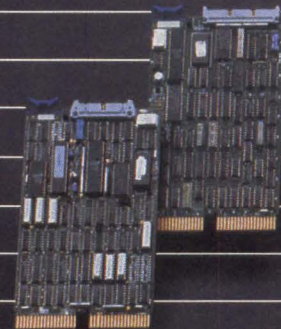
8" & 14" WINCHESTER—SA4000 & PRIAM I/O
• RL01/RL02, RP02/RP03 emulations



WINCHESTER 5 1/4" —ST506/412 & DMA I/O
• RL01/RL02, RK06/RK07 emulations



CARTRIDGE—14" DISK—DIABLO 44B
• RK05 emulation

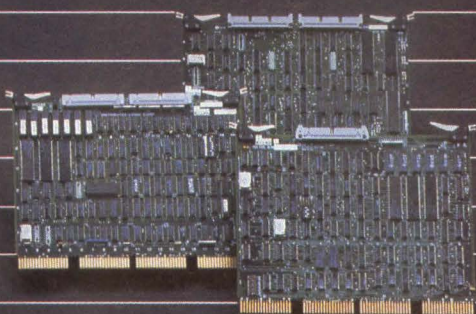


FLOPPY DISKS—SA850 & SA450 I/O
• RX02 emulation

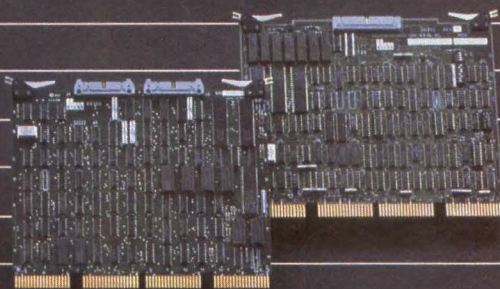
Compatible with DEC's family of RT-11, RSX-11, RSTS, UNIX and VMS operating systems.

Your DEC Computer So Easy

Q-BUS



1/2" TAPE—CONTROLLER/COUPLER PERTEC I/O
• TM-II, TSV05/TS-II/TU80 emulations

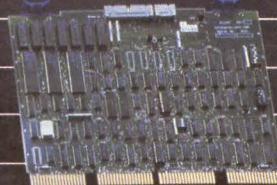


1/4" TAPE—KENNEDY 6455 & CDC SENTINEL I/O
• TM-II/TS03, TS-II/TU-80/TSV05 emulations

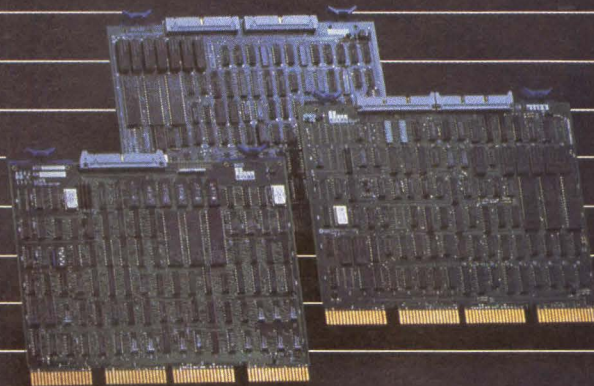
UNIBUS



8" & 14" WINCHESTER—SMD I/O
• RP02/RP03, RK06/RK07, RM02/RM05 emulations



1/4" TAPE—CDC SENTINEL I/O
• TS-II emulation



1/2" TAPE—CONTROLLER/COUPLER PERTEC I/O
• TM-II, TS-II/TU80 emulations



DISTRIBUTED LOGIC CORPORATION

1555 South Sinclair • P.O. Box 6270 • Anaheim, CA 92806 • (714) 937-5700 • TLX 6836051
64-A White Street • Red Bank, NJ 07701 • (201) 530-0044
Chester House, Chertsey Road • Woking, Surrey, England GU 21 5BJ • (04862) 70262/7
• TLX 859231 DILOGI G • FAX (04862) 62666

CIRCLE NO. 15 ON INQUIRY CARD

NOTHING ELSE STACKS UP TO IT.

The IOMEGA Alpha 10H Half High: More Performance, Reliability, Versatility— And Virtually Unlimited Capacity.



Take the measure of IOMEGA's new Alpha 10H. Not just the low-profile, half-high physical dimensions, but its true OEM height—a height measured in performance, versatility, convenience, cost-efficiency, dependability and deliverability.

New Heights In The Measure Of Reliability And Performance.

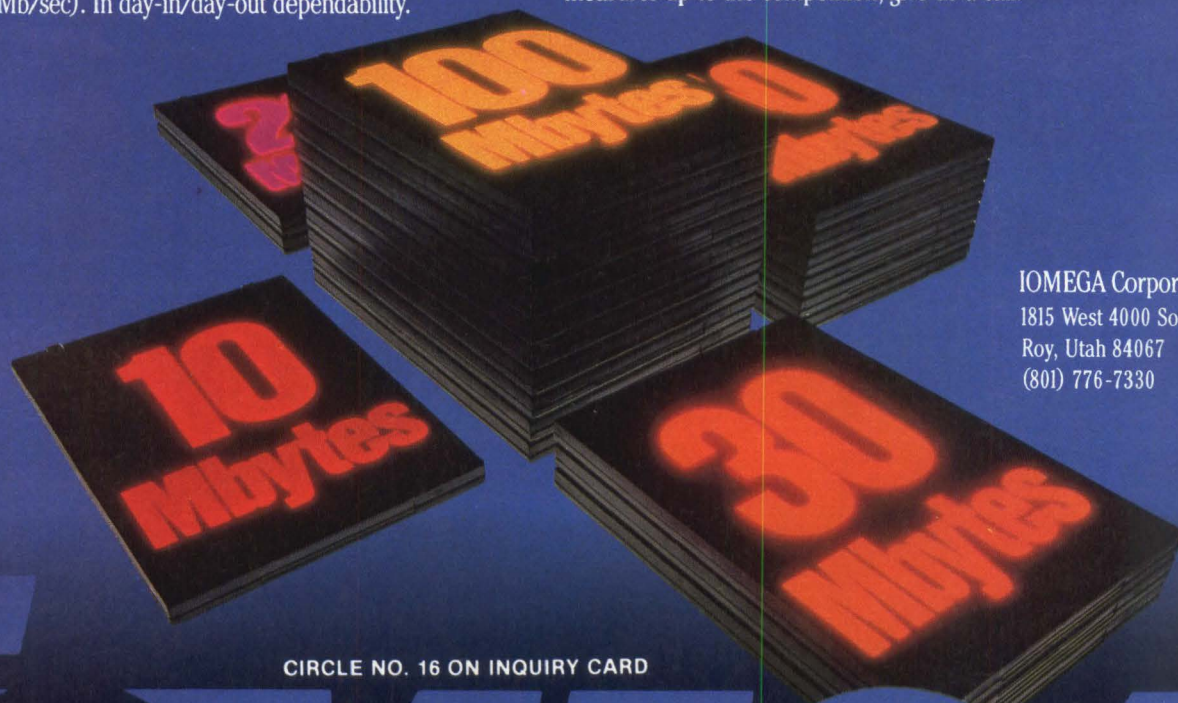
Thanks to IOMEGA's revolutionary cartridge technology, OEMs can integrate a mass storage solution into their systems that easily surpasses traditional Winchester or even Winchester cartridge alternatives. In access time (35 ms average). In transfer rates (1.13 Mb/sec). In day-in/day-out dependability.

Capacity, Convenience, And Low Cost-Per- Megabyte: Taking The Measure Even Higher.

One of the best measures of the Alpha 10H's true OEM height is in the versatility it allows you to design into your system. Our highly reliable, easily transportable and absolutely interchangeable 10-megabyte cartridges mean the sky's the limit on system capacity in applications as diverse as system control and monitoring, office information and word processing, and industrial instrumentation, among others. So is convenience. Be it loading large and complex data bases, or the rapid, reliable backup of system data, the Alpha 10H simply cannot be topped. Lastly, in low cost per megabyte, no storage device, fixed or floppy, stacks up.

Do Your Own Measuring. Call Today.

The IOMEGA Alpha 10H half high is available, right now. For more information on how this superb new IOMEGA offering measures up to the competition, give us a call.



IOMEGA Corporation
1815 West 4000 South
Roy, Utah 84067
(801) 776-7330

CIRCLE NO. 16 ON INQUIRY CARD

IOMEGA™

Mini-Micro World

NEWS

Minicomputer handles multiple needs, uses

Jesse Victor, Associate Editor
and **Carl Warren**, Western Editor

By combining modularity, multiple processors and system executive software, the System 3000 minicomputer from Syte Information Technology Inc., San Diego, Calif., achieves 3.6 million-instruction-per-second (MIPS) performance for engineering and scientific users.

On-board floating-point capability and bit-mapped high-resolution graphics enable the multiuser, multitasking machine to perform high-speed number crunching and computer-aided design/computer-aided engineering (CAD/CAE) functions for 16 linked graphics terminals as well as simultaneously computing for 64 ASCII terminals. Dual operating system (OS) capability allows this OEM system to run different applications on two operating systems at the same time.

Targets diverse markets

Syte is aiming the system at OEMs who want premium performance but don't want to pay a premium price, says vice president of marketing, Robert A. Hahn. "The world is full of 68000 processors in a box running UNIX," Hahn says. "But, to get above the performance of a single 68000, the only solution has been to build it yourself out of bipolar logic."

The 32-bit system's modularity is one of its strongest points, Hahn says. The modularity allows OEMs or end users "to incrementally upgrade performance in the field without changing software" by adding processor boards. "The cost advantages gained by using standard microprocessors and being able to tightly couple multiple processors enable you to build a high-perfor-

mance machine at very low cost," he says.

The 1.0-MIPS system with one processor board employs the National Semiconductor Corp. 16032 microprocessor. The four-processor version is upgradable to the National 32032 chip for 3.6-MIPS performance.

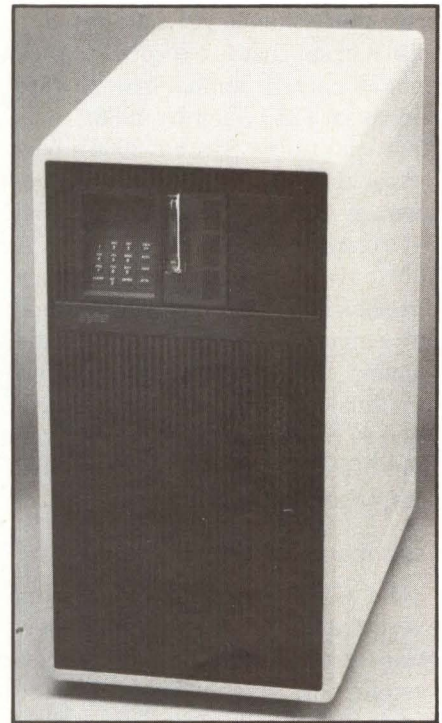
Using tightly coupled graphics

Hahn touts the System 3000's tightly coupled graphics capability as a major advantage for scientific/engineering applications. "I would position our system as a sort of [Convergent Technologies Inc.] Megaframe for people who want floating-point and graphics capabilities."

But the 3000, in contrast to the Megaframe, Hahn emphasizes, implements both high-resolution, 1024-bit-by-800-bit monochrome and optional 640-bit-by-480-bit color graphics without add-ons. "If you want to do serious graphics on the Megaframe, you have to add a graphics terminal to it. On the System 3000 you can put graphics capability right on the processor card and run it out of main memory"—an approach that is both less expensive and faster, Hahn claims.

The System 3000 supports as many as 16 1024-bit-by-800-bit-by-1-bit plane graphics terminals or one 1024-bit-by-800-bit-by-8-bit plane terminal per graphics module. One processor module handles four graphics terminals and 16 ASCII terminals.

The computer's 8-bit plane graphics capability suggests engineering design modeling applications, and Hahn sees OEMs using the System 3000 to go after the CAD/CAE market. "The low end of that market has been taken over by workstations



Up to four tightly coupled processors, floating-point capability and high-resolution graphics fit the System 3000 minicomputer for high-speed number crunching and other scientific and engineering applications.

like the Apollo," Hahn notes. "The high end is served by graphics terminals connected to an IBM mainframe. We are going after the middle market segment—graphics tubes connected to a VAX."

Indeed, Syte has marked out Digital Equipment Corp. (DEC) VAX superminicomputers and similar machines from Data General Corp. and Prime Computer Inc. as the 3000's main competitors. "We are not selling directly against DEC or Prime," Hahn states. "We are not going for the same accounts. We are selling to OEMs who will compete against VAXs."

Its 3.6-MIPS performance puts the System 3000 in the high end of the superminicomputer market, says Hahn, and makes it "faster

Mini-Micro World

NEWS

than most VAX-type machines." Syte's use of VLSI technology, Hahn claims, gives the system a price-performance advantage in a total market that is expected to rack up a 50 percent annual growth rate and reach \$22 billion by 1986.

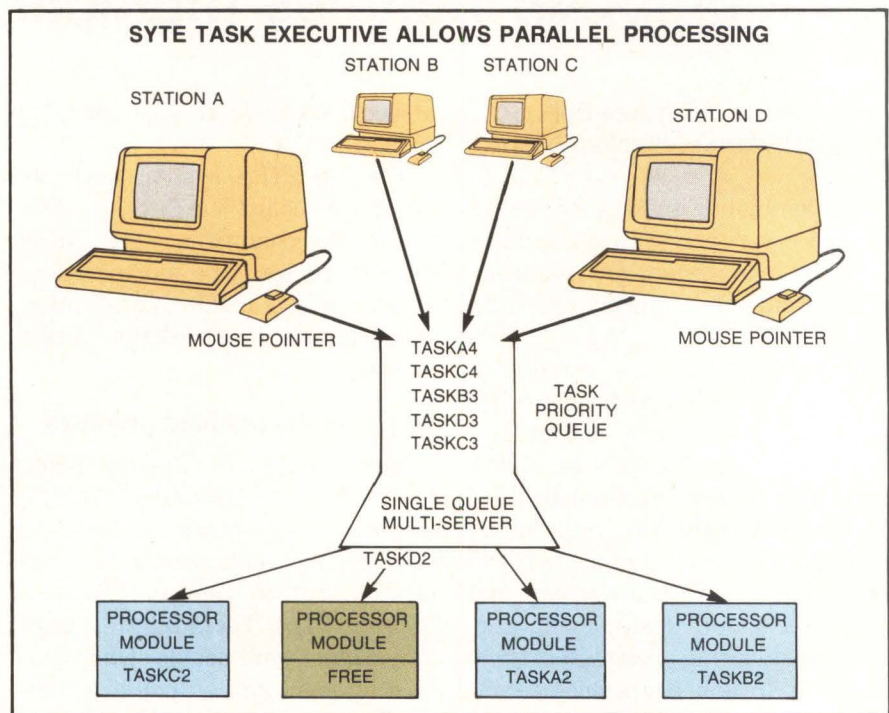
Crucial to the System 3000's performance and its modular architecture are multiple buses and a global environment manager (GEM). A 50M-byte-per-second proprietary Syte bus handles intermodule transfers among processor, graphics and memory modules, while a 32-bit local bus controls traffic directly related to processor functions. An optional four-slot Multibus card cage accepts add-on boards.

Task manager sets the pace

The GEM task-oriented system executive is a general-purpose operating-system kernel that maximizes system performance, according to Syte's software technical specialist, Scott M. Dickson. Queuing up processes in a pipeline, it allocates them to available processors, avoiding processing bottlenecks and achieving true, tightly coupled parallel processing. Overseeing all system operations, the GEM also schedules I/O events, keeps track of file management, controls memory management and establishes a common interface to the user and peripherals.

To ensure speedy memory transfers, system main memory, which can be as much as 28M bytes with 256K dynamic RAMs, is global to all devices. "When a processor or other device writes or reads to memory," emphasizes Dickson, "it is always in the same location, so no memory transfers are needed."

The computer supports UNISYTE, a version of AT&T Technologies' UNIX System V, and Xerox Corp's Smalltalk. The dual operating system capability permits an



The Global Environment Manager (GEM) task executive system kernel handles all system overhead. Prioritizing processes, it allocates tasks to available processor modules. It also controls message passing, without using bus transfers, from module to module.

"OEM to port a proprietary operating system, say XYZ-DOS, on top of the GEM," Hahn says, "and run both XYZ-DOS and UNIX on the same processor at the same time, thus doing concurrent applications under each operating system."

GEM and Smalltalk provide the system with on-board window-management capability with graphics display processors. The GEM also handles specialized input devices such as mouse pointers or digitizers for bit-mapped graphics.

Each system processor board contains 1M byte of RAM (or 4M bytes with 256K chips); 4K-byte to 16K-byte cache buffer; floating-point and memory-management units; a graphics controller for one bit-mapped terminal; a high-speed I/O processor, which in addition to handling disk and tape drives also accommodates Ethernet; a terminal controller driving four RS232 ports;

and a systems support processor for diagnostics and other functions.

The basic \$21,900 system furnishes one processor module with 1M byte of memory and a monochrome display, plus UNISYTE and the GEM system manager. Additional processor modules cost \$9,900. Options include graphics modules; color graphics capability; 26M-, 52M- or 144M-byte, 5¼-inch Winchester disk drives (as many as four can be accommodated); a 45M-byte streaming tape drive; and a 1,600-bits-per-inch, half-inch, table-top tape drive. Two hundred or 600 line-per-minute printers are also available. The pricing depends on system configuration.

Languages currently supported are: UNIX System V-compatible C, ANSI X3.9-1979 FORTRAN and ANSI/IEEE 770X3.97-1983 Pascal. Production shipments are planned for this quarter. □

"IF IT WAS ANY MORE USER-FRIENDLY, IT WOULD JUMP UP AND KISS YOU."

—George Heffley, Intel Corp., Phoenix, AZ

EQUINOX

Presents

DATA PBX

A user-friendly
Port Selector



"Stunning performance and unrivalled dependability."

— Dr. Harold Koplow, Modular Computer Systems, Fort Lauderdale, FL (Equinox's first user)

"Surprisingly compact for its dazzling array of features."

— Charles Bairos, Polaroid Corp., Needham, MA

"Powerful switching with elegant simplicity."

— Arthur Fasciani, Computervision Corp., Bedford, MA

"The greatest thing since sliced bread in datacom."

— Glenn Bryans, Hall Real Estate, Dallas, TX

"Obsoletes Goliath Port Selectors."

— Ralph Glasgal, Glasgal Communications, Inc., New York, NY

SMASH HIT
AT INTERFACE '84

CALL 1-800-DATA PBX*
Ask for an on-site demonstration

FEATURING

- USER CONTROLLED TERMINAL SWITCHING BETWEEN COMPUTERS
- EXPANDIBILITY FROM 24 TO 1320 TERMINALS AND PORTS
- HIGH THROUGHPUT • 660 SIMULTANEOUS 9600 BPS CONNECTIONS
- MAXIMUM RELIABILITY • ON-LINE BACKUP FOR NON-STOP OPERATION
- DO-IT-YOURSELF INSTALLATION WITH REGULAR TELEPHONE CABLE
- MENU-DRIVEN CONFIGURATION, DIAGNOSTICS, AND STATISTICS

G GENERAL AUDIENCES
even a child can operate it

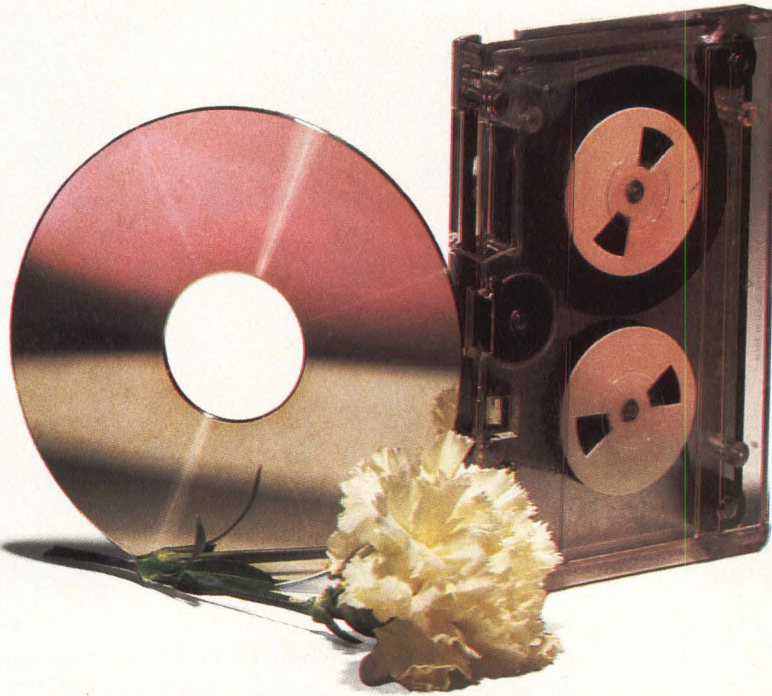


©1984 Equinox Systems, Inc.
All Rights Reserved

NOW SHOWING AT THESE LOCATIONS

ARIZONA Four Corners Technology (602) 998-4440	CALIFORNIA (South) Da/Com Inc. (213) 908-9804	CALIFORNIA (North) Western Data Group (415) 938-9582	COLORADO Four Corners Technology (303) 430-0133	FLORIDA Networks, Inc. (305) 822-6750	GEORGIA Xpoint Corp. (800) 241-4719	KANSAS System Technology (913) 492-7184
MARYLAND Commart, Inc. (301) 261-4344	MASSACHUSETTS Delta Data Comm Inc. (617) 935-8366	MICHIGAN W.C. Koepf Associates (313) 360-0626	MINNESOTA System Technology (612) 647-6902	MISSOURI System Technology (314) 225-4296	NEW JERSEY (North) Consolidated Data Systems Ltd. (201) 599-0380	NEW JERSEY (South) The Datastore (609) 779-0200
NEW MEXICO Four Corners Technology (505) 345-5651	NEW YORK (State) Annese & Associates, Inc. (315) 866-2213	NEW YORK (City) Glasgal Communications, Inc. (201) 768-8082	NORTH CAROLINA Xpoint Corp. (800) 241-4719	OHIO Data Processing Sciences (216) 582-0700	OHIO W.C. Koepf Associates (513) 885-2705	OKLAHOMA System Technology (918) 665-6340
OREGON Data World (503) 292-2679	PENNSYLVANIA The Datastore (609) 779-0200	TEXAS (Dallas) Technical Concepts (214) 783-9330	TEXAS (Houston) System Technology (713) 440-8340	UTAH Four Corners Technology (801) 485-7215	VIRGINIA/WASH., D.C. Commart Inc. (301) 261-4344	WASHINGTON Datacom (206) 575-1470

Equinox Systems Inc., 12041 SW 144th Street, Miami, Florida 33186 Telephone 1-800-DATA-PBX *In Florida (305) 255-3500
Regional Offices: Atlanta, Chicago, Dallas, Los Angeles, New York



A MARRIAGE OF CONVENIENCE.

INTRODUCING THE FIRST MULTIFUNCTION MULTIBUS[®] CONTROLLERS FOR SUPERMICROS WITH SIMULTANEOUS DISK/TAPE TRANSFERS.

The marriage of your system with Xylogics' new 420 Series controllers results in a level of user convenience and speed never before available in a supermicro.

Now your supermicro can support either the ST506 or ESDI 5¼" disk and QIC-02 ¼" tape interfaces—simultaneously.

At DMA rates of up to 2.5MB/sec.

Other controllers allow access of only disk or tape at one time, and require significantly greater bus capacity to do it.

The Xylogics 421 simultaneously controls two ST506 disks and up to four QIC-02 tape drives. The 422 provides even greater throughput, supporting two ESDI

disks and up to four QIC-02 tape drives. And both the 421 and 422 controllers require only one card slot in your system.



Advanced channel control using proprietary Xylogics DMA and ECC gate arrays and separate buffers for disk and tape give the 421 and 422 the lowest DMA overhead and highest data transfer rate in the industry—leaving considerably more bus bandwidth available to the CPU and other I/O devices.

And because Xylogics employs the industry's most rigid quality control and testing procedures, the 421 and 422 come with an infant mortality rate of virtually zero, and an MTBF approaching 100,000 hours.

Little wonder that Xylogics has built and sold more high performance Multibus peripheral controllers to more

major OEMs than any other manufacturer.

Call or write for more information on the 421, 422 and other Xylogics products.



The Peripheral Performance Leader.



144 Middlesex Turnpike, Burlington, MA 01803 Tel: (617) 272-8140 TWX: 710-332-0262 (800) 225-3317 outside of Massachusetts

Xylogics European Headquarters: (Slough, U.K.) Tel: (0753) 78921 Telex: (851)847978

MULTIBUS is a registered trademark of Intel Corporation. MULTIBOOST is a trademark of Xylogics, Inc.

IBM expands PC line with supermicro, LAN

Lori Valigra, Senior Editor

IBM Corp.'s new supermicrocomputer and its local area network scheme most likely will create a bonanza of opportunities for third-party hardware and software companies.

The Intel Corp. 80286-based IBM Personal Computer-Advanced Technology (PC-AT) operates two to three times faster, has about five times the user memory and twice the storage capacity of the company's popular 8088-based PC. For use with the PC-AT are new version of PC-DOS called DOS 3.0 and the XENIX operating system, which is based on UNIX System III and has Berkeley and IBM-specified additions. The PC-AT can be used alone or shared by three users.

Tape controllers head add-in list

As with the standard PC, IBM gave the PC-AT an open architecture for third-party add-ins. Egil Juliussen, chairman of Future Computing Inc., Dallas, Texas, says one of the first add-ins third-party suppliers could provide would be a controller board for backup media, such as a tape drive. Other obvious add-ins, he says, include memory boards (the system can house as much as 3M bytes of add-in storage) and graphics boards. "The PC-AT will turn the market active [with products announced for it] in the fall," predicts Juliussen, "Announcements will start at the COMDEX show [next month in Las Vegas]."

Featured on the PC-AT are a 1.2M-byte floppy disk drive, a 20M-byte Winchester disk drive, an 80287 mathematics co-processor option, a 2½M-byte virtual RAM disk memory, a battery-backed real-time clock and a new 192W power supply.

IBM's PC-AT 80286-based microcomputer includes a new keyboard with a larger return key. The system unit, which houses a 1.2M-byte floppy disk drive and a 20M-byte Winchester drive, can be installed vertically.



IBM has revised some of the expansion chassis cards. For example, the parallel and serial interfaces are now combined on one card, as are the floppy and hard-disk adapters. In earlier PC models, the interfaces and adapters resided on two cards. The motherboard's memory can be expanded to 512K bytes using piggybacked 128K-bit RAM chips. The card cage has eight long slots which are ½-inch higher than PC-XT slots. Two versions of the system are available, one with six slots and one with seven.

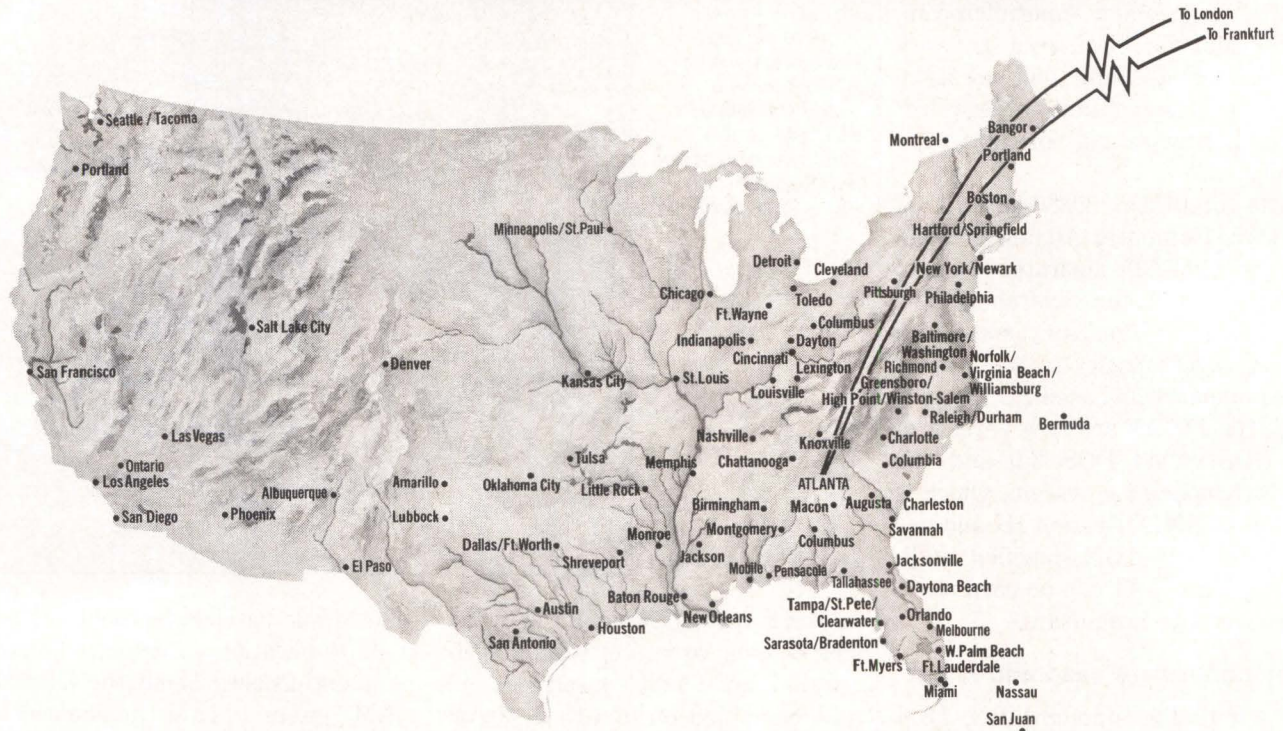
Since IBM announced few applications packages for XENIX, analysts expect software houses to be quite active. However, Juliussen says supplying XENIX is not a principal activity for IBM, and its introduction was merely to cover IBM because other manufacturers offer UNIX-like operating systems. "IBM just threw it on the wall to see if it will stick," he comments.

"People said '[We] want UNIX,' [and IBM said] 'here it is,'" says

consultant Patricia Seybold of Seybold Publications, Boston, who also is unenthusiastic about the XENIX IBM offers. "IBM announced a three-user system for programmers. This is not useful in multi-user office systems. And you can't run XENIX over IBM's network," she says. The IBM PC Network uses another new operating system, DOS 3.1, which will not be available until the first quarter of next year. Seybold expects XENIX-supplier Microsoft Corp., Bellevue, Wash., to provide a product that will combine XENIX and the DOS 3.0 operating systems.

IBM appears to have a secondary focus for its networking software as well. "It's useable, but not elegant, networking software," says Seybold. "If I were a system integrator, I'd write my own networking software." Seybold says the network software is not a strategic product for IBM. But she says the new basic input/output system for the networking DOS 3.1 has all the

DELTA'S MAPPED OUT A WAY TO SOLVE 10,000 OF YOUR CARGO NEEDS.



Delta Air Freight ships door-to-door between more than 90 cities covering 10,000 communities.

See this Delta map? You can ship just about anything, big or small, between any Delta cities shown. That covers over 10,000 communities. You can ship door-to-door. Or airport-to-airport. Delta can frequently give your shipment same-day delivery.

Delta can ship anywhere in the U.S. or the world, via interline connections. In many instances, Delta Air Freight rates are lower than other freight services. And Delta will quote you special low rates tailor-made

for your shipments. Also ask about Delta Air Express—we guarantee to get your shipment on the flight specified. And Delta 3-D™ Air Freight—40% off regular freight rates on high density shipments.

For full details, call the Delta Marketing Office in the city nearest you. **DELTA**
The airline run by professionals.



DELTA AIR CARGO. READY ALL-AROUND.

Mini-Micro World

NEWS

information needed to write the software. She says the current network is a stopgap solution until IBM announces its token-passing software in 18 months. In the meantime, she expects IBM to announce

software for the System 36 mini-computer that will enable that system to attach PCs more efficiently than the PC Network does.

So far, IBM has introduced a group of operating systems for its

personal computers. Included are several versions of PC-DOS and the PC-IX single-user UNIX System III-based software. IBM sources explain PX-IX is for single-users, while XENIX is for multiusers as

IBM's interim local network links its microcomputers together

Amid the critical clamor following the announcement that its token-passing ring local area network (LAN) wouldn't materialize for about two years, IBM Corp. has taken an interim step to interconnect its microcomputers.

The company will bring to market this month the PC Network, designed

to offer peer-to-peer communications in offices and small businesses by joining together combinations of the PC, PC-XT, Portable Personal Computer and the new PC-AT. The PC Network will be tied to IBM's future LAN. The PC Network links as many as 72 personal computers, enabling them to share information, programs,

messages, printers and mass-storage devices.

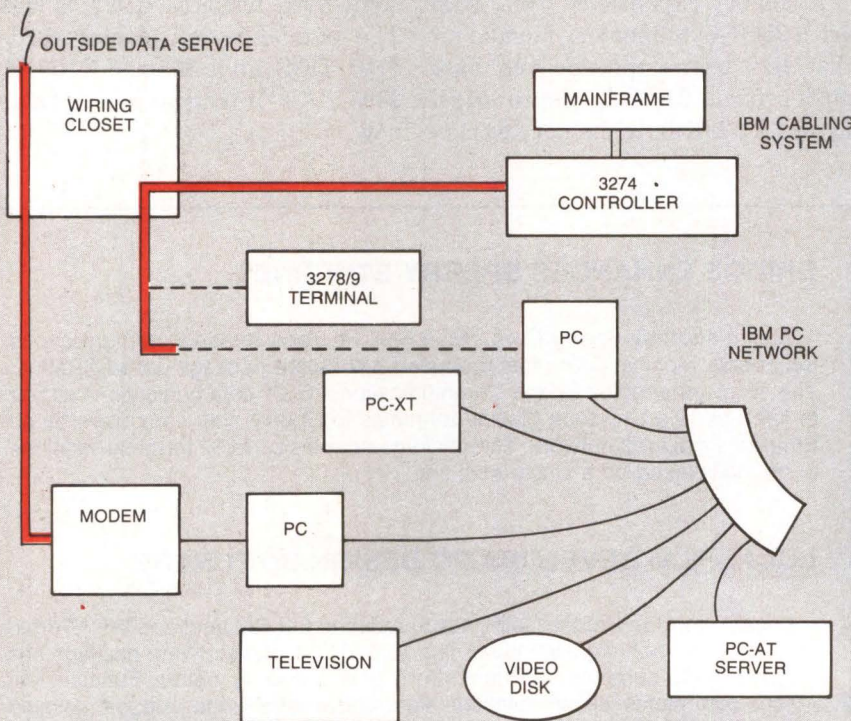
Some industry observers view the broadband, coaxial cable PC Network as a stopgap measure to provide users with some connectivity while waiting for the LAN, but they say it may not prove cost-effective.

Amy Wohl, president of Advanced Office Concepts, Bala Cynwyd, Pa., says the PC Network may be a short-term product. "If the relative cost of attaching the PC Network to the LAN architecture is high in relation to the cost of reattaching the PCs directly into the [LAN], then we are talking about a throw-away product here," Wohl says. She adds that it will be difficult for a company to make a well-informed buying decision for a network because IBM will not disclose prices on unannounced components.

Performance is another issue. The PC Network operates at a speed of two million bits per second. "It's a slow-speed network," Wohl says, "and if a user attaches a PC to a PC Network and then attaches the PC Network through a communications gateway to the ring [LAN] network, it's not clear whether performance would be less than if he had gone directly to the ring network."

Along with the economic and performance factors, users need to address voice capability, says Carol Snell, associate director for telecommunications industry services at Dataquest Inc., San Jose, Calif. "It's odd that not one word was spoken by IBM about digital PBX use anywhere within this whole networking scheme," she says. Snell says IBM will have to resolve the issue of voice and data integration and that the industry will have to know IBM's plans.

—Marjorie Stenzler-Centonze



IBM's PC Network is designed to connect into the company's future local network by using a compatible cabling system. The cable is shown in color.

Mini-Micro World

NEWS

well. They say programs compiled on XENIX can be run under DOS 3.0, which is suitable for all IBM personal computer models, including the PCjr. DOS applications must be recompiled or rewritten to

run under XENIX. The operating system can be started from the diskette or fixed disk drive and uses about 36K bytes of RAM.

Seybold says the PC-AT is "wonderful for software developers. They get high performance [applications] with DOS 3.0." She adds that very large memory-intensive programs can be written for the PC-AT.

Juliussen expects IBM to ship 60,000 PC-ATs worth about \$300 million by the year-end. The PC-AT will be sold through IBM's 1,500 authorized Personal Computer dealers and through IBM's Product Centers and branch offices. IBM has expanded use of its credit card so purchasers can buy products at authorized dealerships as well as at Product Centers.

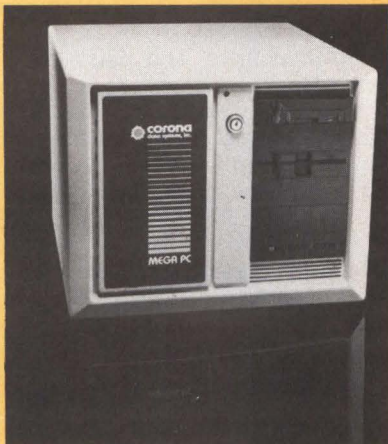
Expanded memory available

Available expansions from IBM are a 256K-byte memory module kit that lets users upgrade the base model from 256K bytes to 512K bytes. A 128K-byte memory expansion

option can be used on both models to allow as much as 640K bytes of memory. The 128K expansion for the motherboard requires that 512K bytes of memory reside on the board. Another option is a 512K-byte expansion card. As many as five of these cards can be plugged into the expansion chassis to provide 3M bytes of internal storage.

The PC-AT with 256K bytes of memory and a 1.2M-byte diskette drive is \$3,995. The enhanced PC-AT with 512K bytes of memory, the 1.2M-byte diskette drive, a 20M-byte fixed disk drive, and a serial/parallel adapter card, is \$5,795. The 128K-byte memory expansion is \$350, the 256K-byte memory expansion module kit is \$495, and the 512K-byte memory expansion costs \$1,125. The 20M-byte fixed-disk drive is available separately for \$1,595. An optional 360K-byte diskette drive is \$425. The parallel/serial adapter card is \$150, DOS 3.0 is \$65 and XENIX is \$395. All products are available now. □

Corona meets IBM's challenge



On the same day that IBM Corp. unveiled its 80286-based PC-AT supermicrocomputer, PC-compatible supplier Corona Data Systems Inc., Thousand Oaks, Calif., announced its MEGA PC multi-user microcomputer.

The \$7,805 MEGA PC is a two-user system, but it can be expanded to support eight users by plugging in an application processor board for each added user. The boards use the 8MHz 8088-2 processor, which runs about twice as fast as the 8088 used in IBM's standard PC. Each user has a minimum of 256K bytes of RAM, which can be expanded in increments of 128K bytes to total 512K bytes. The price to add one user is \$1,495, including a terminal.

The basic MEGA PC includes one 360K-byte floppy disk drive and a 10M-byte Winchester drive. Options include the additional Winchester storage to total 40M bytes, a 10M-byte removable cartridge Winchester drive and a 43M-byte, streaming-tape backup drive. The system unit has 11 IBM PC-compatible bus-expansion slots, a serial port and a Centronics-compatible printer port. Production shipments were scheduled to begin in late September.

—Tom Moran

BRIDGE ENHANCES SPERRY ETHERNET

A joint effort by Sperry Corp., Blue Bell, Pa., and Bridge Communications Inc., Santa Monica, Calif., has produced a software package called SPMUX. The software enables Bridge Communications' CS/1 communications server to link Sperry's Uniscope display terminals to Sperry host computers by an Ethernet local area network. The package enables up to 32 terminal sessions to be multiplexed on a single host line.

LUCASFILM DEVELOPS PC DESIGN SOFTWARE

LucasFilm, San Rafael, Calif., has introduced the CADroid and WRAProid printed-circuit-board design tools. The \$6,000 CADroid software package has a Xerox PARC computer-like user interface with pop-up menus. Function key macro commands allow unlimited hierarchical levels and support session logging. CADroid can zoom from one printed-circuit-board component level to another and store component libraries. WRAProid is an automatic component-placement and wire-routing optimization package. The packages run on the Apple Lisa, Sun, CADMUS 9790 and Apollo Domain workstations.

The Buyer's Guide to Quality Disk Drives

From FUJITSU

A major OEM peripheral procurement involves a substantial commitment of your company's resources. You should choose a supplier who is able to make an equivalent commitment in return.

Fujitsu America is one of the few disk drive suppliers with both the experience and the resources to stand behind such a commitment.

Fujitsu offers a complete family of disk drives, from 5¼ to 14 inch, with capacities ranging from 7 to 671 megabytes. Fujitsu drives provide access speeds among the fastest available today.

Of even more importance to you is Fujitsu's absolute dedication to product quality and customer support.

For more information on Fujitsu's complete family of quality disk drives, contact the Fujitsu America sales office nearest you. Northwest: (408) 946-8777, Central: (612) 835-7025, East Coast: (617) 229-6310, Southwest: (714) 476-0852, Europe: 441/493-1138.



	14"		10½"	8"			5¼"		
CAPACITY (M Bytes)	168/336	671	474	24/48	84	168	7/13*	7/13/20/27	31/55/86
AVERAGE POSITIONING TIME (ms)	27	27	18	70	20	20	95	83	35
TRANSFER RATE (K Bytes/s)	1012	1860	1860	1200	1229	1229	625	625	625
INTERFACE	SMD	SMD (MOD)	SMD (MOD)	SA4000	SMD	SMD	ST506/SA4000	ST506/SA4000	ST506/SA4000
POSITIONING METHOD	Rotary Voice Coil	Rotary Voice Coil	Rotary Voice Coil	Buffered Stepper	Rotary Voice Coil	Rotary Voice Coil	Buffered Stepper	Buffered Stepper	Rotary Voice Coil

*Half High

STORAGE PRODUCTS DIVISION

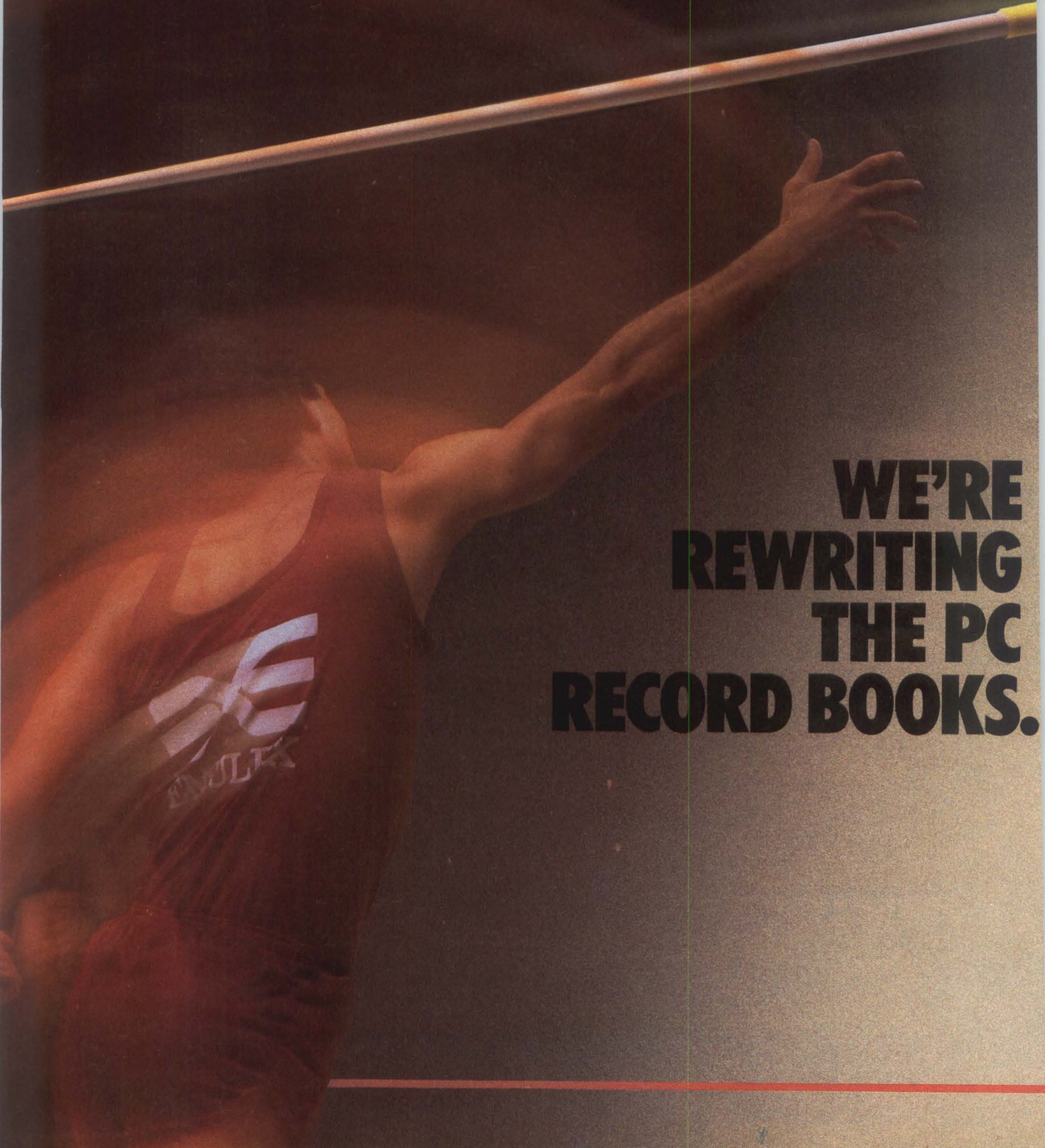
Quality Lives



CIRCLE NO. 20 ON INQUIRY CARD

MINI-MICRO SYSTEMS/October 1984

J A V I



**WE'RE
REWRITING
THE PC
RECORD BOOKS.**

Breakthroughs in flexibility and performance let you upgrade your PC storage and optimize your total system.

Introducing Javelin, the first storage subsystem that lets you increase your IBM PC, PC XT, or PC AT capacity to exactly the level you require. No more, no less.

How does Javelin do it? By offering you the widest range of storage capacities available today. 5¼" Winchester disk drive from 36 to 110 MB and ¼" streaming tape backup of 60 MB. A choice of two peripherals — one disk and one tape, or two disks.

Whether you use Javelin as added storage to a stand-alone PC or as a high-capacity, high-performance file server in a network — you only pay for what you really need.

Keep your options open for the future.

The SCSI* technology used in the Javelin offers easy future expansion. This technology also allows for backup and restore without CPU intervention — with special commands included in the controller.

Javelin's rigorous quality program.

Javelin's reliability, like that of every Emulex product, is built in and guaranteed. All active components are pre-aged. Subassemblies are cycled environmentally — under power, performing diagnostic tests and the total system is integrally tested.

*The Small Computer System Interface (SCSI) is an interface standard that specifies the mechanical, electrical and functional requirements for a small computer I/O bus interface and command set for peripheral devices commonly used with small computers.

Javelin features a full range of utilities that allow for flexible expansion with minimal user intervention.

Call or write us for more information, or ask your dealer for a demonstration. Seeing Javelin in action is a breakthrough experience.

Javelin's unique features include:

- Easy to install and use
- 100% IBM compatible
- 30ms average access rate
- Compact, desk-top design to complement your IBM PC
- Network ready
- Designed for data intensive applications
- Reliable backup and restore utility
- Ideal data-base management storage/retrieval device
- Backup media interchangeability
- Advanced disk and tape diagnostics

Javelin is a product of Emulex Corporation, an industry leader in the development of high-performance controllers, communications products and packaged subsystems for PC's, micro, mini and super mini-computers.

EMULEX PERSYST
EMULEX PERSYST
EMULEX PERSYST

3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, CA 92626, (714) 662-5600



IBM PC, PC XT and PC AT are registered trademarks of International Business Machines Corporation.

CIRCLE NO. 21 ON INQUIRY CARD

Microbar's COM16. It begins where "intelligent" serial I/O controllers leave off.

The new COM16 communications single board computer from Microbar means your next Multibus™-based system can set new standards in serial communications performance and flexibility.

COM16, for example, simultaneously runs all 16 serial ports—*full-duplex*—at 9600 baud.

And that's only the beginning. COM16 is "Unix™-optimized" to a degree that leaves the competition on "square one."

Flexibility? Each COM16 transmit and receive channel has its own programmable baud-rate generator—offering 32 baud rates from 50 to 56K baud. And your 8- or 16-bit I/O or memory data transfers can use any mix of protocols needed.

There's more. Our eight-line COM16 boards—in either RS-232C/Current Loop or RS-449 versions—can be expanded by four-line expansion modules that allow mixed interfaces within a single COM16 system. Or that add DMA channels to each of four to eight baseboard lines. Or give you 128K of Dual-Ported RAM.

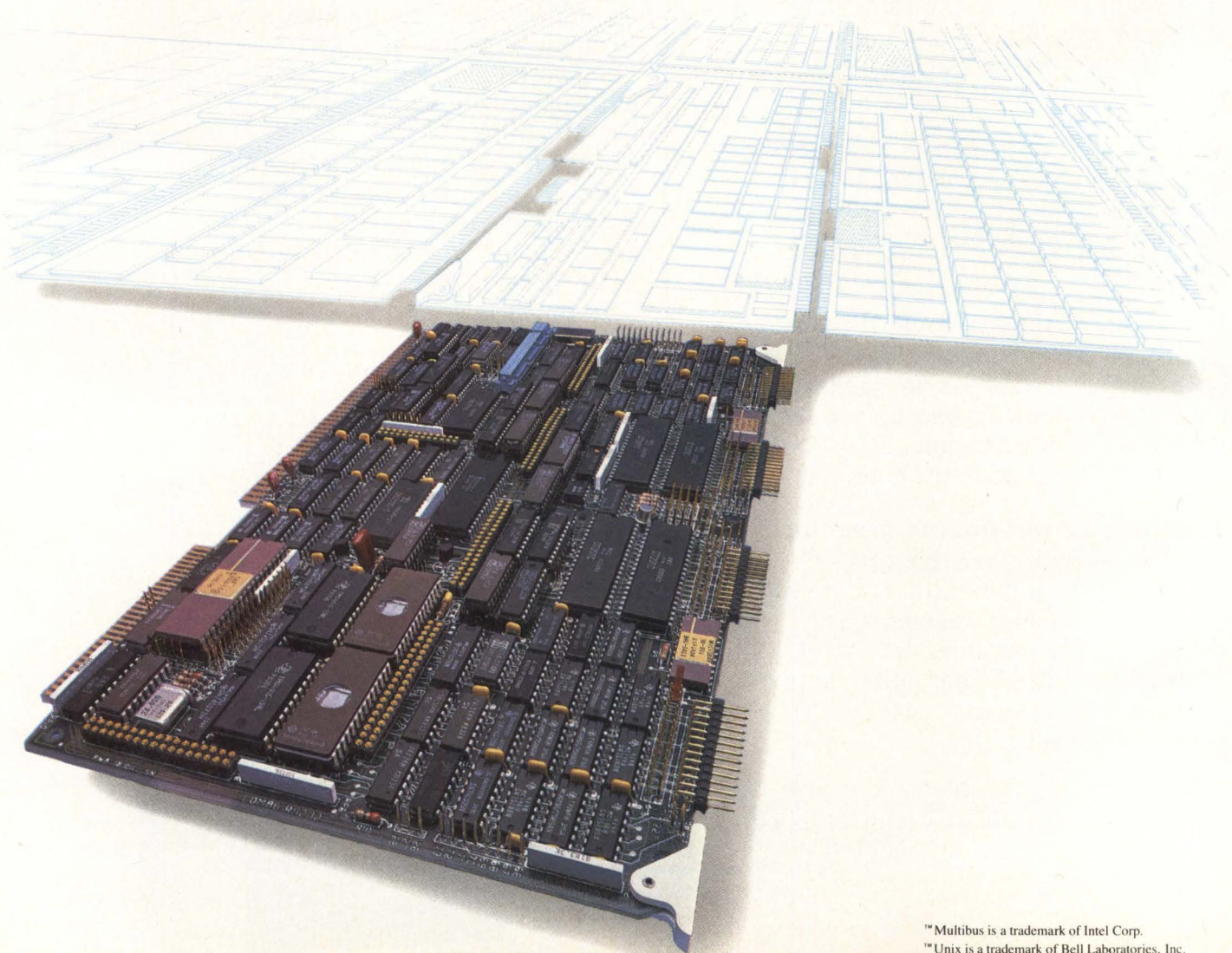
Obviously, we've been busy—working to make your next system a pacesetter. Of course, we're well qualified to do that. Because we're independent—and objective. And because making SBCs is our only business.

Call or write today. Learn how COM16 makes the leap from simple intelligence to pure genius.

Within California: (800) 421-1752

Outside California (continental U.S.): (800) 821-1011

 **MICROBAR
SYSTEMS, INC.**
785 Lucerne Drive, Sunnyvale, CA 94086
Your future system is our current project.



Mini-Micro World

NEWS

Demand soars for VT220 terminals, DEC and competitors ramp up

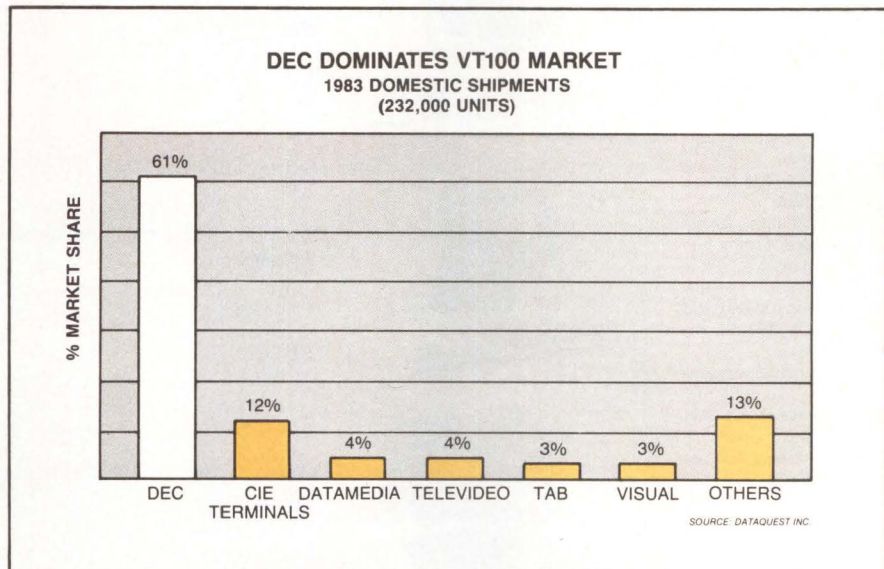
Tom Moran, Associate Editor

Since Digital Equipment Corp. began delivering its VT220 in November, 1983, the conversational alphanumeric terminal has grown so popular that DEC has been able to increase its price by \$100 to \$1,395 and, reportedly, is allocating it to all customers.

Smaller, lighter and less expensive than the VT100s, the VT200 family (of which the VT220 is a member) seems certain to become the next standard in the ASCII terminal market. The other members of the VT200 family are the VT240 monochrome text/graphics terminal, and the VT241, the color version of the VT240. Prepared to profit from the VT220's upward climb were several manufacturers that expected to be shipping VT220-compatible products by late summer.

DEC gears up production

DEC makes the VT220 at its Taoyuan, Taiwan plant, which has the manufacturing capacity for 200,000 of the terminals per year. Production is below that now because the company is still in the process of gearing up to capacity (MMS, Sept., Page 89). Robert Sanekoff, vice president of the display terminals industry service for Dataquest Inc., a San Jose, Calif., market research concern, estimates that DEC shipped 50,000 to 60,000 VT200 family terminals in the second quarter of 1984. About 75 percent, he says, were VT220s. As to demand, Sanekoff says, "It's our conjecture that the simple profile terminal has a very dominant role in the traditional marketplace, plus a very important role in the new emerging marketplace of the office."



Analysts predict that DEC will continue to hold a 60-percent to 62-percent share of the DEC and DEC-compatible terminal market as the new VT220 grows in popularity. Emulators, however, may not be able to maintain their current percentages as new companies join the VT220-compatible terminal market.

TeleVideo Systems Inc., Sunnyvale, Calif., maker of the VT220-compatible TeleVideo 922, predicts that the shipments of DEC-compatible terminals may reach 300,000 units this year. "We believe the TeleVideo 922 will represent a large share of this market," says TeleVideo executive vice president Richard DuBridg.

Sanekoff says that, despite the competition, DEC should still achieve a 60 percent to 62 percent share of the combined VT220 and VT220-compatible market, as it had for the VT100 and VT100-compatible market. Still, he adds, "It would be a tremendous accomplishment...in an expanding market—and with so many people biting at them." Any of the companies that maintain their market share will be doing well, he says.

DEC's competitors will abound

TeleVideo, Lear Siegler Inc.'s

Data Products Division, Anaheim, Calif., Liberty Electronics USA, San Francisco, and CIE Terminals Inc., Irvine, Calif., have all announced terminals with a high degree of VT220 compatibility, but with a lower price. Industry sources expect that Visual Technology Inc., will announce one later this year. Datamedia Corp., TAB Products Co., and Wyse Technology are also expected to introduce VT220 compatibles. Mike Sukihara, Qume Corp.'s OEM marketing manager, says Qume, San Jose, Calif., will not have a true VT220 emulator until the first half of 1985. Analysts and industry sources expect most, if not all, of the approximately 25 current makers of VT100 compatibles to eventually enter the VT220 market.

CIE plans aggressive sales

Joseph Friedman, director of advanced planning for video terminals for CIE Terminals, sees a suitable

Mini-Micro World

NEWS

WHAT DISTINGUISHES DEC'S VT220 FROM THE FIELD OF COMPATIBLES

DEC VT220 standard features*

- 24-line, 12-in. monochrome display
- VT100 and VT522 emulation
- 7- and 8-bit control modes
- Full duplex, asynchronous communications with 10 transmission speeds reaching 19.2K baud
- 25-pin RS232C main port
- Horizontal windowing
- Downloadable character sets
- Plain language set up menu



	List price (\$)	132-column capability?	Keyboard	Non-volatile RAM programmable keys?	Other
DEC	1,395	yes	DEC Rainbow	no	<ul style="list-style-type: none"> • RS423 port • Foreign character sets
Liberty Freedom 220	795	must scroll	similar to VT220	yes	<ul style="list-style-type: none"> • no downloadable character sets • room for add-in board
TeleVideo 922	995	yes	hybrid VT100/VT220	yes	<ul style="list-style-type: none"> • graphics upgrade • 14-in. screen option
CIE Terminals CIE-220+	1,195	yes	same as VT220	yes	<ul style="list-style-type: none"> • vertical windowing • bidirectional printer board
Lear Siegler ADM220	1,165	yes	same as VT220	yes	<ul style="list-style-type: none"> • hooded bezel • no downloadable character sets

*all VT220 compatibles listed possess these features, except where noted
Sources: DEC, Liberty, TeleVideo, CIE, Lear Siegler

occasion to step up production while DEC is still gearing to capacity. "Our information tells us that DEC, with all its planning, is having a production or fulfillment problem on the VT220. We think DEC's manufacturing run rate is about 10,000 (per month) and their backlog is about 100,000 units. If our information is correct, and we believe that it is, this presents us with a window of opportunity. [It] won't last [for-

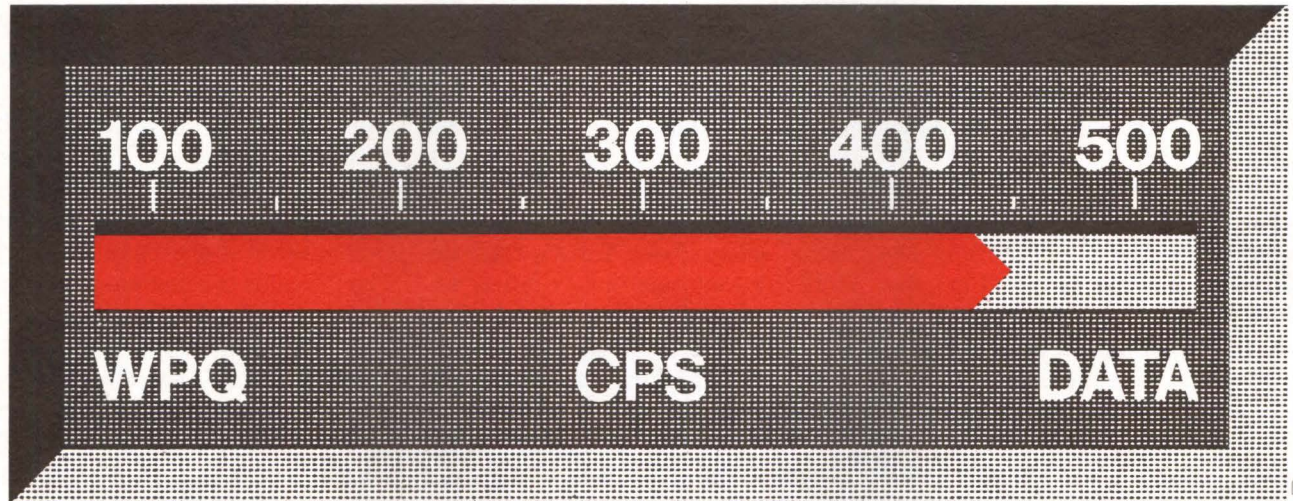
ever], but in that window we can establish our product as a second source." Friedman says CIE Terminals expects to be making its \$1,195 CIE-220+ at a rate of 2,000 per month by the end of the third quarter, and hopes to sell 50,000 of the 220+ terminals in 1985. A DEC spokesman refused to comment on any possible backlog on the VT220.

Friedman claims that the 220+ is 100 percent compatible with the

VT220, while offering the added features of non-volatile RAM for the programmable function keys, a bidirectional printer board, and vertical windowing capability. Still, Friedman says, pricing may determine sales more than will compatibility.

Lear Siegler, Anaheim, Calif., is introducing the ADM 220, which lists for \$1,165. According to Catherine Raftery, director of marketing, Lear Siegler will be building up

Our multi-mode printers accelerate from 100 cps to 480 cps and have an impressive finish everytime.



In the Grand Prix of office automation, HERMES multi-mode printers always come in first. Both 400/480 cps data and 100/120 cps single pass near letter quality are possible with the same print-head.

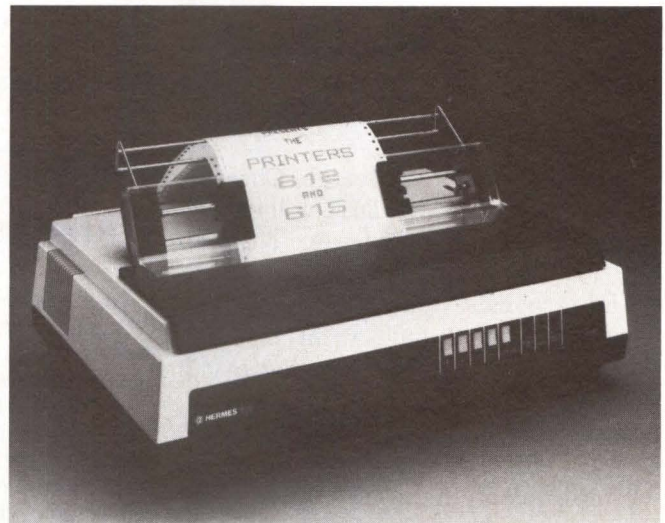
Speed and quality have never been as successfully combined. Professionals who want only the best will also appreciate:

Their versatility. Wide range of attractive characters sets in 16 national versions, as well as math symbols, bar codes and teletex. Dual ports, parallel (CENTRONICS™/EPSON™ compatible) and serial (RS-232C/RS-422) interfaces. DIABLO™ 630 emulation optional.

Their resolution. Finest print quality available on matrix printers. So good you can even print signatures. Bit mapping graphics in single and double density modes, 6 dots densities in each mode. A circle on the screen means a circle on the paper too!

Their quality. Swiss high quality construction. Quality that lasts - thanks to their exclusive «moving-ruby» head.

Their multicolored printing. Text and graphics printing in 8 colors on both models 615 and PC-Printer 2.



 **HERMES®**
The impressive printers

Made by HERMES PRECISA INTERNATIONAL, CH-1401 Yverdon, Switzerland
HERMES printers are distributed in Austria, Canada, Cyprus, Finland, France, Greece, Jordan, Kuwait, Lebanon, Saudi Arabia, South Africa, Spain, Sweden, Switzerland, United Kingdom, USA, West Germany.

To receive a sample of the finest quality matrix print-out and additional information on the HERMES printers, please return the coupon below.

Please send me more documentation about your HERMES printers.

Name _____ Title _____

Company _____

Street _____ City _____

State _____ Zip _____ Phone () _____

Send to: HERMES PRODUCTS, Inc. - Printer Division
1900 Lower Road, LINDEN, NJ 07036, (201) 574 0300

Mini-Micro World

NEWS

production "rather dramatically over the next few months." Lear Siegler has not been shipping into the DEC-compatible market since discontinuing the ADM 36, a VT100 emulator. "We plan to get a higher market share with the ADM 220 than we did with the ADM 36," she says. "Backlog on the [ADM 220] product is already very strong" she claims, although she would not disclose figures. Features of the ADM which the company feels will give it a competitive edge include a full tilt-and-swivel monitor, an adjustable keyboard angle, a hooded bezel, non-volatile programmable function keys, and versions with both 12-inch and 14-inch screens.

Will DEC hold on?

Raftery says DEC's market share will not change dramatically. "DEC has some users, OEMs and distributors that are extremely loyal, but there's a big part of the market that's not that loyal, so there's room for all of us," she says.

Liberty president George Chao disagrees, saying that DEC will not maintain its market share. "New entries will eat into DEC and into CIE terminals. Can DEC come close to holding its [60 percent] market position? And who is going to fall out of the 40 percent? [Those] are the bottom-line questions."

Steve Mikulski, planning manager for terminals in the DEC marketing group in Marlboro, Mass., says that since deliveries of the VT220 began in November, "We have maintained our market share in both the VT100 and the VT200 [families]." Mikulski expects that DEC will follow the example set with the VT100 family and introduce a new VT200 family product about every 18 months.

Frank Orlando, DEC's marketing manager for all terminals products, says that the \$100 price increase on

the VT200 was the result of a routine review of all prices. DEC was able to raise the price in July because, at that time, it was the only supplier during a period of very strong demand.

Differentiating compatibles

TeleVideo's vice president of national sales, Steve Tatum, says the VT220's keyboard may confuse experienced VT100 users. Instead of keeping the VT100 keyboard design for the VT220, DEC copied the one it has on its Rainbow microcomputer. The \$995 TeleVideo 922 (MMS, August, Page 33) uses a keyboard that more clearly simulates the VT100. Dataquest's Sanekoff says TeleVideo made a good move in using a modified VT100 keyboard on its TeleVideo 922. However, should the VT220 keyboard become a standard, TeleVideo will change its design.

Liberty Electronics, in choosing

to price its Freedom 220 aggressively, did not include either foreign character sets or downloadable character sets. Also, the Freedom 220 displays only 80 columns at a time, with horizontal scrolling needed to show its full 132 columns. Liberty has also shown the Freedom 222 at the recent National Computer Conference in Las Vegas. The 222 adds the modem and telephony features of the Freedom 212 (MMS, July, Page 34).

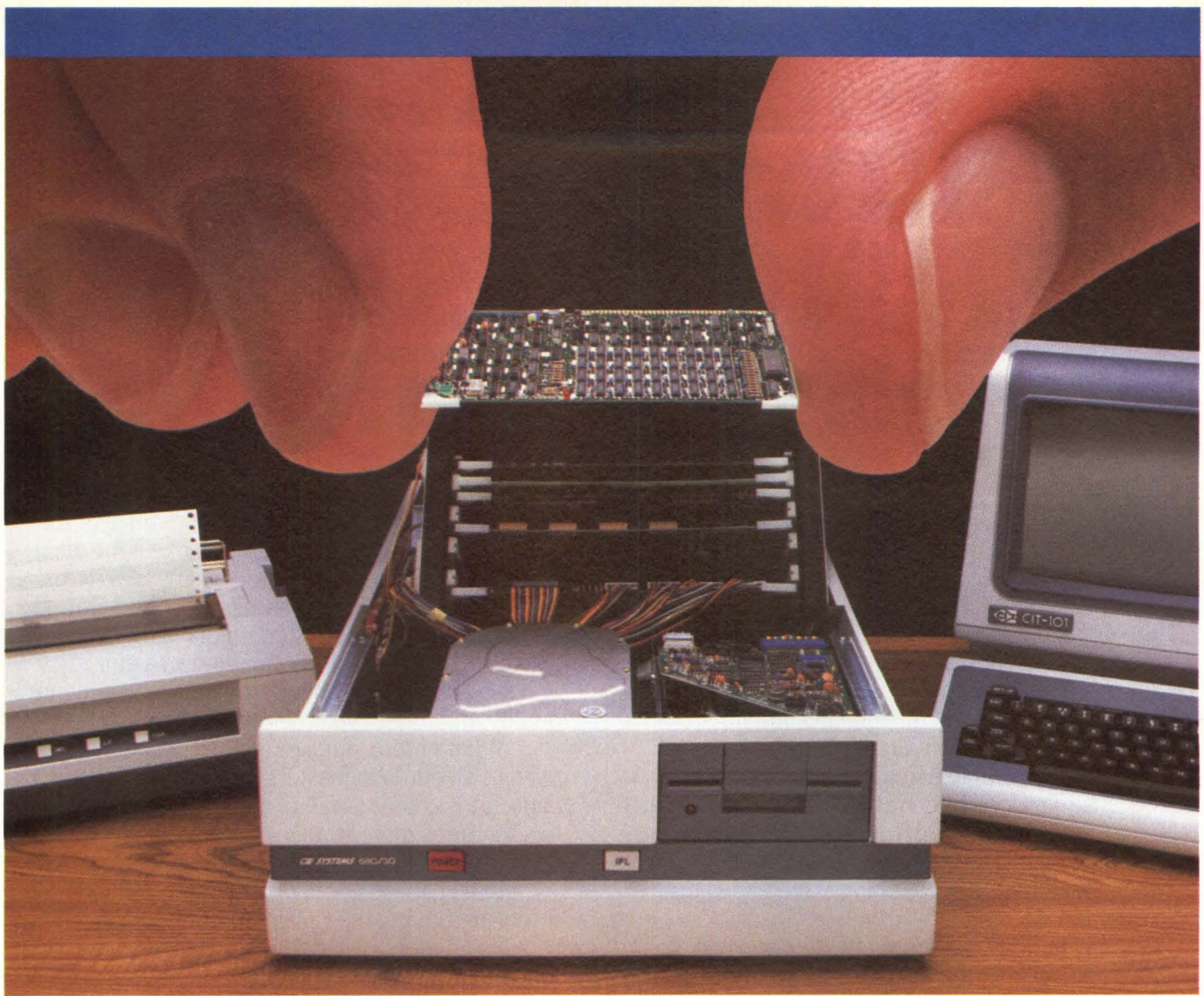
Dataquest's Sanekoff says Liberty's Freedom 220 is "a very attractively-priced product at \$795, which, considering [OEM] discounts, could probably be bought at about \$550." Sanekoff says the Freedom 220's lack of foreign character sets, downloadable character sets and full 132 column display will be "a restriction." But, he says, "Liberty is an aggressive company moving into the marketplace, and their presence will be felt." □

VERTEX 5¼-INCH WINCHESTER STORES 85M BYTES

Vertex Peripherals Inc., San Jose, Calif., has boosted its 5¼-inch Winchester capacity to 85M bytes, unformatted. The model V-185 is an extension of the company's V-100 family and has a voice coil actuator, a closed-loop servo system, and is priced at \$1,695 in OEM quantities. Evaluation models are scheduled for the end of the third quarter, with production quantities scheduled for the end of the fourth. SyQuest Technology Inc., Fremont Calif., is also boosting capacity—and shrinking size as well—with a 12.75M byte (unformatted), 3.9-inch micro Winchester. The Model SQ-312RD is a half-height drive with a removable cartridge that's less than ½ inch high.

PHILIPS PERIPHERALS READIES 1.6M-BYTE FLOPPY

Philips Peripherals Inc., San Francisco, Calif., the U.S. marketing arm of Philips Kommunikations Industrie AG, Siegen, West Germany, has unveiled a 1.6M-byte, half-height flexible disk drive. The model X3138, being sampled now by selected OEMs, carries a \$295 price tag. Volume shipments are expected in December. The new drive uses large scale integration to reduce interface board size and heat dissipation. Philips is expected to broaden the line further by the year-end with a one-third-height 3½-inch flexible drive storing 1M byte.



Our giant commitment to OEMs

BOARDS TO SYSTEMS. YOU NAME IT.

CIE Systems is committed to being your source for the very latest in micros and all that goes with them.

The micros are the CIES 680™ Business Computers with the advanced 32/16-bit 68000 micro-processor and Intel's Multibus™ architecture. So from boards to systems, you can easily configure your product line for virtually any business.

There are four 680 models. The 680/30 (shown above), 680/20 (on the right), 680/35 and the 680/40.

The 680/30 and 680/35 will accommodate up to eight interactive users. The 680/20 expands to four users. And the 680/40 expands to as many as 16 users.

Disk capacities range from 10 to 300 Mbytes, memory from 256K to one Mbyte.

Operating systems include REGULUS™ and CNIX™ (both UNIX™ compatible), as well as RM/COS™.

Language processors include BASIC, FORTRAN, COBOL and PASCAL.

Applications offered are general accounting, financial worksheet and word processing, as well as a wide range of vertical applications.

And you can include PRO-IV™, the applications processor that allows you to develop applications in one-tenth the time or modify applications in one-hundredth

the time it normally takes.

Boards up to complete CIES 680 systems. Our name or your name on them. That's an ongoing commitment to OEMs from CIE Systems, the company backed by the third largest trading company in the world with well over \$60 billion in sales.

Just call or write CIE Systems, Inc., 2515 McCabe Way, Irvine, CA 92713-6579. Call toll free 1-800-854-5959. In California, call 1-800-432-3687.

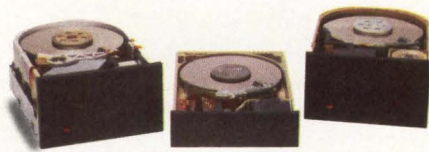


CIE SYSTEMS
A CITOH ELECTRONICS COMPANY

TM CIES 680 is a Trademark of CIE Systems, Inc.
Multibus is a Trademark of Intel Corporation.
REGULUS is a Trademark of Alcyon Corporation.
CNIX is a Trademark of CIE Systems, Inc.
UNIX is a Trademark of Bell Laboratories.
RM/COS is a Trademark of Ryan-McFarland Corporation.
PRO-IV is a Trademark of Data Technical Analysts, Inc.

© CIE SYSTEMS, INC. 1984

WHEN IT COMES TO WINCHESTERS, WE RUN CIRCLES AROUND THE COMPETITION.



Tandon's made so many improvements in Winchesterst that the rest of

the drive industry is dizzy just trying to keep up.

We build a wide range of drives. Open-loop and high performance closed-loop models. In both full and half-height versions ranging from 12.8 to 36.2MB unformatted capacities.

All are available in high quantities now, because Tandon's been ramping up capacities at a pace like never before. And we've kept up the pace of improving Winchester performance as well, so the most advanced technology is ready when you need it.

As far as our current line is concerned, the low-cost TM500 line has become the most reliable full-height 12.8 and 19.1MB drives you can get. The

new TM252 half-height 12.8MB surpasses the industry's most critical specifications. And our TM703 has been increased to 36.2MB to make it the ideal high capacity drive for desktop business systems.

Another part of our success revolves around our highly automated plated media plant in Northern California. Its buttoned-down efficiency and technological sophistication guarantee higher quality and higher volume production than ever.

What's more, our proprietary plated media is used in all our Winchesterst, no matter what the capacity. It's more durable, more reliable. And it has six times more storage capacity than oxide media. At less than half the cost.

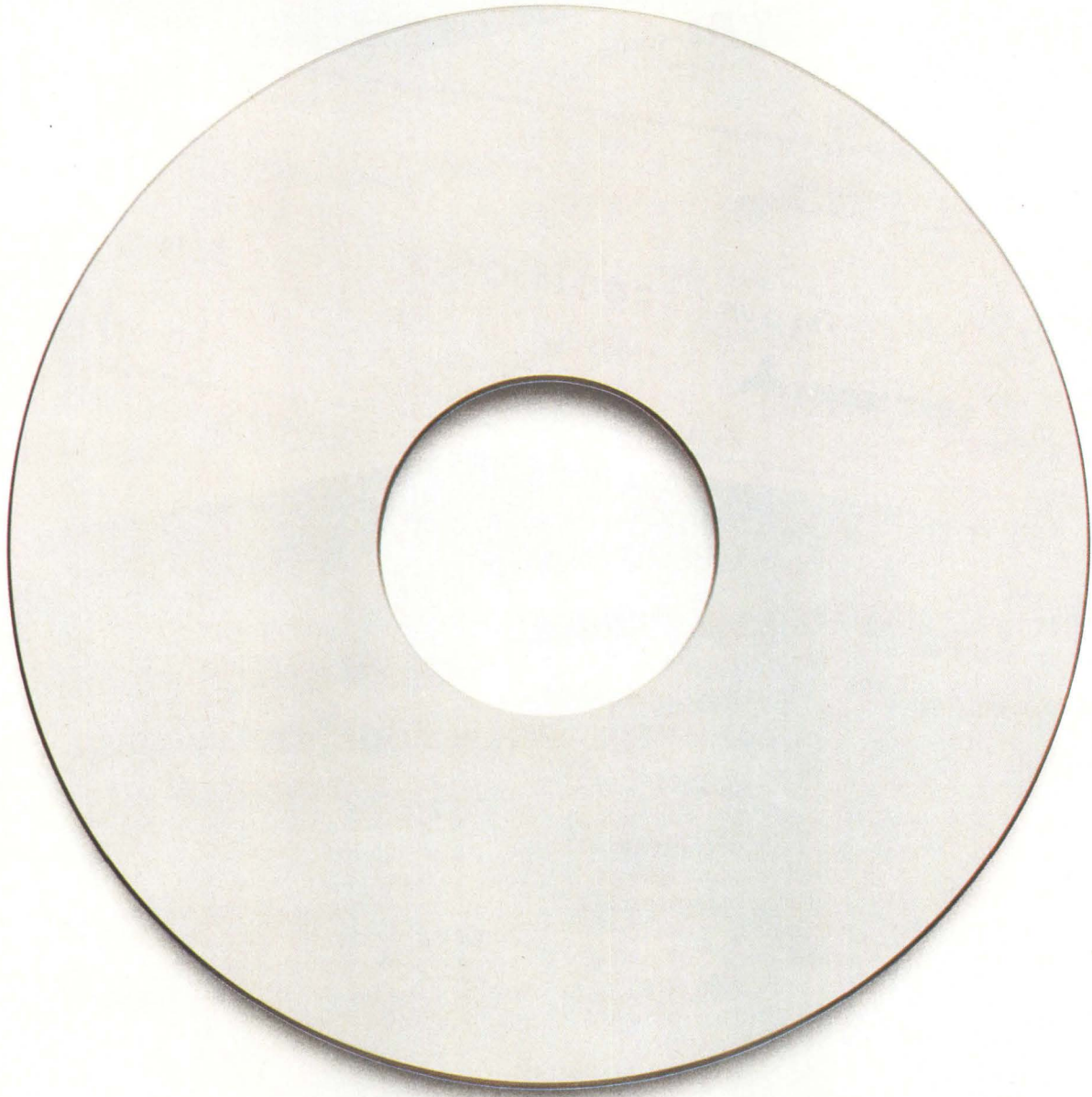
In fact, it's so good, other drive manufacturers are buying their plated media from us.

So all around, Tandon Winchesterst have more capacity in less space at less cost.

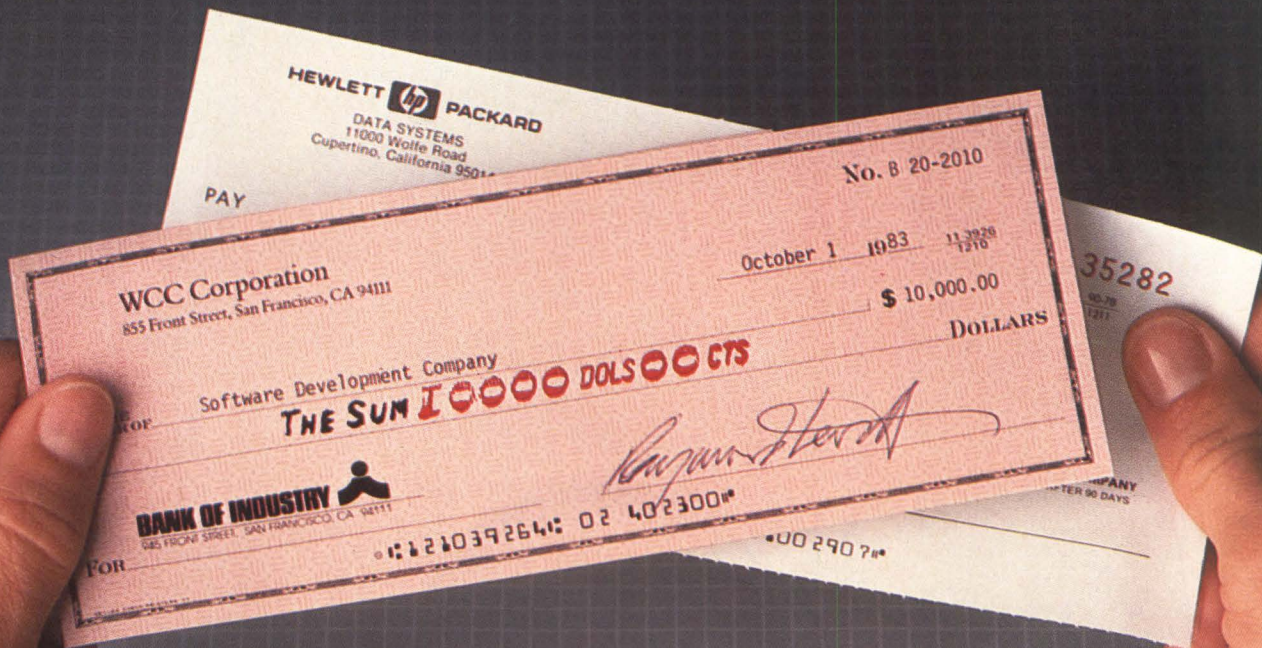
And that's a pretty good circle to run around in.

Tandon
THE DRIVING FORCE BEHIND THE SMALL COMPUTER INDUSTRY.

Tandon Corporation, 20320 Prairie, Chatsworth, CA 91311. (818) 993-6644, TWX: 910-494-1721, Telex: 194794. Regional Sales Offices: Boston (603) 888-8612 • New York (201) 851-2322 • Atlanta (404) 934-0620 • Chicago (312) 530-7401 • Dallas (214) 423-6260 • Irvine (714) 669-9622 • Santa Clara (408) 727-4545 • Kelsterback/Frankfurt, West Germany 6107-2091, Telex: 411547 • Reading/London, England (0734) 664-676, Telex: 848411. Distributors: Hall-Mark, Kierulff, Schweber.



CIRCLE NO. 25 ON INQUIRY CARD



Writing HP software can be doubly rewarding.

Doubly rewarding, because every time Hewlett-Packard sells a new system with your software, you'll not only get a check from the customer, but one from HP as well!

As thanks for writing software for our systems, we'll give you a bonus of 30% of your software's sales price—up to 6% of the net HP system's price. That could mean \$3,000 on a \$50,000 system... or as much as \$30,000 on a \$500,000 system. And you'll get it *every time a new system is sold with your software.*

We won't tell you what kind of program to write. What industry to write it for. Or even specify the system. Our only restriction is that, to qualify for the bonus, your software must sell for at least \$10,000.

Of course, extra cash isn't the only incentive. To help you get started, we'll sell you a development computer at a 40% discount.

We'll also promote your software in HP catalogs, direct mail and advertisements. And you'll have the benefits of being associated with HP—one of the worldwide leaders in computing systems. A company whose products range from widely-used business computers, like the HP 3000, to one of the world's most advanced 32-bit computers, the HP 9000.

If you'd like to learn more, write to Hewlett-Packard, Attn Gwen Miller, Dept. 08173, 19447 Pruneridge Avenue, Cupertino, CA 95014. In Europe, write to Henk van Lammeren, Hewlett-Packard, Dept. 08173, P.O. Box 529, 1180 AM Amstelveen, The Netherlands.

We'll give you all the details on our HP Plus Software Supplier program. And all the reasons why it will be rewarding for *you* to develop software for HP.



CIRCLE NO. 26 ON INQUIRY CARD

U.S. List prices only.
BD-02301

Mini-Micro World

NEWS

Data General takes IBM PC-compatibility into the portables market

Lori Valigra, Senior Editor

The idea of a personal computer, complete in its contents and carried as one would transport a book, was planted at Xerox Corp.'s Palo Alto Research Center, but has germinated at companies such as Data General Corp. (DG), Westboro, Mass. The 9.1-pound Data General/One, code-named Book One, takes the company into new territory—IBM Corp. Personal Computer compatibility—while keeping some ties to its CEO office-automation equipment.

Priced at less than \$3,000, the Data General/One contains all complementary - metal - oxide - semiconductor (CMOS) parts to keep a lid on power consumption and heat build-up. The system includes an 80C88 CMOS processor; 128K bytes of CMOS RAM memory that can be expanded to 512K bytes; a 79-key DIN-standard keyboard; and a full 80-column-by-25-line liquid crystal display (LCD) with 256-dot-by-640-dot resolution. Also included are a 3½-inch, 737K-byte floppy disk drive; two serial ports; an AC power pack; and MS-DOS or CP/M-86 operating systems. Optional parts include a forthcoming expansion chassis for IBM PC and compatible plug-in boards; a 5¼-inch floppy drive; a second 3½-inch floppy drive; an internal 300-baud auto-dial modem; a portable thermal printer; a rechargeable battery pack; and carrying cases. The system measures 13.7 by 11.7 by 2.8 inches.

Ties to DG's CEO office-automation equipment can be made with CEO Connection software, resident in both the CEO MV/family super-minicomputer host and in specific



The keyboard on the Data General/One (inset) is not identical to the IBM PC's, because the function keys are parallel to the screen rather than clustered on the left side of the keyboard. Also, the numeric keypad, which is on the right side of the IBM PC's keyboard, is incorporated in the character keys on the Data General model.

application packages running on the Data General/One. The software lets users transfer files in converted documents between the application programs in the portable computer and the CEO system. This means a document can be mailed to the host CEO in-box, an MS-DOS file can be sent to the AOS operating system in the MV host, a file can be retrieved from the MV/host, MS-DOS files can be executed, and the Data General/One can act as an attached terminal to the MV/minicomputer. At

last month's announcement, DG planned to offer CEO Connection software for Wordstar, PFS Write, Symphony and Multiplan application programs.

Integrated floppy drives

The Data General/One is one of the first lap-sized computers to integrate floppy disk drives. "This is a big step forward in portable functionality," says Egil Juliussen, chairman of market-research company Future Computing Inc., Dal-

Mini-Micro World

NEWS

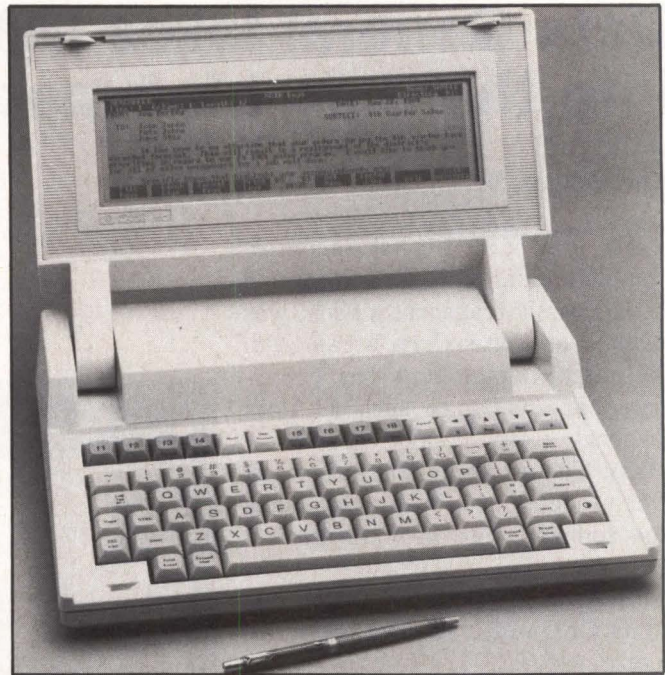
las, Texas. He explains that the computer is compatible with IBM's, and except for the different floppy-disk size it would be operationally compatible. "The product takes PC functions and puts the whole thing—a full display, keyboard, and floppy drives—into one unit. This is a first, he says, adding that it is also the key to the product's success. Juliussen says it would have been better had DG integrated 5¼-inch drives, but technology would not allow that to happen because the 5¼s are too big. "They made the intelligent choice," he says.

Even though Hewlett-Packard Co. (HP) and Apple Computer Inc. have endorsed the 3½-inch floppy-drive format by incorporating such drives in major computer products, off-the-shelf software on 3½-inch diskettes still is not as readily available as on 5¼-inch diskettes. One move that could have changed that scenario would have been for IBM to use the small drives. "I was hoping the new IBM products [the Intel Corp. 80286-based Personal Computer AT] would have had 3½-inch drives. This would help [other products using them]," says Patricia Seybold, a consultant with Seybold Publications, Boston.

To try to attract software house support for its product, DG in June talked with software companies and sent 50 pre-production units to them. Software houses can purchase the machines at a 40-percent discount should they buy them for program development. "We recognized early on that we couldn't sell a product in this market without an incredible amount of software," says Agnes Imregh, manager for software marketing and acquisition for DG's Desktop division.

DG also has done much of the legwork to educate its buyers about 3½-inch drives and their availability. "To address the 3½-inch issue,

Hewlett-Packard's model 110 portable computer contains applications software in ROM, and has a 16-line by 80-column display, but no integral floppy disk storage.



Advanced Computer Techniques' Apricot Portable uses a 25-line by 80-column liquid crystal display, and can house one internal 3½-inch floppy disk drive. A 10M-byte Winchester drive is optional.

we checked what the availability of media would be, and we were assured of a high degree of available media [upon the product's introduction in September]," she says. Maxell Corp., Sony Corp., BASF Corp., and Brown Disc Manufacturing Inc. all supply the small media. In turn, DG gave a list of the diskette suppliers to the software houses. Imregh expected 20 to 30 packages to be available at announcement time.

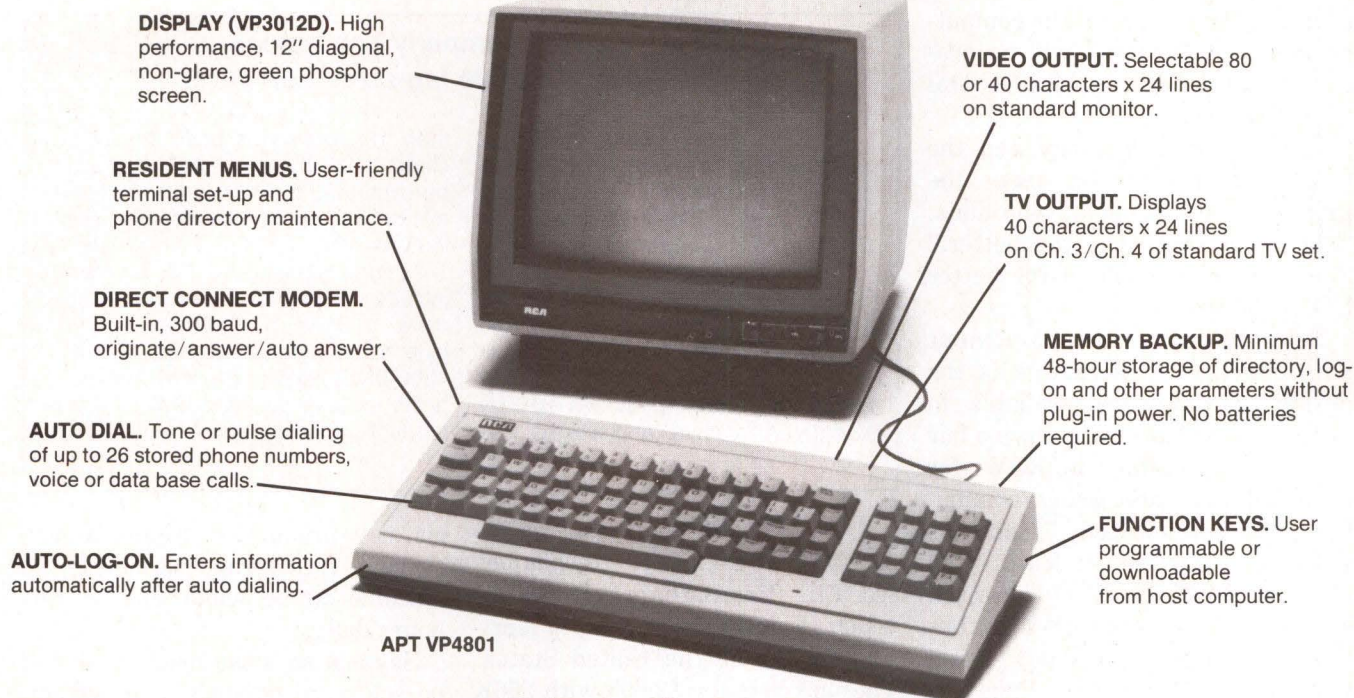
DG users will be able to get the

packages in four ways. DG will both distribute and support the software; the company will distribute it and the software house will support it; DG will acknowledge a program will run on its system; or the third-party developer will claim the package works.

System boasts full display

Another feature DG touts is the full screen. The LCD and other components in the system are pur-

You don't need a computer to talk to another computer.



DISPLAY (VP3012D). High performance, 12" diagonal, non-glare, green phosphor screen.

RESIDENT MENUS. User-friendly terminal set-up and phone directory maintenance.

DIRECT CONNECT MODEM. Built-in, 300 baud, originate/answer/auto answer.

AUTO DIAL. Tone or pulse dialing of up to 26 stored phone numbers, voice or data base calls.

AUTO-LOG-ON. Enters information automatically after auto dialing.

VIDEO OUTPUT. Selectable 80 or 40 characters x 24 lines on standard monitor.

TV OUTPUT. Displays 40 characters x 24 lines on Ch. 3/Ch. 4 of standard TV set.

MEMORY BACKUP. Minimum 48-hour storage of directory, log-on and other parameters without plug-in power. No batteries required.

FUNCTION KEYS. User programmable or downloadable from host computer.

APT VP4801

The new RCA APT (All Purpose Terminal) expands your data communications capabilities for a lot less money.

For business, professional and personal data communications, you'll find more user-friendly features and greater communications capabilities in the RCA APT than in other terminals selling for up to three times the price.

The new APT terminals are ideally suited to multi-data base time sharing and dedicated, direct computer-connected applications. They feature menu-controlled operation and a programmable "personality" to match specific communications requirements for your data bases.

A single keypress can dial a stored number, send the log-on sequence on the host computer, and return terminal control to the user. Password protection prevents unauthorized access to designated numbers. APT can also be used as an auto-dialer for voice communications.

Quite simply, matching features with price, there is no other professional quality terminal available today that can do as much at such low cost.

APT terminals list for \$498, in your choice of full stroke or membrane keyboard versions. Either style is also available with a display monitor for \$697 list. The data display monitor alone, VP3012D, \$199 list.

For more information—or to order—call 800-722-0094. In Penna., call 717-295-6922. Or write for fully descriptive brochure to RCA Data Communications Products, New Holland Avenue, Lancaster, PA 17604. OEM and dealer pricing available. The new RCA APT. Expansive. Not expensive.

OTHER FEATURES

RS232C port for direct computer connections at data rates to 9600 baud, or for connecting high speed modems and other accessories. Parallel printer port for hard copy. Numeric keypad, can dial phone numbers not in terminal directory. Built-in speaker with adjustable volume control for audio monitoring of phone line. Smooth scroll display. Automatic screen blanking to reduce possibility of burn. Briefcase size: 17" x 7" x 2". Weight: under 4 lbs.



APT VP3801.

Flexible membrane keyboard version designed for travel and hostile environments.

RCA

Mini-Micro World

NEWS

chased in Japan, where the computer was developed and will be produced by the Nippon Data General subsidiary.

The display technology and the CMOS parts are what keeps the price up, says Seybold, who adds, "The lower the price, the better." She says DG has one of the better LCDs she's seen.

Seybold's one disappointment with the Data General/One is the dearth of programs available in ROM. "Most competitors have a fair amount of programs in ROM—for example, word processing, communications, and notepads." She says ROM programs are one feature she likes about HP's model 110 lap-sized system, which runs MS-DOS but has a smaller display and no integral floppy drives (MMS, May, Page 33). Future's Juliussen is not as disappointed. "Applications in ROM mean a tradeoff in pricing. HP's machine is priced at \$2,995 with a 16-line-by-80-column display. An external microfloppy drive is priced at about \$700.

Spec summary

- **Processor:** 80C88 CMOS
- **Operating system:** MS-DOS or CP/M-86
- **Internal memory:** 128K bytes CMOS RAM, expandable to 512K bytes
- **External memory:** one 3½-inch floppy drive
- **Display:** 25-line by 80-column, 256-by-640-dot LCD
- **Communications:** two serial ports
- **Power requirements:** standard AC power pack
- **Keyboard:** 79-key DIN standard
- **Physical dimensions:** 13.7 by 11.7 by 2.8 inches, 9.1 pounds
- **Options:** socket for 8087 math coprocessor; second microfloppy drive integral to unit; external 5¼-inch floppy drive; expansion chassis; hard- or soft-sided carrying cases; rechargeable battery; pack and charger; portable thermal printer; internal 300-baud auto-dial modem

Singapore company announces IBM PC-compatible lap-sized computer

BML Computer Design Pte. Ltd., Singapore, a research, engineering, development and prototype computer company, has designed a lap-sized IBM Corp. PC-compatible computer.

The product is based on an 80C86 CMOS processor, runs MS-DOS, has a built-in 3½-inch floppy disk drive and a software-programmable 12-line or 16-line LCD. The keyboard has 72 keys. The product measures 16.5 by 12.5 by 2.4 inches, and weighs less

than 10 pounds. A basic model includes 128K bytes of RAM, which can be expanded to 512K bytes, and one microfloppy drive. A battery pack also is available.

Options planned by the company include a 5½-inch half-height floppy drive, a 5¼-inch 10M-byte or 20M-byte Winchester drive, and a 300-/1200-baud internal modem. BML expects to have pilot production of the product underway soon.

Another major competitor of DG is Applied Computer Techniques (ACT), Birmingham, England, which recently introduced its Apricot Portable in the United States. The unit lists for \$2,695 with 256K bytes of RAM; an infrared keyboard and mouse/trackball cursor controller; a 25-line-by-80-column LCD; and a 3½-inch floppy drive. The Portable is based on the Intel 8086 processor, runs MS-DOS, and weighs 13 pounds.

Juliussen estimates the market for products in the Data General/One's class will be 100,000 units sold this year, representing \$330 million in revenues. Both numbers will more than double next year he predicts, which is the first full year of shipments for DG, HP and ACT products.

Selling the second machine

DG is positioning its portable as a second computer for IBM PC owners, who can use it when they're traveling. "The office can be on the move, in a sense," says Arun Tan-

eja, new products manager. He anticipates the average use time of the machine to be about one or two hours daily.

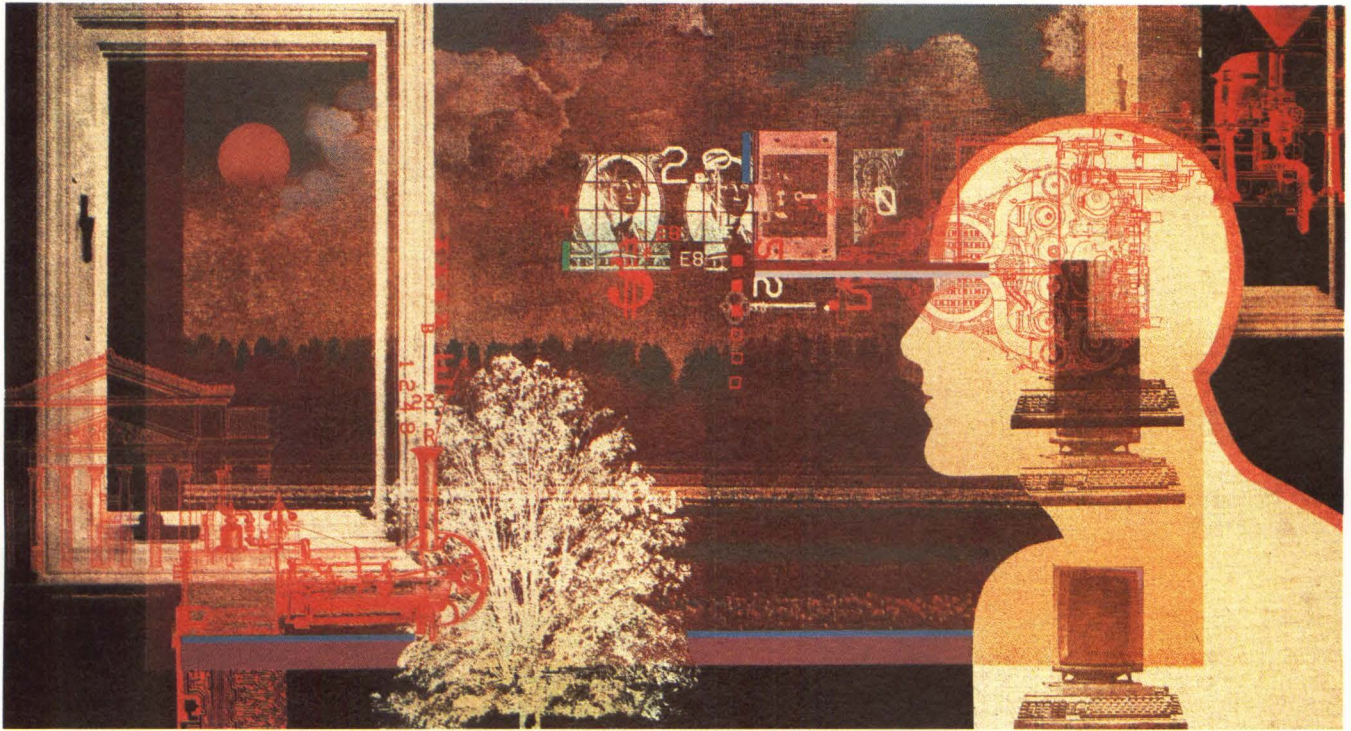
Seybold says the machine should be sold as a person's only system, rather than as a second system, because the expansion chassis allows a user to plug in a full display. Juliussen says a large portion of DG's sales will be to users buying a second computer, but says the product ideally will be sold to both first- and second-system buyers. He adds that one advantage DG has in selling its computer into the already packed retail distribution channels is that the product has unique features such as combining PC-compatibility and an integral floppy drive.

The product will be sold by DG's direct sales force and through the company's independent dealer channels. The company hopes to have 200 dealers by the end of this year. The price for a 128K-byte system with MS-DOS and one floppy drive is \$2,895. The Data General/One should be available now. □

COMPUTER MEMORIES ADDS HALF-HEIGHT DRIVE

Keeping pace with the competitors, Computer Memories Inc., Chatsworth, Calif., has introduced a 25.5M-byte (unformatted) 5¼-inch half-height Winchester aimed at the portable market. The model CM3426 offers an 85-msec average access time, closed-loop servo and 690 tracks per inch. Deliveries are planned for late in the third quarter.

WHY BUY A DATABASE SYSTEM?



TO BUILD APPLICATIONS!

PROGRESS™ is the high-performance database system and fourth-generation application development language for multi-user microcomputers.

PROGRESS gives you all the flexibility and control of structured programming languages, but uses plain English syntax for simplicity and ease of customization. You and your staff will learn to use PROGRESS quickly and benefit immediately from its state-of-the-art features.

Why build business applications in C, BASIC, or COBOL when PROGRESS will increase your productivity 10 to 40 times? PROGRESS makes this possible by integrating these powerful features:

- English-like application language
- Flexible relational DBMS
- Integrated data dictionary
- Automatic screen and report formatter
- Full-screen syntax-checking editor with on-line help

Once your application is built, PROGRESS offers:

- High performance
- Comprehensive multi-user capabilities
- Automatic database recovery
- Easy modification and customization
- Ad hoc query and report-writing capability
- Portability to a wide range of machines

PROGRESS is available today on major UNIX™-based super-microcomputers.

Power. Performance. Ease of Use . . . Now, that's PROGRESS! You can't afford to build applications without it.



DATA LANGUAGE CORPORATION
5 Andover Road, Billerica, Ma. 01821
617-663-5000

PROGRESS

A NEW APPLICATION ENVIRONMENT

Want to make PROGRESS in a hurry?
Call Area Code 617-663-5000 today.

Or just fill out and return the coupon below.

DATA LANGUAGE CORPORATION
5 Andover Road, Billerica, MA 01821
(617) 663-5000

- Yes! Please send me a demonstration disk and documentation for PROGRESS. I enclose \$295.
- Please send more information about PROGRESS.
- I am interested in PROGRESS seminars.

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Telephone (_____) _____

5

PROGRESS is a trademark of Data Language Corporation, developers of advanced software technology for business and industry.
UNIX is a trademark of AT&T Bell Laboratories.

**So
how many
years
would you
like to take
off?**

Before you waste any more time, you may want to read about this.

VRTX. That being the real-time operating system packaged in silicon. From Hunter & Ready.

It's a versatile kernel, efficient I/O system and flexible file manager.

Or to put it another way, it's everything you'd want in a multi-tasking operating system.

But not in the usual all-or-nothing sense of the word.

Fact is, you can use as much — or as little — as you like. And yes, then take as many years off as you like.

A good place to start is the VRTX kernel. Because with it, you can subtract two years from a lengthy design cycle.

Think of it as task management, real-time clock support, dynamic memory allocation, basic I/O, interrupt handling and fast pinpoint timing — all rolled into a neat 4K of memory.

OK, sounds like a lot, but not quite two years? You're right. That

doesn't just come from design time. But from what makes VRTX as reliable as a quartz watch.

100,000 manhours of debugging and testing. The stuff nights and weekends can be made of.

Still you'll be happy to know, for all VRTX takes off, there's not much to give up.

Unlike other operating systems, it doesn't lock you into one processor

for life. Or tie you to one type of I/O and file management forever. VRTX is compatible with all major processor families and all standard types of file management and I/O.

And with that choice, we're back to the count.

Meaning if you don't want to spend time on I/O, take off another two years. Since our IOX component works with VRTX to take care of all block, disk and character I/O.

And right along with that goes our FMX file manager. And another two years off. Besides which, FMX includes all the things you'd want in a hierarchical file system. Concurrent file access. Random and sequential access. And compatibility with standard file systems, including none other than PC-DOS.

We could go on. But it's now time for our final summation.

A total of six years if you want it all off (VRTX, IOX and FMX). Two or four years if you'd like a real-time

head start.

Or if you'd like to know more before you decide,

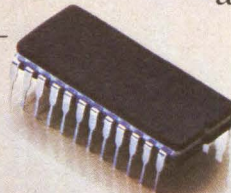
write Hunter & Ready, 445 Sherman Avenue, Palo Alto, CA 94306. Or call (415) 326-2950.

There should always be more than one way to buy time.

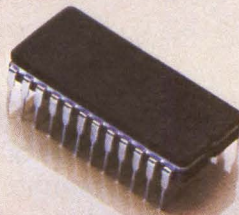
HUNTER ♦ READY

We've taken the hard part out of operating systems.

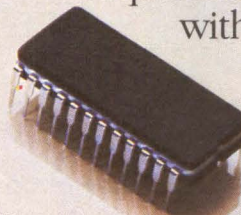
CIRCLE NO. 29 ON INQUIRY CARD



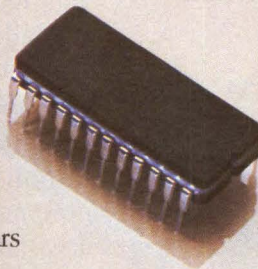
2 Years



4 Years



6 Years



Early to Market

... Through Building Block Technology



Memory System Modules

Our Series 90 Family features five of the most comprehensive memory products available — up to 128 megabytes in a single chassis — each extensively tested for reliability and engineered to fit your unique application requirements, exactly. That means that you don't have to give up a single design objective to get all the advantages of an off-the-shelf system. Like low cost. And faster time to market.

Guarantee Against Obsolescence

In today's market of compressed product life cycles, it is imperative that your product remain the leader for as long as possible. That's a problem which Zitel turns into opportunity. Because the Series 90 Family accepts new memory component technologies as they become available.

Broad-Based Applications

For unfriendly operating conditions, we offer ideal add-on for mobile and impact-susceptible environments normally associated with defense and geophysical applications. And there's main memory add-on, intelligent memory, disk replacement and disk cache.

In fact, Zitel products are an integral part of systems throughout the computer, medical, simulation, communications, industrial automation and environmental control industries, to name but a few.

Low cost, proven reliability and the flexibility of our building block modules. When it comes to implementing your next memory system for early market entry, think Zitel.

We'd like to bring you there . . . on time.

Please send me more information on the following Zitel Products:

MMS 10/84

- Multibus® Memory
- Series 90 Family of Bulk Memory
- VME/Versabus™ Interface Special Interface
- Other _____
- Custom Microcomputer Cards
- Custom Memory Cards

My application is _____

Name _____ Title _____

Company _____ Phone (_____) _____

Division _____

Address _____

City, State _____ Zip _____

zitel®

Zitel Corporation
Attn: Applications Manager
399 W. Trimble Road
San Jose, California 95131
408/946-9600

Zitel International
53 Blvd. de Waterloo, bte 2
1000 Brussels, Belgium
32-2-513-3565

Multibus is a registered trademark of Intel Corp. Versabus is a trademark of Motorola Inc.

CIRCLE NO. 30 ON INQUIRY CARD

Diconix, Ferix challenge non-impact printer technologies with innovative designs

David Bright, Assistant Editor

At least two of the many new non-impact printers promoted as alternatives to laser and traditional impact printers incorporate innovative technologies said to improve performance and reliability.

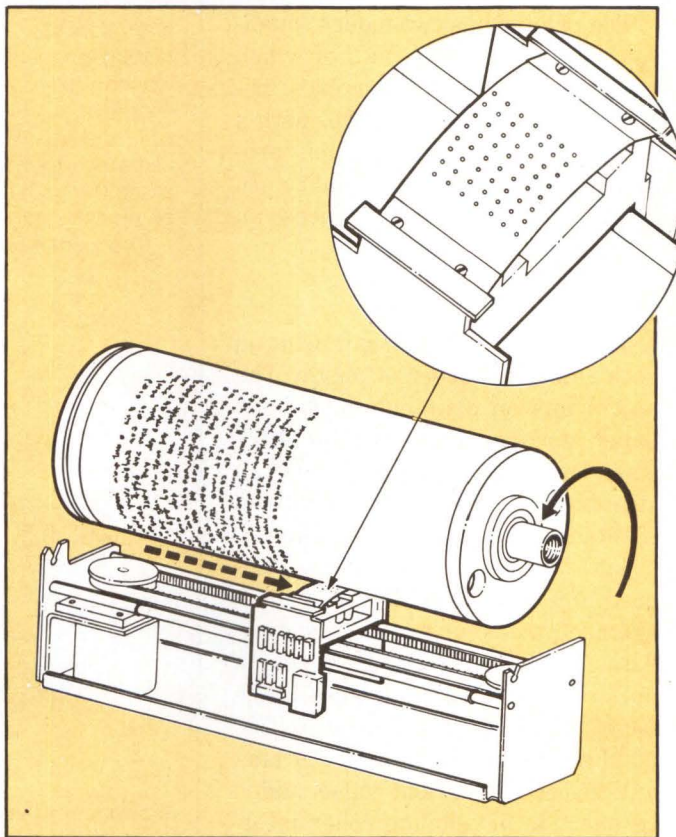
The first is a continuous-stream ink-jet printer introduced late last month by Diconix Inc., a Dayton, Ohio, subsidiary of Eastman Kodak Co. It uses binary deflection and multiple array technology to produce 300-dot-by-300-dot-per-inch (dpi) character resolution at speeds reaching 18 pages per minute (ppm). The new printer, which at press time was unnamed, is targeted at OEMs and value added resellers, with a quantity price between \$5,000 and \$7,500. The end-user price is about \$12,000, depending upon configuration.

In another challenge to tradition, Ferix Corp., Fremont, Calif. is using thin-film magnetic recording heads on its desktop model 800 magnetic page printer to achieve 10-ppm output at an OEM price of about \$2,500.

Diconix, formerly known as Mead Digital Systems, was a pioneer in using binary deflection in multiple-array technology. The company produced its first large scale commercial printer in 1973. Dijit and Admark machines, well known in the commercial printing industry, can print as fast as 100,000 lines per minute.

With binary deflection, droplets of ink emerging from nozzles are either electrically charged or left uncharged. The charged droplets are deflected to a gutter system for recirculation and re-use, while the

The 128 Ferix heads reside on a half-inch wide strip that moves across the drum, providing 240-dot-by-240-dot resolution.



neutral droplets travel directly to the paper.

Multiple-deflection, continuous-stream ink-jet printers normally have one jet, and the droplets' trajectories and consequent placement on the page is determined by varying the charge levels. Diconix printer products director Loyd Tarver says binary deflection is more accurate for continuous-stream ink-jet printers because it creates a consistent aerodynamic force on each droplet. With multiple deflection, a range of aerodynamic effects and charge levels must be considered, thereby increasing the chances of errors such as collisions among droplets. The simplicity of the binary deflection method thus promotes

superior print quality.

Diconix has 64 jets

Also contributing to high print quality is the fact that the Diconix printhead contains 64 jets, each of which can be individually addressed. Since continuous-stream ink-jet printers are sometimes plagued by ink clogging, having 64 jets would seem to increase the likelihood of clogging. But Tarver says four built-in clogging safeguards prevent that. In addition to four filtering stages (one in the ink bottle, one in the printhead and two lifetime filters in the system), there are acoustic crystals used to excite the jets and dislodge any attached particles, the materials used are

streamlined to prevent the trapping of particles, and the head is kept wet. At printer shutdown, the head is sealed with ink and at startup the jets are cleared during a wash cycle.

The printer has two modes, quality- and draft-output, both of which can combine text and graphics. Diconix says the quality mode, with a resolution of 300 by 300 dpi, provides near typographic quality. In draft mode, the head places an array of 200 by 300 dpi.

Duplex printing offered

The Diconix machine can print on both sides of a sheet of paper. The unit prints on plain cut-sheet bond paper, or transparencies in letter size, legal size or A4 (European standard) stock. Five hundred sheets can be loaded at one time.

Two MC68000 processors are used: one for image and data management and one for font control. Also included are 128K bytes of buffered RAM, a Centronics interface, and Xerox laser printer 2700 emulation and self-testing. Diconix will assist OEMs and value added resellers in developing other interfaces.

Ferix drum overlays images

Ferix's model 800 magnetic, desktop page printer also addresses each individual dot. Its 128 heads reside on a half-inch wide strip that moves across the drum, recording three lines of images with each revolution of the drum. The Ferix machine has no buffer, but the magnetic drum acts somewhat as a memory by storing latent images of both graphics and text, allowing them to be merged and overlaid until the print command is given and the toner is applied.

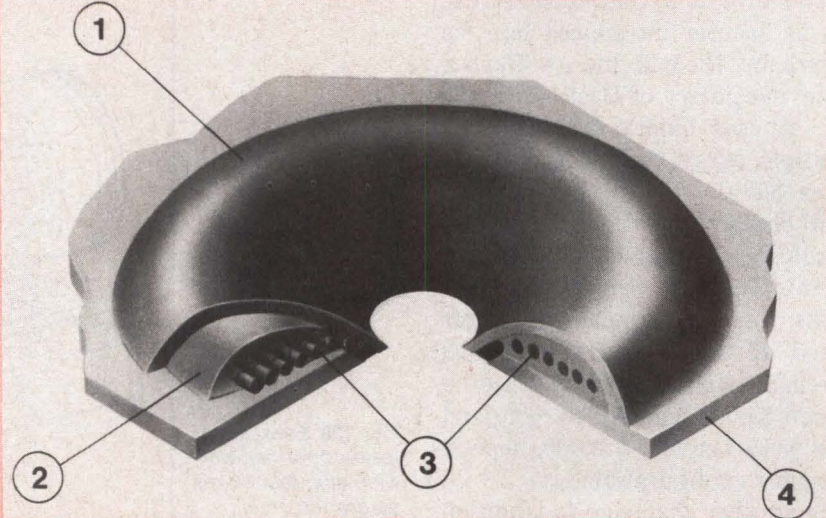
The model 800 prints at 10 ppm, but because of the drum's ability to retain images, the printer can duplicate 14 copies of the same page per

A look at the Ferix head

Ferix sources say the company's innovative thin-film magnetic recording head design is more reliable and less expensive than conventional head design.

With conventional units, a coil is wound around a magnetic ring. When electrical current passes through the coil, the resulting magnetic charge disperses from the poles and travels along the underlying substrate before going onto the recording surface.

The Ferix head, however, is donut-shaped. Its coil is surrounded by the magnetic material, which sits on the substrate. The magnetic change projects perpendicularly through the substrate's plane and onto the recording drum. Since most of the charge remains near the center of the donut, interference among heads is lessened. This containment provides sharper images, according to the head's inventor, executive vice president Gilbert Springer. Springer founded Ferix three years ago.



Shown is the "inside-out" architecture of the Ferix thin-film head. A top pole structure (1) covers a magnetic material (2), which surrounds the internal coils (3) on top of the substrate (4).

minute without having to access further data. This frees the host computer to perform other work. (Laser printers do not have such an ability to retain images.) The foam-filled Ferix drum is operator-replaceable.

Also selling to OEMs, Ferix is positioning its magnetic printer, which is its first product, against the more expensive laser printers, such as Hewlett-Packard Co.'s recently-introduced \$3,495 LaserJet, and against high-end daisy wheel printers. The LaserJet has a maximum resolution of 300 by 300 dpi, compared to the Ferix's 240 by 240 dpi. But Ferix president J. Peter Wilson says the Ferix machine, with

a monthly duty cycle of 10,000 prints, dual 250-sheet input cassette, and a cost of one cent to produce a page, is more suitable for busy offices than the LaserJet. By contrast, Hewlett-Packard rates the LaserJet's monthly duty cycle at 500 to 3,000 prints. The LaserJet has a single, 100-sheet input cassette, and the cost comes to 3.5 cents per page.

Diconix, on the other hand, expects its ink-jet printer to be much more heavily used—its projected monthly duty cycle is 30,000 to 50,000 prints, with an input capacity of 500 sheets. The projected cost per page is 1.5 cents.

Analyst Dean Scott, associate director of Dataquest Inc.'s electronic

NO OTHER CUT-SHEET FEEDER GUARANTEES RELIABILITY LIKE WE DO



ELECTRONICS MAKES THE DIFFERENCE

When evaluating a cut-sheet feeder to increase the productivity of your word processing system, compare the Ziyad® Z-300 Intelligent Paper Processor™ to all other cut-sheet feeders. The difference is obvious.

The Z-300 is the only cut-sheet, dual tray and envelope feeder that electronically captures both name and address from a typed letterhead and automatically delivers a typed envelope collated with your letter.

This single feature alone makes all other sheet feeders obsolete.

Electronics Makes The Difference

Microprocessors, sensors, and three drive motors constantly monitor and drive paper and envelope flow through the Ziyad Z-300. If trays are empty or if a misfeed should occur, the Z-300 immediately stops—eliminating platen printing. It memorizes typing position and automatically alerts the operator with an audible and visual signal.

Electronics Means Reliability

Proven performance has made us the leader in the industry. Ask any of the 22 world's leading manufacturers of word processing equipment

who have chosen to sell the Z-300 under their own name. It's reliable...with an MTBF of 6000 hours. That's why more than 100,000 Ziyad products will be sold this year.

Don't compromise your electronic word processing system with any other sheet feeder. Add the electronic cut-sheet feeder that outperforms all others—the Ziyad Z-300 Intelligent Paper Processor™. Call Sue Turner, 201/627-7600 today.

ZIYAD

Ziyad, Inc., 100 Ford Road, Denville, NJ 07834 USA
Telephone (201) 627-7600

CIRCLE NO. 31 ON INQUIRY CARD

Mini-Micro World

NEWS

COMPARING LETTER-QUALITY PRINT

INTERS we
mechanical
designed

DICONIX INC.
INK-JET PRINTER

Fonts can
cartridge
most comp

FERIX CORP. MODEL 800
MAGNETIC PAGE PRINTER

This sampl
printers
Spinwriter

NEC INFORMATION SYSTEMS INC.
SPIN WRITER 7710

printer industry service, says he is impressed with the capabilities of both the Diconix and Ferix printers. In both cases, however, his judgment was based on pre-production models. It remains to be seen, he says, if the companies can produce in volume with the same level of quality. Diconix plans volume shipments in the first quarter of 1985, and Ferix plans shipments late this year.

More laser printers expected

Meanwhile, more laser printers are in the works. Portland, Ore. startup Concept Technologies Inc. last month planned to join the growing list of vendors with laser printers based on Canon U.S.A. Inc.'s LBP-CX print engine. Concept intends to integrate the 8-ppm printer, priced at \$7,995, with its Concept 100 publishing system. And Dataproducts Corp., Woodland

Hills, Calif., should this month introduce its first non-impact printer—a table-top, 24-ppm model with a resolution of 300 by 300 dpi. Dataproducts will offer the printer, which it originally purchased from Toshiba Corp., Tokyo, to OEMs with optional controllers. The top-of-the-line controller provides full bit-mapping on 11-by-17-inch paper. The end user price is approximately \$15,000. □

GSA expands computer store program

Stephen J. Shaw
Washington Editor

Testifying to the initial success of the federal computer store concept, the General Services Administration (GSA) recently opened its second commercially operated retail outlet in Philadelphia and plans to have a third in operation at an Atlanta federal building by November 1.

The GSA's first store, Office Technology Plus (OTP), is located at GSA headquarters in Washington. Operated by Math Box Inc., Rockville, MD, a computer retail chain, OTP has exceeded the GSA's original sales projections by more than

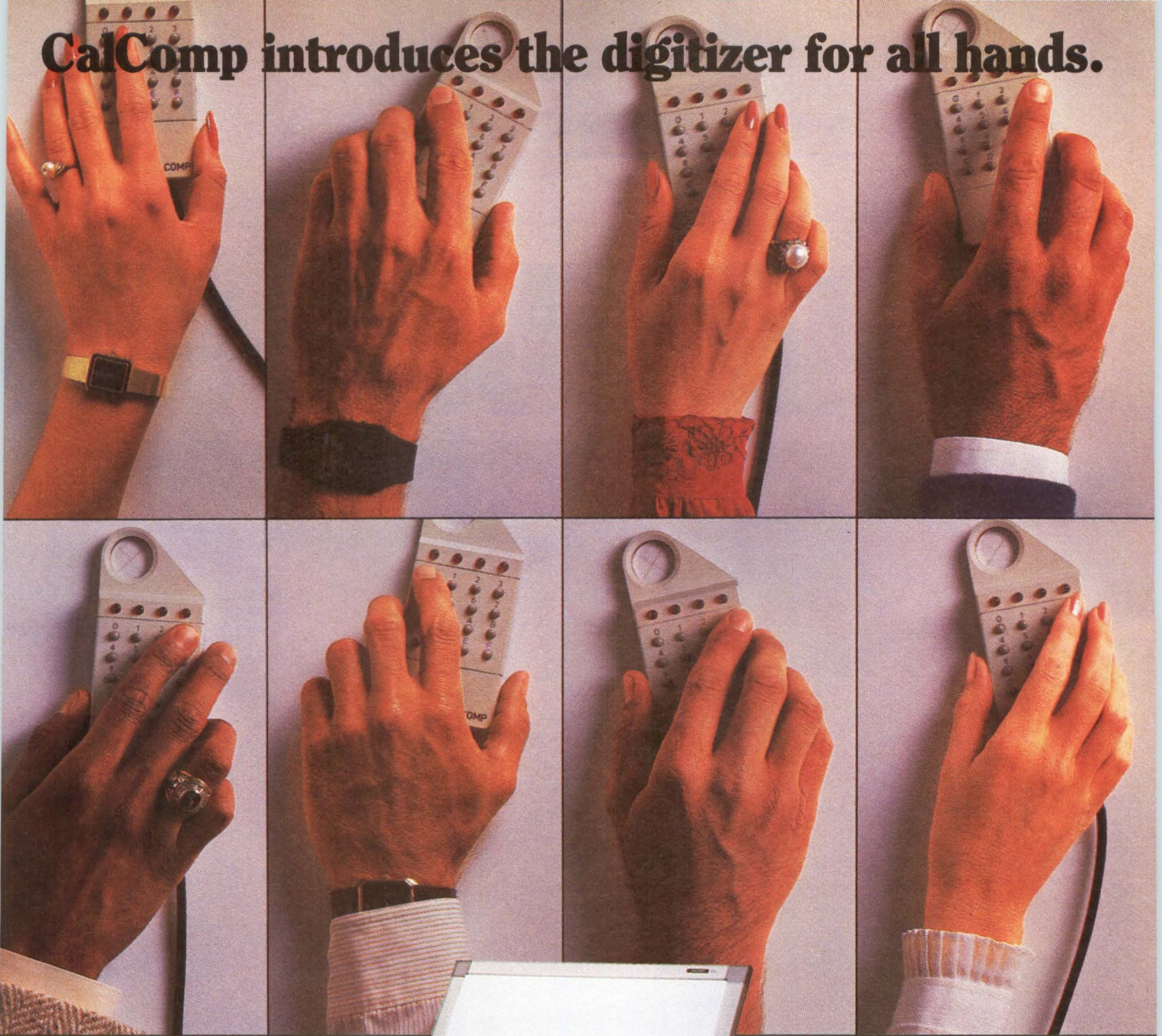
five times since the store opened in August 1983. By mid-June, a year after the contract was awarded, OTP had recorded \$12.7 million in sales. The GSA had originally estimated that OTP would reach \$2.5 million in sales during its first year of operation. Math Box has two GSA stores (one in Washington and one in Philadelphia) and eight commercial stores.

Through the end of June, the Washington store sold approximately 1900 microcomputers, of which almost 90 percent were either IBM Corp. PCs and XTs, or Compaq Computer Corp. IBM-compatible portable computers. According to GSA records, microcomputers ac-

counted for 43 percent of total sales. Peripheral equipment, including printers and plotters, represented 38 percent of total sales. Sales of software and supplies, training and maintenance work comprised the remainder of business.

The GSA's contract with Math Box to run the stores currently restricts purchases to federal employees within a 50-mile radius of the facility. Additionally, employees may purchase equipment and services at between 15 percent and 30 percent below retail list price, but only for use on the job. In such cases, the employee functions much as a government purchasing agent. The government owns the ma-

CalComp introduces the digitizer for all hands.



At CalComp, we believe a digitizer should be easy to use. For everyone. In every application.

As a result, our new 9100 features a special ergonomic design ideal for both left- and right-handed operation. The cursor's slim body promotes accurate cross hair placement, even at severe operating angles. And the signal cable exits the cursor behind your hand, away from the work area.

To keep all hands happy, we've concealed the 9100 digitizer's control electronics in the frame. And table edges are smooth so they'll never snag clothing. We've also included a handy accessory tray to keep digitizing tools in easy reach and a pen/cursor holder that can be mounted anywhere on the 9100's uniquely constructed frame.



The new 9100 digitizer.

and a wide choice of options. For details call toll-free 1-800-CALCOMP, ext. 156. Or write CalComp, 2411 W. La Palma Ave., P.O. Box 3250, Anaheim, CA 92803.

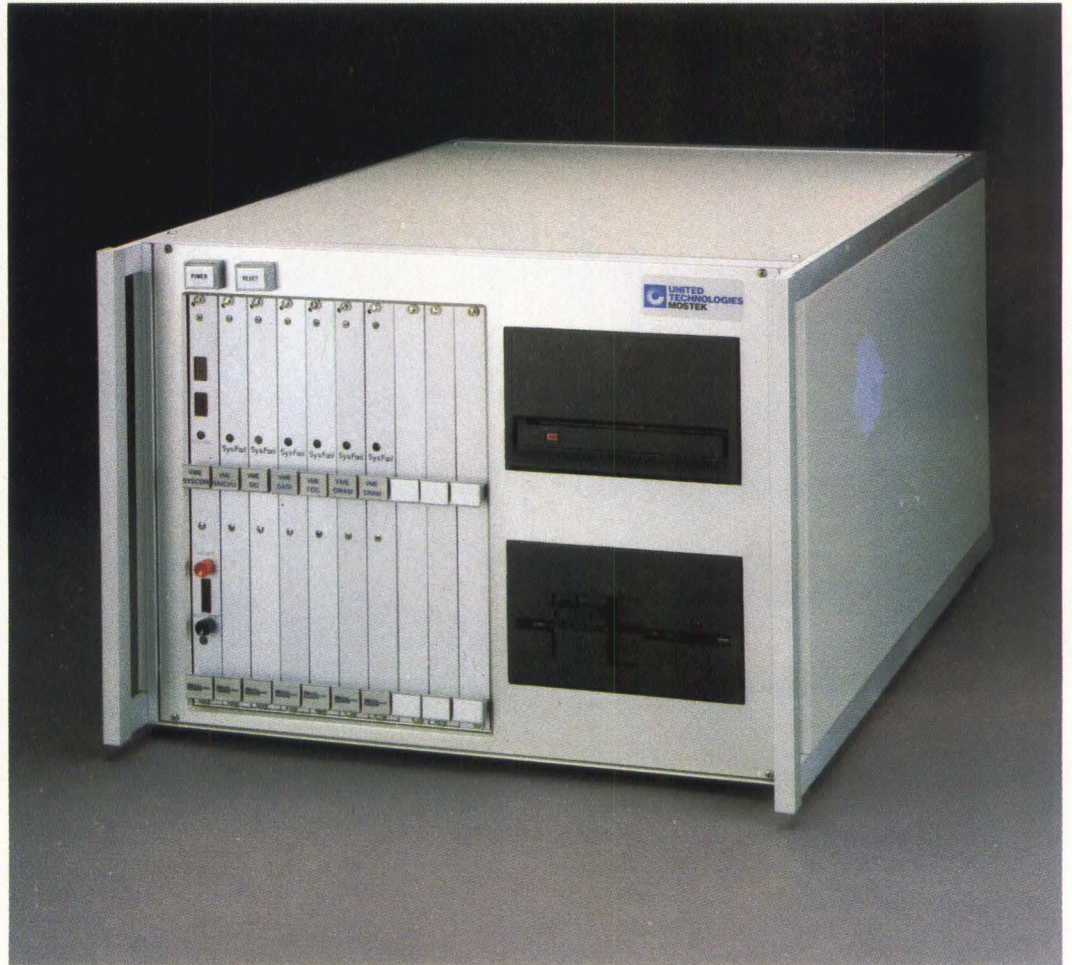
Ergonomics even extend to accurate operation of the unit. Here, human engineering combines with the patented electromagnetic technology to deliver ± 0.005 " accuracy with a resolution of 1000 lines/inch. Performance is verified with automated testing, detailed in an accuracy certification printout and brochure shipped with every unit.

CalComp innovation puts new digitizing productivity in your hands. The new 9100 digitizer is available in a range of table sizes, with 4- and 16-push-button cursors, pens,



CALCOMP
A Sanders Company

VMEbus + UN



UNIXTM + MOSTEK

Add the above together, and what do you get? The Mostek Matrix 68KTM. It combines a multi-user, 16-bit microcomputer system based on the VMEbus architecture – plus a UNIX operating system. The result is a powerful and cost-effective tool for system integrators.

The Matrix 68K is also a high performance tool. It's modular. Structured. Flexible. And easily expandable for future application requirements. What's more, it can lower your development costs, and get your product to the market faster.

This new system in its base configuration features 640KB of expandable main memory, a 36MB Winchester disk, 1MB of floppy disk storage, serial RS-232 interfaces for five users, a standard parallel printer interface, and three open slots for expansion.

The heart of the system is the VME-MMCPU board with its 16-bit processor. The VMEbus-based modular board designs meet today's 16-bit needs. And permit fast, easy reconfiguration for 32-bit applications in the future. So, you won't have to develop another architecture as more powerful hardware becomes available.

The flexibility of VMEbus architecture is further enhanced by the powerful UniPlus +TM operating system (UNIX System III with Berkley enhancements). It provides you with a flexible, expandable operating system that's well suited to program development, text preparation, and general purpose processing. Its supported languages include "C," Fortran, and Pascal.

Another big plus is Mostek's ongoing development of new cards for the VMEbus: a one megabyte DRAM, SMD disk controller, and Intelligent I/O boards will soon be available. With the reconfiguration software package, UNIX can easily be expanded to use these and many more VMEbus boards.

With the Matrix 68K, you get high performance. Full VMEbus compatibility. Transportable software. Flexibility. And unusual value. Because it's all you need today. And tomorrow.

Get in on VMEbus + UNIX + all the future applications. Contact Mostek, 1215 W. Crosby Road, MS2205, Carrollton, Texas 75006, (214) 466-8801. In Europe, (32) 02/762.18.80. In Japan, 03/496-4221. In the Far East (Hong Kong), 5-681157.

UNIX is a trademark of Bell Laboratories. UniPlus + is a trademark of UniSoft Systems. UniPlus + is derived from UNIX System II under license from AT&T. Matrix 68K is a registered trademark of Mostek Corp.



CIRCLE NO. 33 ON INQUIRY CARD

Mini-Micro World

NEWS

chines.

Negotiations are underway between Math Box and the GSA to liberalize those requirements. When complete, the contract modifications are expected to allow federal employees to buy their own computer equipment at any Math Box commercial store other than OTP at the discounted price normally reserved for government purchases. Additional modifications would allow government contractors to receive the preferred price through GSA stores and abolish the 50-mile limit in certain GSA regions.

The GSA is considering abolishing the 50-mile limit to more effectively serve GSA regions, such as Denver, that have a widely dispersed federal population. Allowing contractors to purchase equipment from the computer stores would enable government computer costs to be lowered in areas that have a large number of federal installations essentially run by "middleman" gov-

ernment contractors, explains Barry Petroff, the GSA's program manager for the OTP stores.

May rekindle controversy

Liberalizing the purchase requirements may rekindle the controversy that arose when the GSA first announced it was seeking a commercial operator for its planned computer stores (MMS, June 1984, p. 32). Computer retailers in the Washington area opposed the award of any contract to a single organization to run the GSA stores. The fear was that GSA's approach would create a federal retail monopoly, potentially worth hundreds of millions of dollars for the eventually successful bidder.

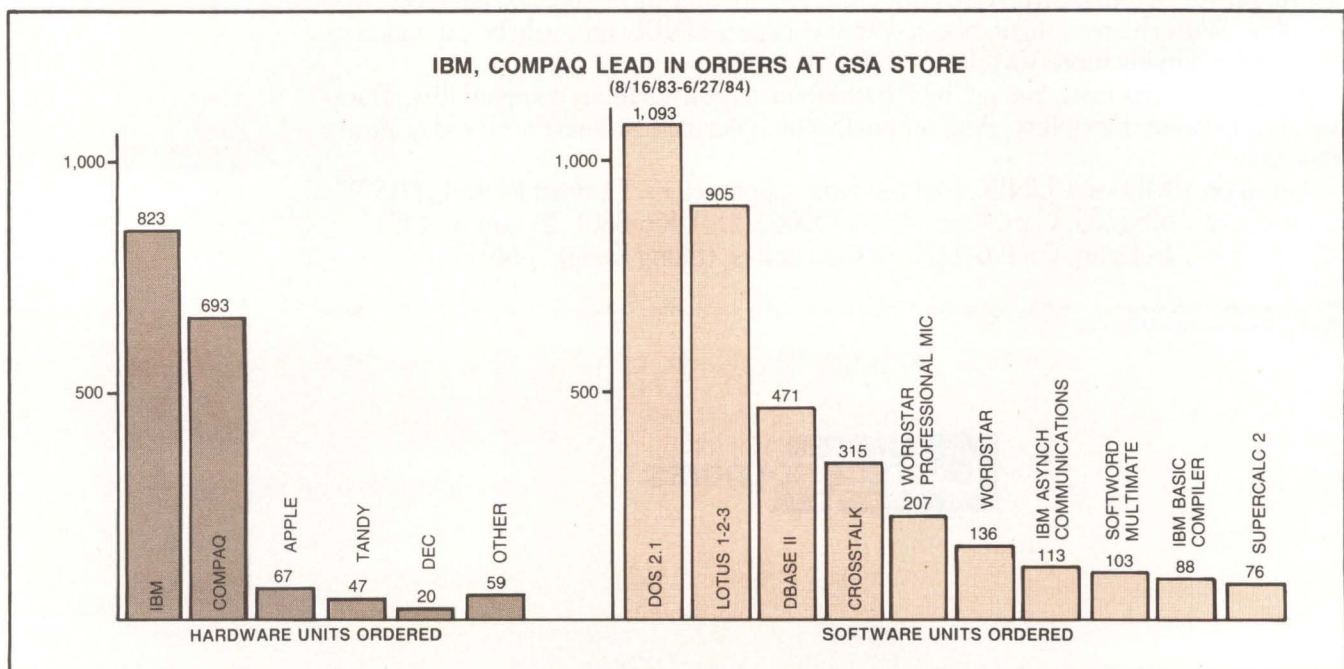
"I don't think the proposed contract modifications are going to go down too well with other computer retailers," comments Robert Dornan, a federal computer analyst with market research company International Data Corp., Framingham, Mass.

Responding to criticism of Math Box's market advantage, GSA's Petroff points out that other retailers can, if they want, allow special discounts to federal employees. "Retailers can give any discount they want to whomever they want," he says.

Big discounts for federal buyers

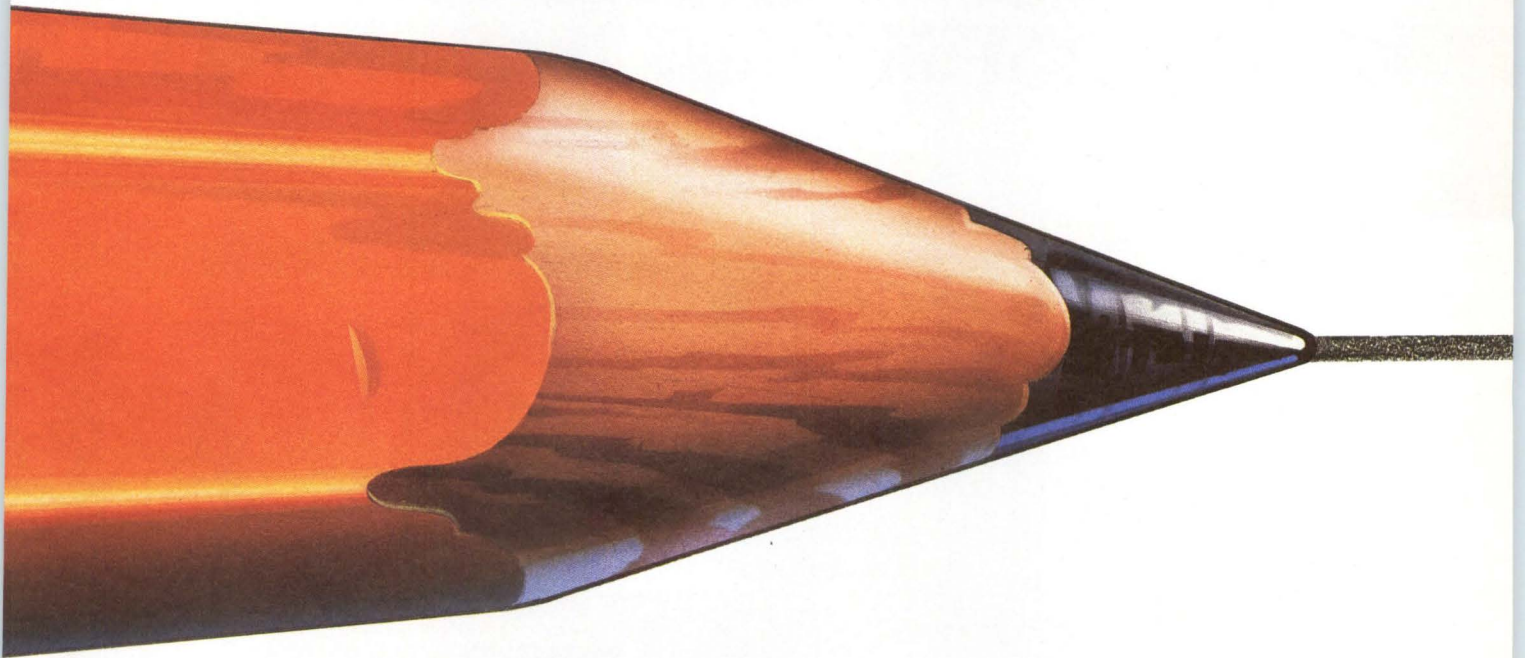
Still, Petroff admits, some computer manufacturers allow government buyers greater discounts than commercial customers.

"We expect people to be upset, but that's business," says Avner Parnes, Math Box president, adding that 40 percent of his chain's current sales revenues are coming from the Washington OTP store. Under the terms of the contract, Math Box could potentially open two more stores in the Washington area, and one store each in the 10 remaining GSA regions, excluding New York City and San Francisco, which will be bid for separately. The GSA's Petroff says that the GSA is analyz-



IBM and Compaq microcomputers and DOS 2.1 and Lotus 1-2-3 software packages have been the most popular items at the GSA's commercially-operated Office Technology Plus computer store. The store is currently open only to federal employees.

The only line printer easier to maintain than ours.



At Centronics, we combine the most advanced technology available with 20 years of experience to build the world's most reliable line printers. So that you don't have to worry about maintenance.

Take our Linewriters at 400 and 800 lpm. They deliver print quality better than any line printer on the market, at noise levels below 55 dB(A). Yet they're so reliable that with no preventive maintenance whatsoever, they run for 18 months

without service. Something no other line printer can do.

For heavy duty applications, our E-Series line printers can print three times faster. Up to 2400 lpm. And they too require less maintenance than any printer in their category. So they're perfect for your most demanding needs.

Pick up a pencil and write us. We'll show you that if you're looking for line printers, you have to look at Centronics.



CENTRONICS®

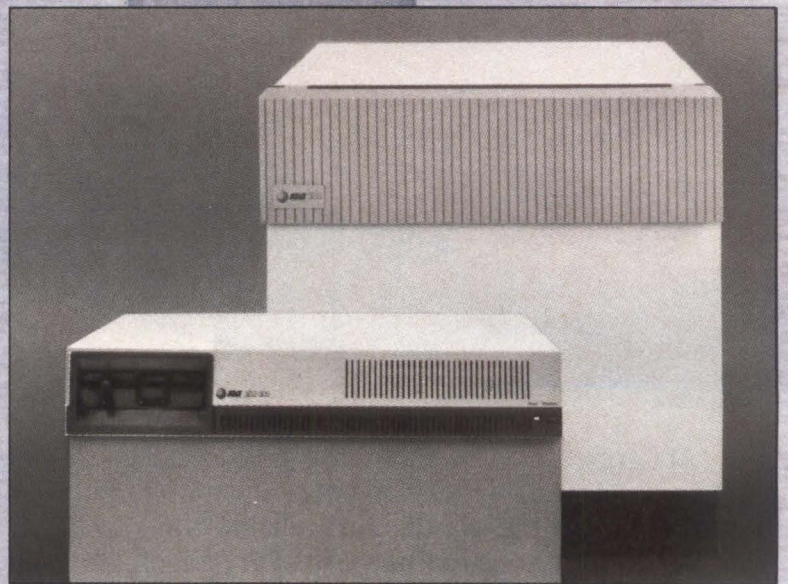
An affiliate of Control Data Corporation

When was the last time you looked at us.

Centronics Data Computer Corp., Dept. A, One Wall Street, Hudson, NH 03051. Tel. (603) 883-0111.

POWERFUL

COMPUTERS - **UNIX** SYSTEM V - AT&T 3B COMPUTERS - **UNIX**



VERSATILITY

SYSTEM V - AT&T 3B COMPUTERS - UNIX SYSTEM V

More options. More power.
More sales.

That's what you can count on from the 3B family of business computers from AT&T.

Their special ability to run UNIX™ System V at maximum efficiency makes the AT&T 3B2/300 and the AT&T 3B5/100 and 200 the ideal machines for the growing multi-user and multi-tasking markets.

In fact, the benefits that AT&T builds into its UNIX System V are built into the hardware, too. WE® 32000 microprocessor. Software portability. Compatibility with other 3B computers. Reliability. Flexibility. Communications capability.

They'll open your customers' eyes to a better, more cost-efficient way of meeting their computing

needs. And open the door to more sales for you.

THE 3B2/300—A MIGHTY SUPER-MICRO COMPUTER

The 3B2/300 can support up to 18 users at individual workstations—making it an excellent machine for offices where a number of people require desk-top computing.

Because they share peripherals and data, the cost-per-user is far lower than if you achieved the same end with a network of PCs. The 3B2/300 works as a powerful single-user machine as well.

The 3B2/300 comes with a set of simplified UNIX System utilities that first-time users will find particularly helpful.

The four standard configurations allow for easy growth for

your customers; continuing business opportunities for you.

THE 3B5/100 AND 3B5/200

Up to sixty users at one time can work on these general-purpose super minicomputers. And with no sacrifice in response time.

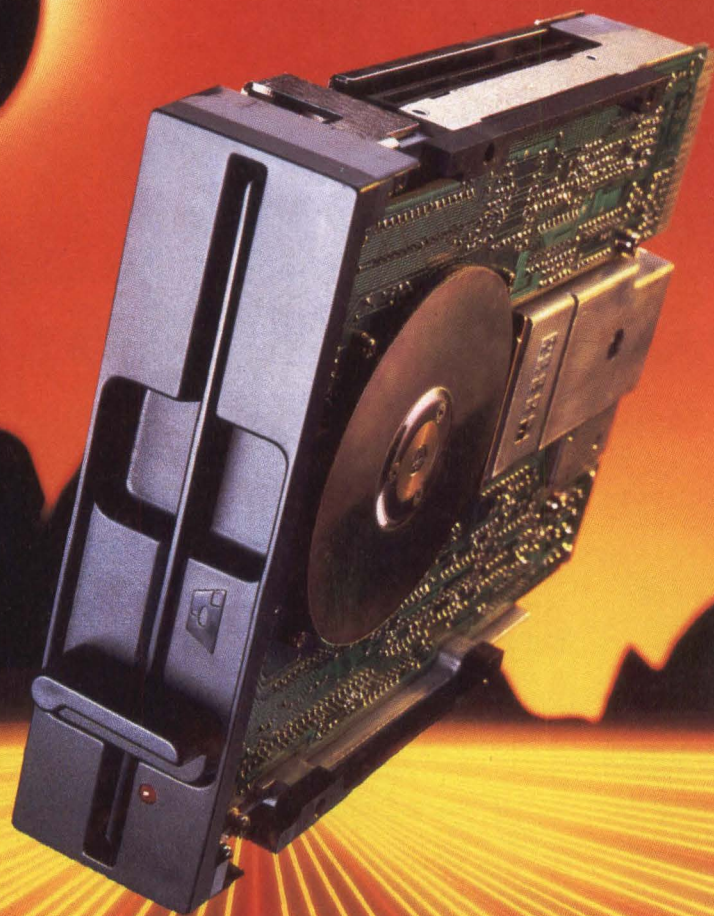
The 3B5 computers, which run UNIX System V, can be custom-configured to handle any specific business application—with a wide variety of I/O, peripheral, memory and communications options.

For all members of the 3B family of computers, AT&T pledges a full program of service and support. Including a comprehensive, flexible program for resellers.

To find out more about our 3B family and our programs, call 1-800-833-9333, or use the international telex number (210-209).



AT&T



ANOTHER OKIDATA BREAKTHROUGH: NEW FDD RELIABILITY IN 1/2 HIGH.

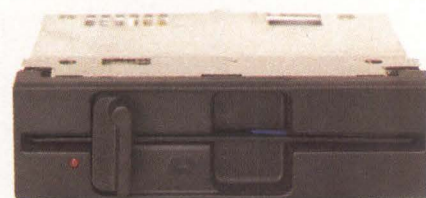
Introducing the new Okidata Floppy Disk Drives with MTBF of 11K Power on Hours. And 100% Duty Cycle. Four times the duty cycle of most other disk drives.

New streamlined engineering puts Okidata reliability out front. With drives that have fewer mechanical parts. So not a single movement is wasted.

We pushed ahead with lighter weight and more energy efficiency. To give you drives that run on only 7W of power.

We broke away from the pack with unique features. A linear stepping motor/head assembly with only one moving part. A direct drive micro-processor-operated spindle motor for new precision quartz-locked speed control. An accessible DIP switch for easy individual configuration. And 48 or 96 TPI models with up to 1000K Bytes of unformatted capacity. So no application is too tough.

Get going. Get the new Floppy Disk Drives from Okidata. And get the endurance to go the distance.



OKIDATA
an OKI AMERICA company

For more information contact Okidata, Mt. Laurel, NJ 08054, 609-235-2600

CIRCLE NO. 35 ON INQUIRY CARD

MINI-MICRO SYSTEMS/October 1984

Mini-Micro World

NEWS

ing the remaining regions to determine which could support a computer store. In addition to the three stores already in operation or announced, he says that only "two or three others" look economically viable.

The store's popularity with Washington-based federal employees took the GSA by surprise and caused some early problems for Math Box. The store's stock of IBM PC and XT microcomputers sold out within a week of the store's opening. Math Box consequently fell behind in deliveries, in violation of its contract with GSA. As compensation, the retailer was forced to provide an additional third month of equipment warranties, free delivery and free burn-in testing.

Math Box was able to increase its allocation of the popular IBM models from the manufacturer and di-

verted inventory from its commercial outlets to meet the unexpected demand. "We were aghast at the early backlogs," comments a GSA official. "But we weren't exactly Snow White in this thing either. We failed to anticipate the heavy demand."

Another surprise for the GSA was the relative sophistication of the federal customers. Government officials expected customers to buy off-the-shelf microcomputers and peripherals in single-unit quantities. Instead, reports the GSA, most customers specified exact equipment configurations, including communications software, operating systems and memory capabilities. The average purchase order has been for four to five systems. "No one is walking out of the store with a single stock micro," comments a GSA official.

The computer store program is one part of the GSA's effort to increase the use of microcomputers within government. In 1983, reports the agency, the federal government spent approximately \$12 billion dollars, twice the 1978 amount, to buy, operate and maintain 18,000 large and medium-sized computers.

Under a five-year GSA plan begun last year, the government's computer expenditures are expected to reach \$28 billion by 1988. The GSA has raised the purchase ceilings on computer procurements, eased some procurement requirements, and introduced procurement schedules specifically for microcomputers and related equipment to speed the introduction of the new, small, more powerful generation of computers into the federal environment. □

Ashton-Tate, Lotus, Informatics link IBM PCs to mainframes

Marjorie Stanzler-Centonze
Associate Editor

Software heavyweights Ashton-Tate, Culver City, Calif., and Lotus Development Corp., Cambridge, Mass., recently joined forces with Informatics General Corp., Woodland Hills, Calif., to develop separate but related products that link their IBM PC software with IBM or IBM-compatible mainframe data. The companies are following a lead set a year ago by VisiCorp, San Jose, Calif., which has a similar agreement with Informatics.

The latest products, called dBASE/Answer and Lotus/Answer, enable users to access and download mainframe data to the microcom-

puter in a format compatible with the particular software company's products; no conversion of data is necessary.

Users request data by going through a series of menus to identify and select the desired fields and selection requirements. The software then sends the request to the mainframe, where an Answer module extracts the specified information from the database and delivers it to the microcomputer.

Ashton-Tate's dBASE/Answer is compatible with its dBASE II, dBASE III, and Friday database programs and with Framework, the company's integrated software offering. Lotus/Answer delivers data to the microcomputer in a format

compatible with the Lotus 1-2-3 and Symphony integrated packages. Installations with both Ashton-Tate and Lotus software need only one mainframe Answer module to mix and match the packages.

Merritt M. Lutz, software group vice president at Informatics, claims dBASE/Answer and Lotus/Answer represent the next step toward micro-to-mainframe integration. "There's been a big hole in the capabilities of the Fortune 1000 companies," Lutz says. "They need the full breadth of data on the mainframe to connect to the most popular personal computer software packages."

Despite a potential market for those types of products, analysts

Mini-Micro World

NEWS

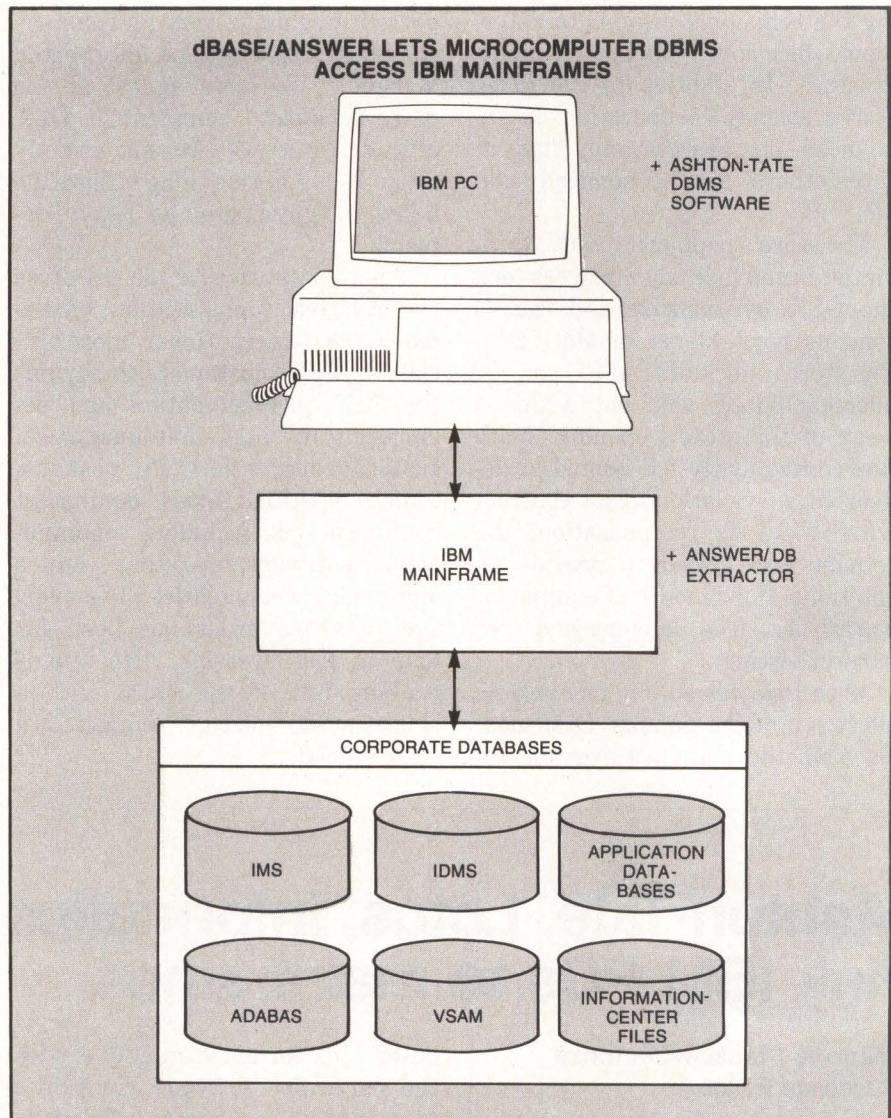
say sales have yet to take off. "What's interesting about the market is that so many people are talking about how many people want that micro-to-mainframe link and how important it is. But sales just haven't been [as strong] as everyone predicted," comments Maureen Fleming, senior analyst at International Resource Development (IRD) Inc., Norwalk, Conn.

IRD pegs the 1984 micro-to-mainframe communications market at \$450 million. A recent survey of major corporations by the research company concludes that the market may surge to as much as \$790 million by 1987.

Ashton-Tate and Lotus are confident their Answer products will start a mushrooming effect in the industry. Ashton-Tate will co-market and co-publish dBASE/Answer with Informatics, according to Ashton-Tate president David Cole. Ashton-Tate will sell to its traditional customer base through its distributors, 55 key dealers in the U.S. and its international subsidiaries. Informatics will market the product to data processing managers at Fortune-1000 type companies through its own direct sales force.

Informatics has exclusive rights to market Lotus/Answer. The two companies have not disclosed the financial terms of the agreement. Informatics will be given access to Lotus' Fortune 1000 account-dealers, Lotus president Mitchell Kapur explains.

While dBASE/Answer and Lotus/Answer offer a new-found freedom to many personal computer users, the three companies share concerns about mainframe data protection which is threatened by unauthorized access by PCs. Both Cole and Kapur say the security features of the Answer products are critical to data-processing managers. "We feel it is necessary to empower end



The dBASE/Answer product allows access to IBM mainframe files from Ashton-Tate database-management products running on IBM PC or PC/XT microcomputers.

users, but not to the point of sacrifice for the data-processing department," Kapur states.

Maintaining data integrity

Users of Answer products are, for instance, issued an identification number that allows them to access the database at the segment, record and field levels. Microcomputer users can store data in files set up specifically for them. They cannot update the central databases maintained by the data-processing

department, Informatics' Lutz explains, because that data is protected.

John R. Hollcraft, data-processing manager for the GTE Lighting Products division in Danvers, Mass., a beta test user of dBASE/Answer, says the security features are essential to the product's success. "There's an obligation to provide access to mainframe data in a secure way such that it does not jeopardize corporate information and that it does not impact existing



WE'RE WILLING TO LIVE WITH THE CONSEQUENCES OF HAVING XENIX ON OUR 286/310.

We're delighted to see the future catching up with our past. When we designed our Xenix* 286/310 multiuser, multitasking supermicro system, we felt confident that the industry standards would fall neatly in step with our own standards.

Like they just did.

So now dozens of independent software vendors will be publishing stacks of new software for machines using Xenix on the 286. Machines like ours.

But because our supermicro was introduced last year, we can already offer OEMs a choice of our own and ISV software that's here now and ready to run.

There are applications programs like spreadsheets, inventory, accounting, manufacturing and mainframe to micro connections. There

are productivity tools like forms and menus. And high level languages like COBOL, C and BASIC.

The Xenix 286/310 is designed for use by 4-12 people. And whatever tasks those people give it, the 286/310 races through them all at minicomputer speed.

It's perfect for OEMs who need to get to market fast. Not only because it has an existing software base, but also because it's an open system.

From chips to board to box, it's built on industry standards. Like Xenix, the 286 microprocessor and MULTIBUS. That means, like all Intel systems, the 286/310 is easy to configure and easy to upgrade.

So you'll be able to adjust to the future's changing

markets as fast as you can adjust to this one.

For all its openness, multitasking, multiuser capabilities, and software, you can still get the 286/310 at a microcomputer price.

To find out how to take advantage



of this changing market today, call us toll free at (800) 538-1876. In California, call (800) 672-1833.

Or write: Intel, Lit. Dept. S-13, 3065 Bowers Avenue, Santa Clara, CA 95051.

And be prepared to live with the consequences.

intel[®]

© 1984 Intel Corporation
*Xenix is a registered trademark of Microsoft, Inc.

Mini-Micro World

NEWS

Ashton-Tate's dBASE III runs on 16-bit micros

While Ashton-Tate's new dBASE III relational database-management software program for 16-bit and larger machines is an extension of dBASE II, it is an entirely new product with its own documentation. Written in C, "dBASE III is directed toward the future as more powerful, new products emerge," says Harvey Jeane, vice president of product development.

The package has triggered a dBASE II price cut of about \$200, to \$495. The dBASE II product runs on 8- and 16-bit microcomputers. The company plans to continue selling and

supporting dBASE II for the 8-bit world, says David C. Cole, president and chief executive officer at Ashton-Tate. "We expect dBASE II to remain the dominant database system in the world, since 8-bit machines continue to outsell 16-bit and larger machines in a variety of international markets."

dBASE III stores as many as two billion records per file, limited by a user's computer system, and 128 fields per database. As many as 10 database files can be used simultaneously. It offers a command-assistance mode that guides new users through

the most common areas of database use. On-line and context help is available in order to make the product attractive to first-time users.

The package enables users to work with English-like commands. It also features full-screen entry, along with modification of data and reports, and the ability to create mailing labels.

The software runs on the IBM PC or PC XT computers and requires 256K bytes of RAM, two 5¼-inch diskette drives or one fixed drive and one diskette drive, and the PC-DOS 2.0 operating system.

on-line production systems," Hollcraft says.

A typical configuration consisting of an Answer module for a single mainframe and a dBASE/Answer and Lotus/Answer for 50 personal

computers is priced at \$45,000. Both products require an IBM PC or PC/XT, a minimum of 256K bytes of storage, two double-sided, double-density diskette drives or one drive and a hard disk, and the PC-DOS

2.0 or 2.1 operating systems. The price for a mainframe Answer module is about \$15,000; each microcomputer module is \$550. The software also runs on IBM PC- and XT-compatibles. □

Programmable servo writer solves portability and cost problems

Carl Warren, Western Editor

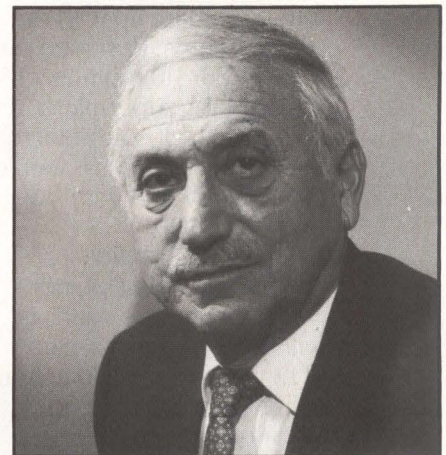
A programmable servo writer designed to ultimately supplant units that are more than five times its size and three times its price has been developed by Pioneer Research Inc., Santa Monica, Calif.

The 30-pound, 7-by-19-by-15-inch PR1000 servo writer can create head positioning information for a range of disk diameters from 3½ inches to 14 inches, in any servo format desired. "The unit is designed to be flexible, since no two disk-drive manufacturers have the same needs. This way they can choose the desired format and servo technique," says Pioneer president Sol Gindoff.

Although rigid-disk-drive manufacturers desire low-cost, portable

programmable servo writers, Andrew Roman, vice president of marketing and sales for Cogito Systems, San Jose, Calif., is guarded on the subject of the PR1000's potential. "There is definitely a need for a more cost-effective way of doing servo writing. But, it [the PR1000] may have the effect of giving some startups false hopes that another barrier to the high-performance rigid-disk business has been knocked down. There is more to making disk drives than writing servo information cheaply."

But Gindoff says there's a market beyond just disk-drive manufacturers. "A major problem area has been the repair of rigid drives. Most repair depots can't afford to have a servo writer." Typically, once the head-disk assembly is opened and a



Pioneer Research president Sol Gindoff says low-priced, flexible servo writers can be used in disk drive repair.

damaged platter replaced, servo information must be rewritten. "It's a matter of economies. Right now, the only people who can make such a repair are the drive manufacturers," says Gindoff.

Not everyone shares Gindoff's



COMPAQ PRESENTS

How To Do More With Less

It used to be that when you wanted personal computers to do more, you added peripherals. A fixed disk for storage. A second monitor for graphics. A backup system for data protection. And slowly the octopus devoured your desk.

But now everything you wanted in a personal computer is *in* a computer. The new COMPAQ DESKPRO™ is here.

There's room *inside* for up to four storage devices. For instance, you could insert two diskette drives, a 10-megabyte fixed disk drive, even an exclusive tape backup system. The new COMPAQ DESKPRO can grow *inside* instead of *out*, saving your desktop.

Plus internal expansion slots will let you add even more functions like local area networking. A mouse. And more.

All that makes COMPAQ DESKPRO the most expandable PC you can buy. And thanks to some ingenious engineering, the COMPAQ DESKPRO displays high-resolution text *and* graphics on one monitor, not two.

It also runs thousands of business programs made for the IBM® PC and XT straight off the shelf—a full two to three times faster than older, slower computers.

So you can run the most complex software this side of mainframes quicker than you can say, "1-2-3."

We designed the new COMPAQ DESKPRO around the same philosophy that made us the best-selling portable business computer in the world. We simply offer more in less space. For a free brochure or the location of your nearest Authorized COMPAQ Dealer, call toll-free 1-800-231-0900.



It simply works better

COMPAQ
DESKPRO™

An open-and-shut case for making MiniFrame™ your first choice in low-cost OEM systems.

ONE TO EIGHT USERS. MiniFrame can be configured for up to 50 Megabytes of integral mass storage: 5¼" Winchester fixed disks of 13, 26 or 50 Mb.

IMPRESSIVE CPU SPEED. Running the AIM™ Benchmark, MiniFrame is as fast as a VAX-11/750. The MiniFrame's MC68010 microprocessor operates at 10MHz, with no wait states.

VIRTUAL MEMORY MANAGEMENT. MiniFrame's custom MMU provides unique demand-paged implementation of UNIX™ System V... with 3.5 Mbytes of address space per process.

RUNS AS MANY AS 8 TERMINALS. Convergent PT and/or GT, or standard ASCII. Multidrop RS-422 communications line operates at 307 Kbit/sec.

FOR HIGH-SPEED PRINTERS, a Centronics-compatible parallel printer port is standard in the MiniFrame processor.

ECONOMICAL MEMORY EXPANSION. MiniFrame provides ½ Megabyte of RAM standard; up to three boards can be added for system expansion to 2 Mb.

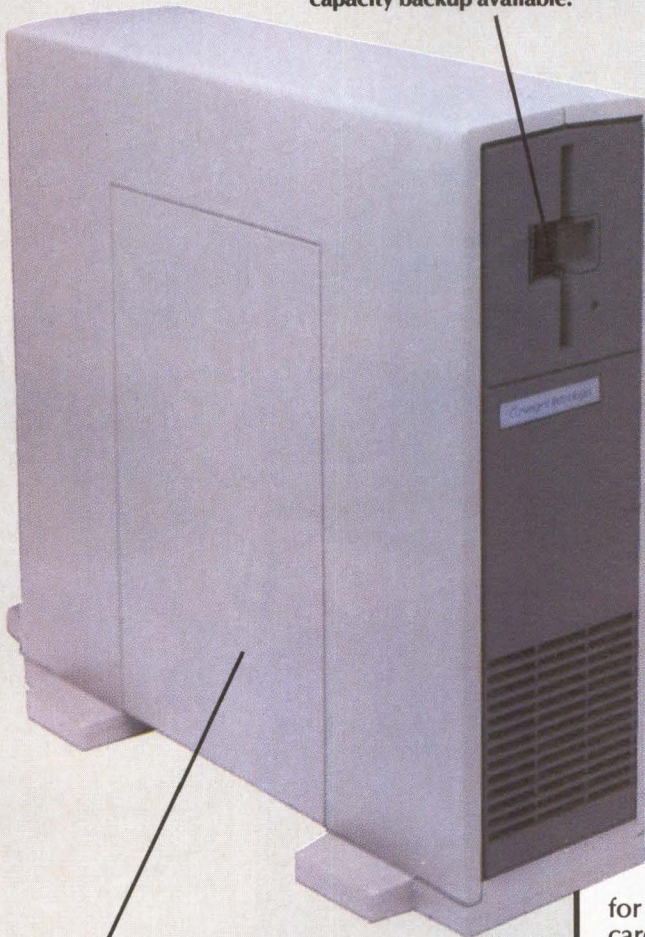
COMMUNICATIONS EXPANSION. LAN capability via optional high-speed Ethernet interface module, and/or 8 additional RS-232 ports.

MiniFrame: another first from Convergent Technologies. Super-minicomputer power at PC prices.

OEMs can now meet the needs of small to medium-sized organizations for low-cost, high-performance systems capable of handling large UNIX-based applications.

The MiniFrame system—which effectively opens a whole new market for you—is unique not just for its price/performance advantages. It also provides complete flexibility in meeting requirements ranging from single-user “personal UNIX systems” to eight-terminal data-processing installations.

BACKUP STORAGE with integral 5¼", 640 Kbyte floppy disk. Optional high-capacity backup available.



WE'VE CLOSED OUR CASE... now send for a complete information package. Write to Convergent Technologies, Data Systems Division, 3055 Patrick Henry Drive, Santa Clara, CA 95050. Phone: 408/980-0850. Telex: 176-825.

Convergent Technologies

Where great ideas come together

CIRCLE NO. 37 ON INQUIRY CARD

Convergent Technologies achieved this breakthrough by adapting the innovative hardware and software developed for its MegaFrame multiprocessor.

The result is a powerful, compact and expandable unit priced to give you the maximum opportunity of capitalizing on a rapidly growing UNIX market.

There are, of course, many other unique benefits of the MiniFrame system.

Convergent provides foundation software for office applications—including a powerful, Wang keystroke-compatible word processor, an advanced financial spreadsheet and complete electronic mail facility.

The Window Manager permits viewing and manipulating of up to four applications running simultaneously on Convergent's PT or GT terminal screens.

Major performance increases result from utilizing these terminals with the MiniFrame. At only slightly higher cost than standard “dumb tubes”, our PT or GT terminals offer high-speed communications plus built-in processor with enough memory to execute key portions of the system code.

Programming languages include industry-standard High Level COBOL and BASIC, full FORTRAN-77, Pascal and C.

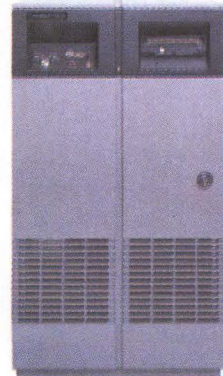
OEM prices for the MiniFrame start at less than \$5,000; an eight-user MiniFrame can be configured for under \$10,000. Prices like these make it an open-and-shut case for choosing the MiniFrame.

Graceful upgrade path to the MegaFrame™

The MegaFrame, Convergent Technologies' revolutionary super-minicomputer system, utilizes multiple processors; has expansion potential to 128 users, 8 MIPS and gigabytes of disk storage. It enables OEMs to handle today's growing demand for computing services without discarding a single piece of hardware... or being forced into expensive CPU upgrades.

Applications software can be transported—unchanged—from the MiniFrame to the MegaFrame whenever the workload requires it. The two systems are object-code compatible, allowing OEMs to provide a complete family of systems.

MegaFrame: proof that if anyone can build a UNIX system the way it should be built—it's Convergent Technologies.



MiniFrame and MegaFrame are trademarks of Convergent Technologies, Inc. UNIX is a trademark of Bell Telephone Laboratories, Inc., VAX is a trademark of Digital Equipment Corp., Ethernet is a trademark of Xerox Corp.

Gould . . . Innovation and Quality in Software

CELEBRATE!

New UNIX™-based software tools bring projects in on time, within budget.

Get your hands on our UNIX tool kit. Take out the Gould Software Division 4.2 UNIX with System V enhancements. You'll know it. It has a fast file system, automated system configuration, interactive debugging, and a Source Code Control System that compresses files for more efficient disk storage.

Then grab The Newcastle Connection, an ingenious tool that lets you create a distributed UNIX file system in a LAN by uniting heterogeneous UNIX versions and hardware environments.

Next, try the Unicellator™, a high efficiency, user transparent tool that dramatically increases productivity under UNIX by offloading CPU intensive jobs from the host. The Unicellator is available to *all* users of a system simultaneously.

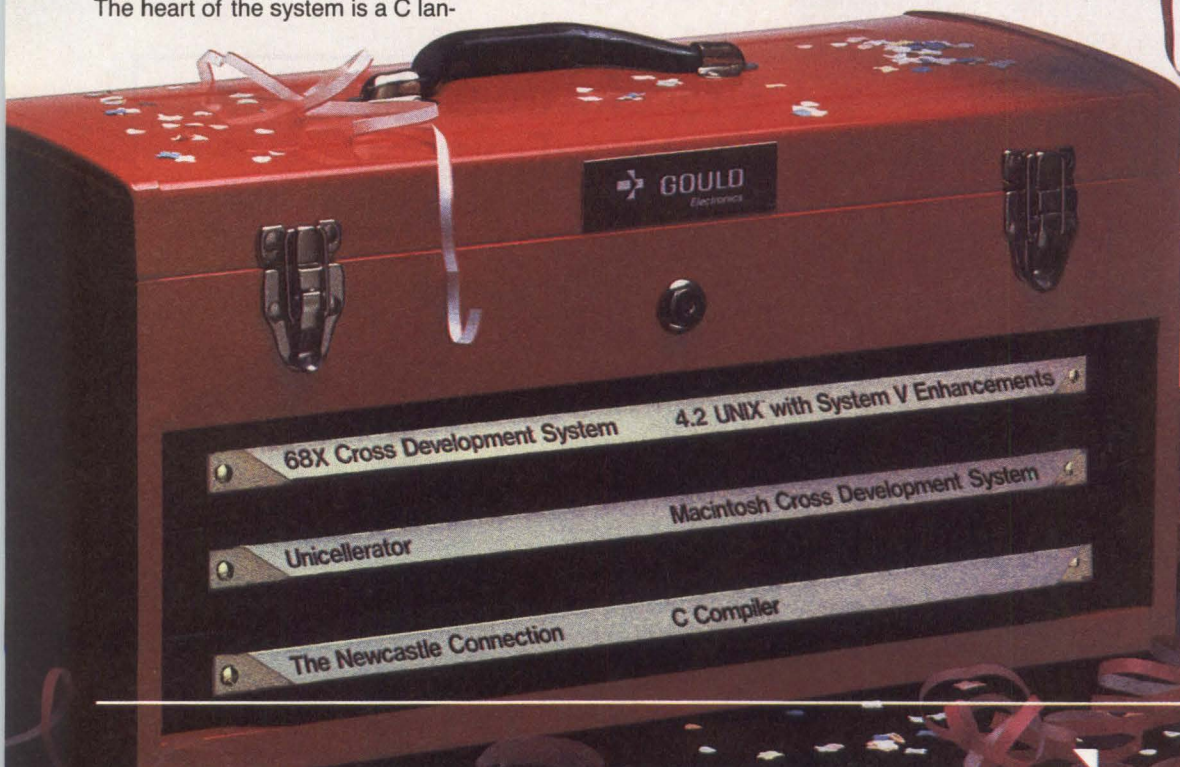
The kit also contains a Cross Development System for developing and interactively debugging C language programs under UNIX that will run on Motorola® and Intel® microprocessors. The heart of the system is a C lan-

guage compiler that generates compact, efficient code that reduces code space by 20-40% and increases performance by an equal amount. For programmers who want to develop Macintosh™ applications in C under UNIX, our Macintosh Cross Development System will do it four times faster than Apple's Lisa™-based environment.

Our UNIX tools are available individually or as a complete, well-integrated set. The sooner you get your hands on them, the faster you'll finish your development projects. And that's worth a toast any time. Contact Gould Software Division, 1101 East University Avenue, Urbana, Illinois, 61801. (800) 952-8888 or (217) 384-8500.

UNIX is a trademark of Bell Laboratories
Apple is a registered trademark of Apple Computer, Inc.
Motorola is a registered trademark of Motorola, Inc.
Intel is a registered trademark of Intel Corporation
Lisa is a trademark of Apple Computer, Inc.
Macintosh is a trademark licensed to Apple Computer, Inc.

CIRCLE NO. 38 ON INQUIRY CARD



GOULD
Electronics

Mini-Micro World

NEWS

opinion. Jim Porter, president of Disk/Trend Inc., Los Altos, Calif., and an industry consultant, discounts the repair market argument. "It doesn't seem that the interest is really there for repairing drives—in most cases it's better to [replace them]," he says.

But Porter points out, in the PR1000's favor, that the bulk of current market products use open-loop servo techniques. "The higher capacity drives are using servo methods, and that is growing, so there is an obvious need [to support servo writers]," notes Porter. Raymond C. Freeman, a storage system industry consultant and president of Freeman Associates, Santa Barbara, Calif., echoes Porter's statement. "The trend is toward embedded servo drives, and the tools have to be in place to maintain [servo drives'] growth."

Features versus price

Jess Rifkind, an Encino, Calif. independent consultant, says a servo writer's features are more important than price. "With servo writers, features are the most important factor. Everyone who does servo writing wants it their way. Virtually every servo writer sold today is customized to meet special needs."

Gindoff agrees. "Everyone wants something different. The PR1000 may look like one machine, but in reality it is several. The user can customize it for virtually any servo writing task desired," he says.

The PR1000 Servowriter is based on an Intel Corp. 8085 microprocessor, has 128K bytes of ROM, 64K bytes of RAM, a front panel keypad for entering the desired servo data, an alphanumeric display and an RS232C interface. The basic unit comprises four functional units: a precision clock writer for writing the reference track; a program-

Servo writers: more complex than the disk drive

The purpose of servo information—whether it is on a dedicated surface or embedded in the data surface—is to guide the read/write heads of a disk drive to the proper position. The servo writer is designed to establish the pitch (distance between tracks) and establish the operating characteristics of the drive. The process of creating the critical servo information is far more complex than what it may appear to be, says Theodore Oliver, director of technology for Northern Telecom Inc., Ann Arbor, Mich.

Servo writers are complicated because, Oliver explains, there are a number of critical steps that have to be executed to ensure that a proper pattern is written. An electronic servo writer interfaces with a drive's transducers (read/write heads) to write the

servo information without additional mechanical devices.

Besides creating the drive's operating parameters, a servo writer also has the benefit of finding faults in media or transducers. Thus, repairs can be made before the head/disk assembly is sealed. Additionally, the servo writer's electronics handle the calibration of the drive's heads to ensure proper track pitch.

The importance of properly written servo information is amplified on embedded designs. On such designs, each surface acts as its own servo guide.

By contrast, a single-surface, dedicated servo dictates the position of all heads on all surfaces, and as a consequence is more subject to off-track errors due to jarring.

mable servo pattern generator (data can be entered either from the keyboard or downloaded from a microcomputer); a programmable servo positioner (also programmed from the keyboard or from downloaded data); and a microprocessor control-

ler for handling the read/write amplifiers and head positioners during the servo process. Volume shipments are scheduled to begin this quarter; the price is under \$60,000. □

SGS ADDS INTELLIGENT MULTIBUS CONTROLLER

SGS Semiconductor Corp., Phoenix, Ariz., has introduced an intelligent 16-bit I/O Multibus communications board. The SAM-ISCC/8 includes on-board RAM and ROM. Single-unit price is \$1,490; discounts are available for volume purchases. SGS has also added an Ethernet enhancement to its 32-port Sampson UNIX-based Z8003 system. That implementation, provided by Excelan Inc., San Jose, Calif., adds eight users per Ethernet board. The cost is less than \$200 per user.

MONITRON OFFERS MONOCHROME MONITORS

Monitron Corp., San Jose, Calif., has unveiled a series of monochrome alphanumeric monitors based on its EK 9120, 15.75-KHz, 12-inch monitor. The EK series comprises 5-, 7-, 9-, 12-, 14-, 15-, 17-, and 19-inch monitors with horizontal sweep rates of 15.75 KHz and options up to 65 KHz. The video bandwidth of the series is 20 MHz, with options up to 75 MHz. All models have either TTL or ECL inputs. Quantity prices range from \$65 per unit for the 5-inch model to \$375 for the 19-inch model. The highest possible resolution for products in the series is 1056 dots by 1024 dots.

Stock, Boston/Bohdan Hrynewych



HEARD ON THE HILL

Cellular telephones promise efficient data communication

Stephen J. Shaw
Washington Editor

Squiggly antennae are appearing on automobile trunks in Washington, D.C. and the surrounding suburbs in ever-increasing numbers. They herald the arrival of the mobile cellular telephone, a new technology that will be available in 30 selected markets by the end of next year. Although cellular systems are designed for voice communications, data-communications applications that allow users to bypass local telephone companies may create a strong demand for the telephones.

Cellular technology owes its existence to increasing sophistication in data-storage techniques, computer-controlled switching systems, and data-transmission methods.

Conventional mobile telephone service uses one or two high-powered transmitters to communicate with car telephones in a 30- to 50-square mile metropolitan area. Cellular technology, developed at Bell Labs, divides each metropolitan area into "cells," each with its own low-powered transmitter and receiver. Each cell is capable of handling more than 300 calls simultaneously. As the number of users grows, the cells divide into smaller cells to accommodate the demand for service. With low-powered transmitters, the same channels may serve non-adjacent cells.

However, because the voice-communications market is still much larger than data transmission, that's where cellular operators are putting their emphasis. "Our whole focus had been getting voice customers," comments an executive with Metromedia Telecommunications Inc., Secaucus, N.J., which is running the nation's first operational non-wire cellular system in the Washington-Baltimore

area. "Never having been really tried, no one really knows the capabilities of cellular data [on a wide-spread basis]," says the Metromedia spokesman.

The most obvious near-term application for cellular data is portable computers. The increasing popularity of the notebook-sized microcomputers, coupled with the cellular-marketing emphasis on attracting the businessman, means cellular systems could be employed by those who want to access a remote computer with handheld terminals. Another potentially widespread application is remote data entry from areas where it would be inconvenient to use a conventional telephone, such as a land surveyor sending data on boundaries back to the home office.

Millicon Inc., Washington, D.C., has under development a cellular handset with a built-in RS232 data interface that will allow the unit to be connected with a modem or terminal. The unit is being manufactured by E.F. Johnson Co., Waseca, Minn., which completed its first prototype earlier this year. The handset is expected to become available in mid-1985 at a retail price of approximately \$1,500.

Bell Atlantic Mobile Systems, Basking Ridge, N.J., has conducted at least one successful demonstration of cellular data communications running at speeds up to 2400 bits per second (bps). In June, the company used a modem it had designed to relay weather information to the Pentagon through Bell Atlantic's Washington cellular system. Bell Atlantic was called in after the test's sponsor, a manufacturer of weather radar systems, could not obtain a conventional telephone line from the local telephone company in time for the demonstration. The cellular link worked

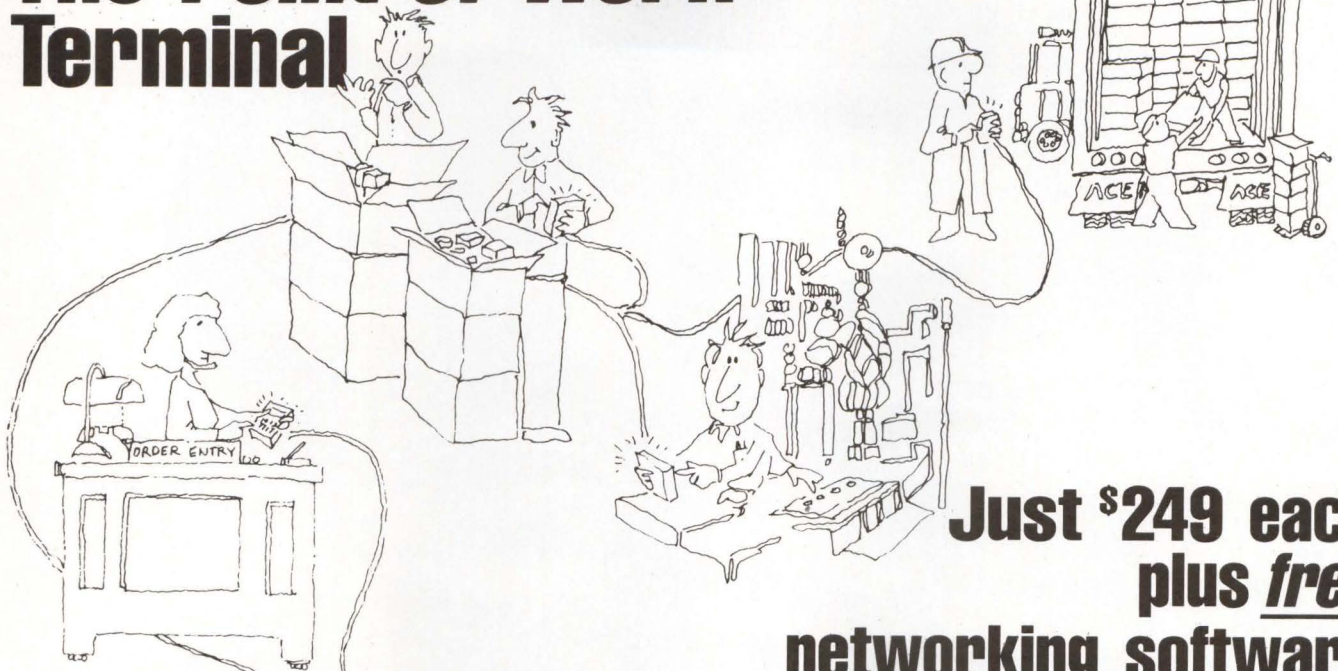
so well that the radar company wound up buying several of the cellular phones and data transmission equipment for future use.

Still, there are problems with using cellular technology for data communications. Data transfer, for example, is much more susceptible than voice communications to signal fading, cross-talk and intermodulation interference. The most pernicious hazard to cellular data transmission, however, is the short electronic "blip" that occurs on a channel when its frequency assignment changes to handle a different call. The 200-msec pause plays havoc with the electronic communications. Many computer modems and digital transmission equipment disconnect automatically when the circuit is broken for more than 10 msec, according to a Bell Atlantic official. If the computer does not also disconnect, the data being transferred could be destroyed by extraneous high-frequency noise. According to one estimate, as much as 40 bits of data could be lost when transmitting at 1200 bps.

Dealing with the problem requires sophisticated cellular-tailored data communications protocol and software packages. The basic elements of such solutions are already commercially available, but they need to be customized to operate efficiently.

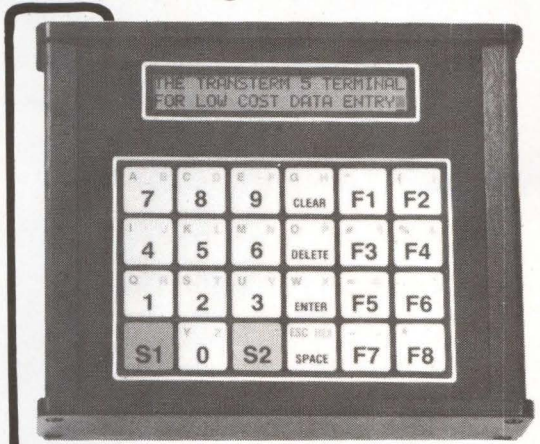
Given a little experimentation and the realization of the predicted price decreases in cellular equipment and services, data applications could become an important factor in the growth of cellular data. "People look at cellular for voice, and naturally overlook data," says James Smith, marketing director for Bell Atlantic distributor Atlantic Cellular Telephone Inc. "But the real key for the long-term success of cellular is going to be data."

The Point of Work Terminal

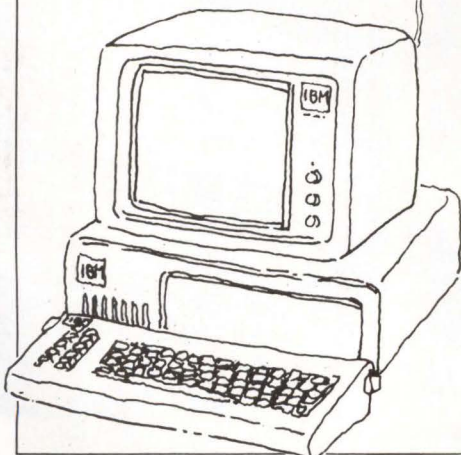


**Just \$249 each
plus free
networking software**

- ◇ What's the point of work? It's where the profit war is won or lost. You need fast, inexpensive, timely data from each point of work in order to keep costs down and profits high. That's the point of work. ◇ And this is the Point of Work Terminal...the TransTerm 5 from Computerwise. Now you can put a data entry terminal at every work station in your organization...for just \$249 (in single unit quantities).
- ◇ Process orders faster...keep inventory current...speed up production...post shipments as soon as they arrive or depart. With the TransTerm 5 you can afford as many Point of Work Terminals as you need. Up to 255 on a single port.
- ◇ What's more, when you order just 10 TransTerm 5's, you get networking software for the IBM PC/XT...absolutely free. ◇ So about the only terminal that puts more profit into the



call or write for more information
point of work...the TransTerm 5.



Physical Specifications

- Size (5.625" W x 6.9" D x 1.75" H).
- Weight 1.25 lbs.
- Power — 2.5 Watts AC or DC sourcing.

LCD Display

- 48 Character LCD Display (2 lines of 24 each).
- 5 x 7 Dot Matrix font with blinking cursor symbol.
- Font size: 4.55mm high by 3.15mm wide (179" x 124").
- 96 Character ASCII Set (upper and lower case).
- Variable contrast control.

Keyboard

- 24 Key Membrane Keyboard with embossed graphics.
- Ten key numeric array plus 8 programmable function keys.
- Alpha characters available via two keystroke sequences.
- Key-entry of any other codes via HEX mode.
- Audible Key-click for Tactile Feedback.

User Selectable Set-Up Features

- Eight Baud Rates (110-19.2K)
- 7/8 Data Bits per character
- Parity Bit State (even, odd, mark, space)
- X-on/X-off protocol
- Local Echo Enable
- Auto Line Wrap Enable
- Auto Key Repeat Enable
- Auto New Line Enable
- Scroll/No scroll select
- Line Buffer Transmit Enable
- Auto Keyboard Re-enable
- Barcode Wand Enable

Communications Interface

- Standard RS-232 Serial Asynchronous ASCII Communications.
- Optional RS-422 Four-wire multidrop mode (255 units per link).
- Optional 20 Ma current loop
- 25 pin female RS-232 connector.

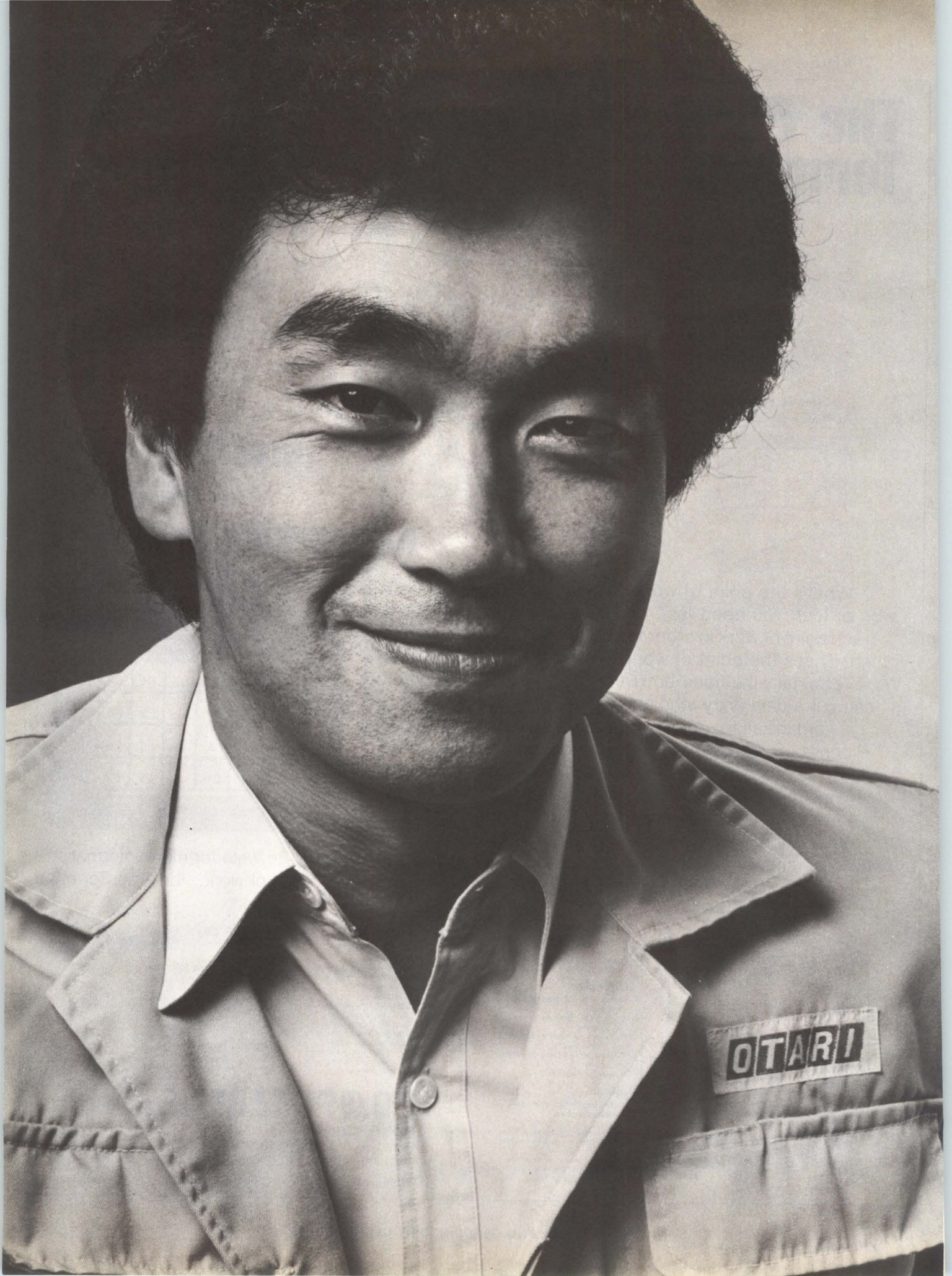
Optional Features

- Backlighting for Display
- Integral Bar Code Wand Support (Code 39).

COMPUTERWISE, INC.

4006 E. 137th Terrace
Grandview, Missouri 64030
(816) 765-3330 • TELEX 705337

®IBM is a registered trademark of International Business Machines.



“At Otari, every detail of our Winchester drives must achieve ultimate workability. This is the philosophy that pushes us. We must be proud of our product.”

—Toshiyuki Hora, *Quality Control Engineer, Otari Data Inc.*

“For the last 20 years, Otari has built a fine reputation in Japan for superior magnetic tape technology, and we are committed to this same excellence in disk drives.

We will not settle for second best, absolutely not. We continue to seek the best way to make our drives last longer, run better and stand up to incredible stress in the field.

Our product testing is intense, we put every drive through controlled burn-in at elevated temperatures for days. So when you buy Otari, you buy a rugged, reliable workhorse, a drive of quality.

We are not trying to be the Goliath of the industry, no. We want to be the better David. We are here to grow with our customers and keep them satisfied. The customer must be happy, must be pleased with the product we make, otherwise we have not done our job.

When, for example, a customer tells me Otari is making a great drive this makes me admire the standard of excellence we have set for ourselves. This is what makes me most proud.”

For immediate information call (408) 738-4808, or write 271 N. Mathilda Ave., Sunnyvale, CA 94086.

OTARI
OTARI DATA INC.

Subsidiary of Otari Electric Co., Ltd., Japan

Disk Drive Confidence, Guaranteed.

CIRCLE NO. 40 ON INQUIRY CARD



IT ALL STARTED WHEN HE BOUGHT THE NEW SYSTEM 73 WORKSTATIONS.

There is absolutely nothing meek or mild-mannered about the new System 73 color graphics workstation from AED Colorware.[™]

Colorware has never produced creampuffs. Up to 40MB of disk storage on 5¼" Winchester with either an 8" or 5¼" floppy has always been standard equipment. And a selection of three color graphics processors gives you as much resolution as you need. From 512 x 483 to 1024 x 767.

But now there's more.

System 73 provides more powerful "super-micro" performance by incorporating a DEC* LSI-11/73* (16/32-bit CPU) with true 32-bit internal architecture.

Add to that powerful DEC software including RT-11* and RSX-11M,* internal floating point instructions, 8KB on-board cache memory and 4MB memory addressing.

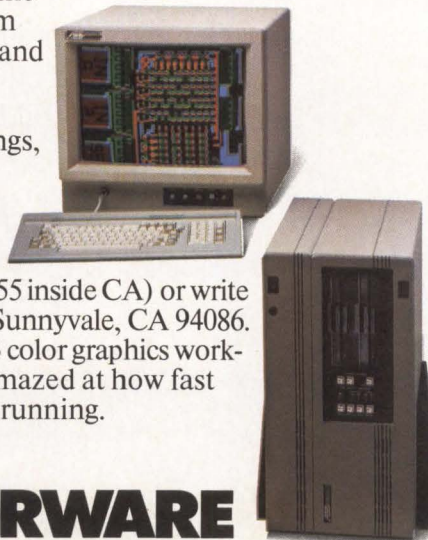
Now we're talking all the muscle you need to perform custom applications easily and to leap short deadlines in a single bound.

All at substantial savings, thanks to total DEC software compatibility.

For more information and a free brochure call us at 800/538-1730 (408/733-3555 inside CA) or write AED, 440 Potrero Avenue, Sunnyvale, CA 94086.

So try on the System 73 color graphics workstation for size. You'll be amazed at how fast your next project is up and running.

Or maybe even flying.



Colorware is a trademark of AED.
*Trademarks of Digital Equipment Corporation.

AED COLORWARE

CIRCLE NO. 41 ON INQUIRY CARD

MINI-MICRO SYSTEMS/October 1984

Mini-Micro World

CORPORATE AND FINANCIAL

Hewlett-Packard streamlines to provide complete systems solutions

Tom Moran, Associate Editor

After more than a year of planning, Hewlett-Packard Co. has announced a corporate reorganization of its former product-based divisions into four major application sectors. Company officials say the new structure has been designed to provide customers with complete systems solutions.

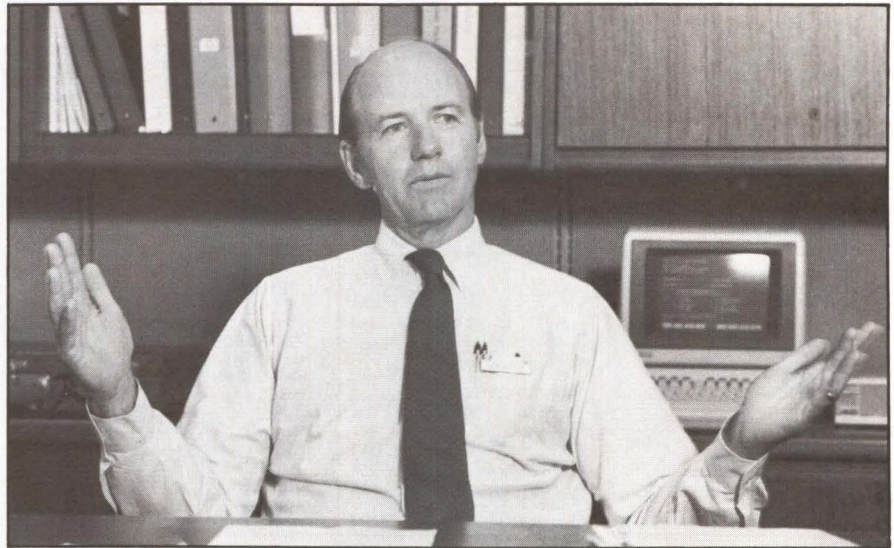
The Palo Alto, Calif., company also announced the promotion of executive vice president Dean O. Morton to the newly created post of chief operating officer, allowing president and chief executive officer John A. Young to concentrate on broader, longer-range issues. Co-founder William R. Hewlett will remain as vice chairman of the board of the \$4.7 billion corporation. HP representatives have denied reports that co-founder and chairman of the board David Packard will retire and be replaced by Young.

Sectors serve HP's markets

The four new sectors announced by HP are: Measurement, Design and Manufacturing Systems; Information Systems and Networks; Analytical, Components, Medical and Technology; and Marketing and International. The company's Finance and Administration division was left essentially untouched by the reorganization.

The Measurement, Design and Manufacturing Systems sector contains the Electronic Instrument, Microwave/Communications, Manufacturing Systems, and Design Systems Groups. Executive vice president William E. Terry heads this sector.

The Information Systems and Networks sector includes the Infor-



Dean O. Morton, executive vice president and new chief operating officer of Hewlett-Packard, says of his company's organization, "We want to be sure that, as customers look at HP, they see one company."

mation Systems, Personal Computer and Information Products groups. The Information Systems group will provide business computer systems, while Information Products will produce peripherals and networks. Newly elected executive vice president John L. Doyle directs this sector.

HP Labs and the Corporate Engineering and Corporate Manufacturing groups fall under the Analytical, Components, Medical and Technology sector, as do the Components, Analytical and Medical groups. The latter three groups' sales functions were already aimed at complete customer solutions and weren't changed. This sector, which contains many of HP's most important operations, was placed under the direction of Paul C. Ely, Jr., an executive vice president since 1980.

The Marketing and International sector comprises the European Operations, Corporate Marketing, Major Accounts, and Intercontinen-

tal Operations groups. Recently appointed executive vice president Richard C. Alberding is responsible for the sector.

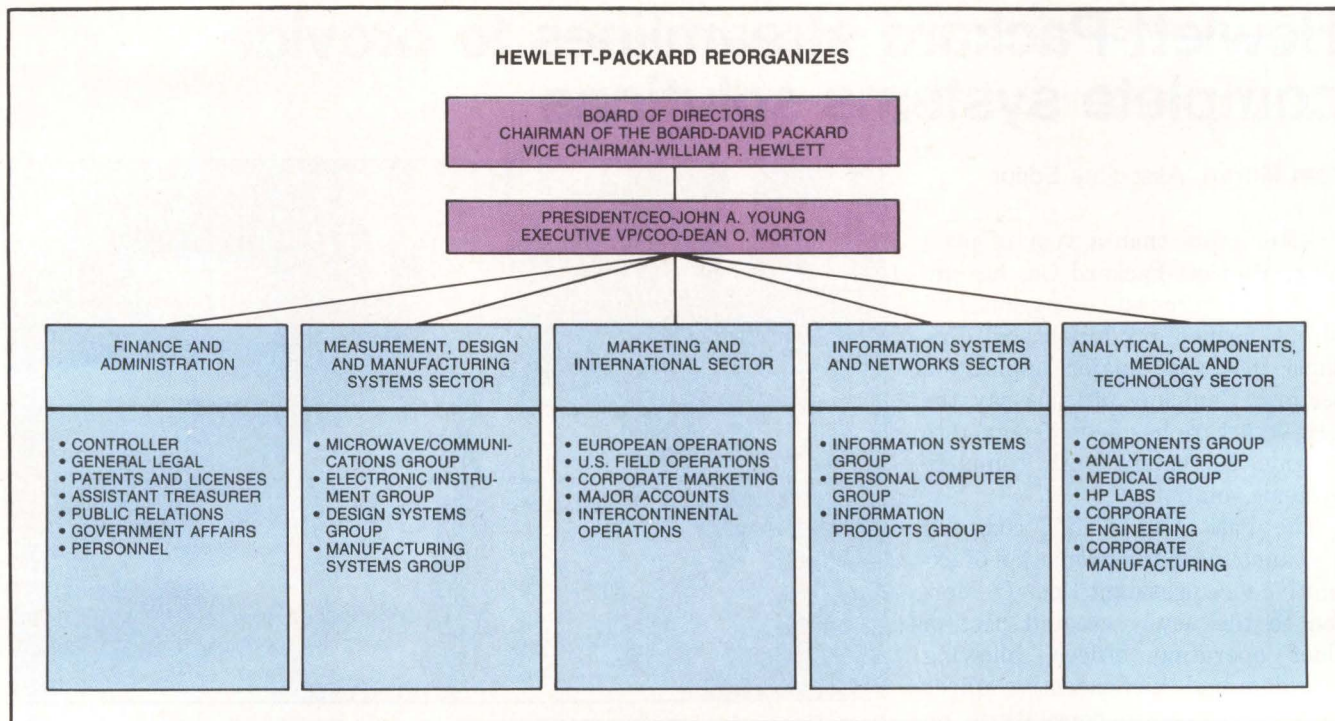
According to Young, the organizational changes will improve HP's ability "to provide our growing customer base, and especially our major accounts, with fully integrated product solutions drawn from anywhere in the company." Young says that HP's new market-oriented structure will make it easier to focus on customers' needs, but still allow for "single-product solutions in a more traditional selling environment."

'Error Signal' led to reform

The new chief operating officer, Morton, sees the changes as by no means complete. "The context and certain organizational principles have been established, but detailed decisions about precisely how we organize to do particular marketing or sales functions are still being

Mini-Micro World

CORPORATE AND FINANCIAL



Hewlett-Packard's realignment into four new operating sectors is intended to more closely fit the company's sales and marketing structure to customer needs. Previously, some customers had to deal

with several different divisions of HP to obtain a complete systems solution. The company's Financial and Administration sector has not been affected by the reorganization.

made. I think we felt we were sub-optimized, that having [one] organization for instruments calling on a particular customer, and one for computers calling on [the same] major customer, caused some organizational binds that were not always totally productive. We want to be sure that, as customers look at HP, they see one company." Morton says that HP tries not to let the organization get in the way [of selling to customers]. "But when you find that you have to patch things, or you have to impose team efforts that don't naturally fall out of the organization, it's an error signal and a sign that you have to look at the way the fundamental framework is set up."

David Crockett, president of the research concern Dataquest Inc., of San Jose, Calif., says of the long-planned HP reorganization: "It has taken maybe even longer than they have anticipated to implement fully.

HP has a good share of the pieces, but they existed in different product groups."

Crockett says that the changes are very positive and that dissatisfaction with the company's performance was not an issue in the realignment. "If you look at the record, HP has had a very good growth rate, they have evolved their organization over time, they have adjusted the entrepreneurial strategy over the years, and have consistently made groupings of divisions to reflect the market.

"I view [the recent reorganization] as an extension of a trend that has been going on [at HP] for roughly 14 years," he continues. "They've made a management change much in the way that IBM [Corp.] makes management changes—by doing it before there's a problem, always looking for an organization to reflect the marketplace and the size of the company." □

Financings

Excelan Inc., San Jose, Calif., recently received its second round of venture capital funding. The \$4.5 million will be used for producing the company's Exos Ethernet processor boards and the Nutcracker local area network development and management system....At press time, **Gavilan Computer Corp.**, Campbell, Calif., was working out a deal to bring in as much as \$8 million in additional venture financing; the company has so far received about \$30 million in venture capital for manufacturing and marketing of its portable computer. Delays in the computer's shipping, which is now underway, caused Gavilan to lay off more than 70 of its 300 employees in June...**Microrim Inc.**, the Bellevue, Wash., manufacturer of R:base relational database software for microcomputers, has closed a \$5.3 million private stock placement.

At Last! A Communications Processor For DEC Computers That You Can Program

The Simpact ICP1600 Intelligent Communications Processor can off-load your host system because it's versatile enough to handle the toughest communications tasks and is code compatible with VAX and PDP-11s.

Use your host system utilities and our software toolkit to create your custom protocols, or let our communications specialists help you develop them. X.25 software is available from Simpact now, and more standard packages are on the way. For under \$5,000, the ICP1600 is the most cost-effective communications processor available today.

256 Kbytes on-board memory to store downloaded programs and buffer data

High-speed DMA transfers with host processor

Eight programmable, serial communications ports (expandable to 20) support multiple asynchronous and synchronous protocols at speeds up to 612 Kbaud

15 Kbytes PROM contains Boot Loader, Self-Test routines and Debugging firmware

DEC MICRO/T-11 processor engine executes the PDP-11 instruction set

Single hex-size card plugs into any UNIBUS slot*

*Q-Bus version available soon.

DEC, PDP, MICRO/T-11, UNIBUS and VAX are trademarks of Digital Equipment Corporation

© 1984 SIMPACT ASSOCIATES, INC.

simpact
ASSOCIATES, INC.

5520 Ruffin Road
San Diego, California 92123

CIRCLE NO. 42 ON INQUIRY CARD

**Introducing
the only true
general purpose
multicomputer.**

Flex/32™

A True MultiComputing Environment.

All computers are not created equal. Especially when it comes to their ability to tolerate change. In fact, most computers have a hard time trying to adapt when you need to expand or modify their capabilities.

The Flex/32,™ on the other hand, is a scaleable, general purpose multicomputer. That means it can be configured and reconfigured as often as needed at different levels of capacity and performance. All the way up. And down again.

True scaleability.

Each Flex/32 MultiComputer cabinet can contain up to twenty 32-bit CPU's, each operating in excess of one million instructions per second with 1 megabyte of RAM each. That's more power and memory than some of the largest mainframes available today. The Flex/32 is easy to maintain with automatic and continuous self diagnostics built in.

With an entry level system, you get two 32-bit computers with 2 megabytes of local memory, 128 kilobytes of common memory, and 2 VME bus I/O interfaces all located inside one card cage. It's card cage can accept another 18 cards allowing up to 18 more computers or another 152 megabytes of memory. As you expand your multicomputer, additional computers, memories and interfaces are merely slipped into slots.

As powerful as the entry level system is, Flex/32 can go much, much further. Your ability to expand the system is literally without limits.

True concurrency.

Because Flex/32 is a multicomputer, it can provide

true concurrency in processing. Which means it can run many processors at exactly the same instant in time. And since it provides direct programmer control over the use of concurrency, Flex/32 can be tuned to your application needs.

True programming freedom.

Just as the Flex/32 hardware gives you freedom from restrictions of growth, its software will set you free, too. Free from vendor dependence. Because it uses the universal UNIX™ System V operating system, and languages like C, FORTRAN 77, RATFOR, Flexible's own Concurrent C™, for real time and concurrent programming, and a selftest capability. And for enhanced performance, Flex/32 supports the

ISA extensions to FORTRAN 77.

It even contains a concurrency simulator and optimization procedures to improve run time performance—to enable you to tune your application.

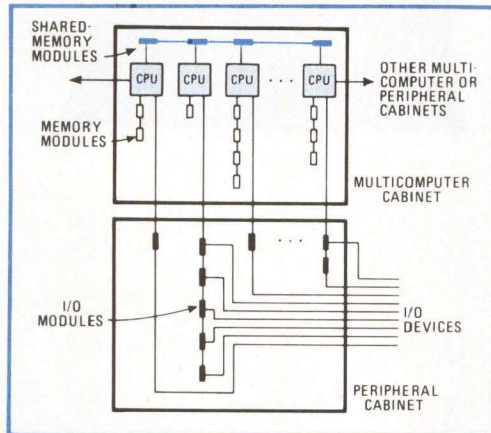
True cost efficiency.

Given that a basic Flex/32 can outperform two superminis, it still only costs about the same as a single VAX™ 750. And since Flex/32 is scaleable, the economies continue throughout its growth path.

When you add it all up, the Flex/32 has few equals in terms of its performance and value in the supermini computer world. And you can't take away from that.

For more information, call (214) 869-1234, or write to us at 1801 Royal Lane, Suite 810, Dallas, Texas 75229.

Flexible
Computer Corporation

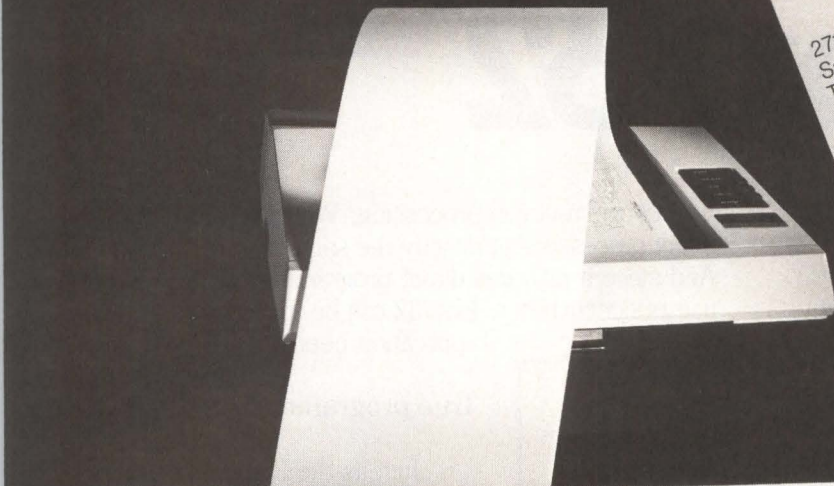


UNIX is a trademark of Bell Laboratories.
Flex/32 and Concurrent C are trademarks of Flexible Computer Corporation.
VAX is a trademark of Digital Equipment Corporation.

©1984 Flexible Computer Corporation

2710 Walsh Avenue
Santa Clara, California 95051
Telephone: (408) 988-2800
TWX: 910-338-0243
Telex: 334421

VERSATEC EUROPEAN MARKETING
27/35 London Road
Newbury, Berkshire, England
Telephone: 44-635-42421
Telex: 847259

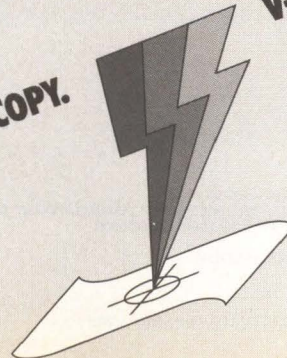


V-80. YOUR OWN PRINTER/ PLOTTER.

Why wait? Give your workstation a V-80. Get the high resolution hard copy you want—complex graphics, software generated text, maps, even halftone pictures. And get it fast—an 11-inch wide page in just 8.5 seconds. Plot drawings in A-size, B-size, or any length. Print 132-column listings at up to 1000 lines per minute. On a wide selection of paper or film media. An electrostatic V-80 costs half as much as the typical laser device. And one V-80 can serve several users without contention. Quickly. Quietly. Reliably. Versatec interfaces, including IEEE-796 (multibus) and IEEE-488 (GPIB), intelligent controllers, and multiplexers link V-80 with many popular workstations and computers. Versatec support and supplies are available throughout the world. So why wait? Circle our readers' service number for your free brochure.

THE FAST WAY TO HARD COPY.

V-80.



Ask about our special year-end offer

Versatec is a trademark of Versatec, Inc.
XEROX is a trademark of XEROX CORPORATION.

CIRCLE NO. 44 ON INQUIRY CARD

VERSATEC
A XEROX COMPANY

Mini-Micro World

INTERNATIONAL

Advent of venture capital may fuel Taiwan's high-technology businesses

Charles W. Hintermeister
Taiwan Correspondent

Venture capital, that glamorous, versatile and risky mechanism by which many of today's successful high-tech companies originally were financed, has debuted in Taiwan. The establishment of Taiwanese venture-capital companies, and the anticipated arrival in Taiwan of at least five foreign venture capital outfits, falls in with the Taiwanese government's goal of internationalizing the island's young high-tech industries.

Taiwan's first such venture capital company, Multiventure Investment Inc., is putting \$750,000 into the establishment of MOS Electronics Corp., Republic of China (Mosel-ROC), which will produce the first Taiwanese very-large-scale-integration (VLSI) chips. Test production of CMOS 16K S RAM chips is underway. The chips will initially be manufactured by United Microelectronics Corp., Taiwan's largest maker of integrated circuits, and then by Mosel-ROC when its planned factory is completed. Total investment in the new corporation—mostly earmarked for building the factory—is said to be \$40 million, although Multiventure would not confirm this figure.

The Multiventure deal indicates that Taiwan's computer industry, which grew 235 percent from 1982 to 1983 and rang up export sales of \$383 million, may get the bulk of venture-capital funds from multiple sources expected to become available over the next several years. The United States is Taiwan's largest trading partner.

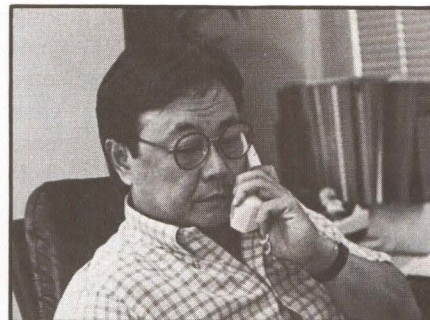
Taiwanese companies could use

the help on several fronts. Most of the island's computer companies are seriously under-capitalized; the majority are capitalized at less than \$1 million. And most companies spend little on research and development, as evidenced by a recent Taiwan Industrial Development Bureau proposal to have those companies spend at least 1.5 percent of revenues on R&D, a fraction of what most U.S. companies spend.

U.S. partners give expertise

U.S. companies that are now reportedly considering setting up venture-capital operations in Taiwan include such major corporations as Catalyst Technologies Inc., Citicorp and TA Associates. Irving Ho, vice chairman of Taiwan's National Science Council and newly-appointed president of the Institute for Information Industry says, "Foreign venture capitalists will be able to offer local computer firms the benefits of their relatively longer experience in venture financing and their connections with foreign firms."

Likewise, Taiwanese venture-capital companies are aiming to offer U.S. and European high-tech corporations their knowledge of Taiwan's business environment and connect them, if necessary, with appropriate manufacturers. Stan Shih, president of Multiventure, estimates that half or more of Multiventure's total investments will be in U.S. businesses. Shih, who is also president and chairman of Multitech Industrial Corp., a Taiwanese computer maker, says that capital gains on Multiventure's U.S. investments will likely be re-invested in other U.S. companies. According to Multiventure vice president Jeff



Ted I, president of consulting company Investec (Taiwan) Ltd., says a 20-percent capital gains tax may lessen U.S. venture capitalists' interest in Taiwanese companies.

Chen, it is already involved in the financing of several U.S. integrated circuit design companies. Investment in U.S. companies designing 32-bit computers is also a strong possibility, he says.

Investments bring in technology

A chief reason Multiventure is investing in U.S. companies is that it hopes to attract technology to Taiwan via lucrative OEM deals. Shih adds that computer products developed in the United States are considerably less likely to run into patent or copyright infringement problems than if they were developed in Taiwan.

Shih says that when Multiventure invests in a firm, it will often do so in conjunction with a second venture capital company, possibly one from the United States. One of the main reasons for this is that no Taiwanese venture capital firm may legally invest more than 15 percent of its total registered capital in any single enterprise.

Beyond OEM business

Underdeveloped distribution

Mini-Micro World

INTERNATIONAL

channels, poor marketing and insufficient funds for foreign promotion have long plagued Taiwanese electronics and computer manufacturers, obliging even the largest among them to rely heavily on OEM business. More than 70 percent of computer exports from Taiwan last year were conducted on an OEM basis. Although the Taiwanese government is encouraging the continued development of the OEM sector as a necessity to gain international recognition of Taiwanese brand names, OEM manufacturers often find themselves with slim, and sometimes non-existent, profit margins. Also, the technology transfers that Taiwanese OEM manufacturers desire often don't materialize.

The Taiwanese government has for some years recognized the need for more versatile forms of financing than have been available from Taiwanese banks. It has set up a number of special funds for the island's high-tech industries. The Bank of Communications, following a re-organization in 1979, began financing high-tech projects, as have the China Development Corp., a large trust company, and the Development Fund of the Executive Yuan.

While these organizations have done much to aid the development of industries they consider essential to the island's economy, they have tended to avoid the riskier product-specific investments in which venture capital companies specialize. For instance, out of a total of \$33.6 million in investments made by the Bank of Communications between July 1982 and May 1984, only \$2.2 million was invested in the information industry. The China Development Corp., according to one of its officials, placed only about 1 percent of its total investments last year in the computer industry.

One of the chief reasons that the U.S. venture capitalists have not

yet formally applied to set up Taipei offices is uncertainty over the crucial issues of capital gains tax and repatriation, says Ted I, president of Investec (Taiwan) Ltd., a consulting company that acted as advisor to Taiwan's Ministry of Finance in formulating venture capital regulations.

The latest government interpretation of the relevant regulations,

though not final, holds that corporate investors are subject to a capital gains tax of 20 percent, but that wholesale repatriation of capital gains may be allowed by the Ministry of Finance on a case-by-case basis. Ted I says the 20 percent tax to be levied on foreign corporate investors may seriously lessen the attraction of entering the Taiwanese venture-capital industry. □

PRECISION VISUALS ANNOUNCES GKS LIBRARY

Precision Visuals Inc., Boulder, Colo., has officially climbed onto the Graphical Kernel System (GKS) bandwagon with the introduction of the GK-2000. This subroutine library supports more than 80 output devices and adheres to the basics of the GKS standard. The package prices are based on machine size, and range from \$4,500 to \$21,000. An implementation for a DEC VAX-11/780 is about \$8,000.

IBM PC UTILITY HANDLES 20 RECORDING FORMATS

An impressive utility package for IBM PC users is available from advanced Software Technologies, Bloomfield, N.J. The \$79.99 package provides the ability to read and write 20 different disk-recording formats and includes capability for user-customized routines to handle special formats. In addition, the package comes with utilities to dump disk contents, read specific sectors, or combine small files into larger ones.

CROMEMCO TOUTS SPEED OF UNIX SUPERMICROS

Cromemco Inc., Mountain View, Calif., claims its new 10-MHz, MC68000-based machines are the fastest UNIX supermicrocomputer systems in the industry. The 16-user Systems 100 and 300 run UNIX System V with Berkeley enhancements. The additional speed is gained via a separate memory management board and an intelligent hard disk controller that performs direct memory access and has 40K bytes of cache memory. Maximum memory for the two models is 4M bytes and 16M bytes, respectively. A basic System 300 with 512K bytes of RAM and 14 open slots is \$12,995.

ETHERNET PRODUCTS LINK RAINBOW COMPUTERS

Network Research Corp. (NRC), Santa Monica, Calif., and UniVation, Inc., Sunnyvale, Calif., will jointly provide networking for Digital Equipment Corp.'s Rainbow microcomputer line. NRC's FUSION networking software will be ported to UniVation's UniNet Ethernet board for Rainbow and Rainbow Plus models. FUSION will network Rainbow to other systems supported by the software such as the IBM PC and PC/XT microcomputers. The UniNet board sells for \$795.

SPECIAL OFFER!

TWO FREE

StorageMaster™

flexible diskettes
with every box of ten.

Buy the specially-marked boxes of Control Data's new StorageMaster brand 5¼-in. double sided, double density diskettes and get 2 extra floppies free during our special limited time offer. That's 12 disks—20% more—in every box, while supplies last.

So plan to stock-up now on StorageMaster brand diskettes. Ask for them at your local computer store or call your local authorized Control Data Business Products distributor.



StorageMaster™
Media
Premium Series
5.25-inch Flexible Disks

100% Certified
5-Year Warranty

Get 12
Control Data
Flexible Disks
20% More In This Box.

2 FREE DISKS

Give him a call...or call toll-free and we'll help you find the nearest source.
1-800/328-6207 (In Minnesota call 1-612/835-8065).



Sell someone a Genicom 3000, and it may be some time before you hear from them again.

Genicom 3000 printer reliability can keep a customer happy for years.

From offices to factories across the country—hour after hour, day after day—Genicom 3000 printers have been proving their quality and reliability under even the toughest conditions for years.

The result has been a large number of very satisfied customers, which means a large number of satisfied OEM's. But durability is only part of the Genicom 3000 printer advantage.

The Genicom 3000 family of printers offers multi-model flexibility combined with single design simplicity to give OEM's real dollar savings with price/performance matching for every customer. Parts

commonality. Easier servicing. Single source supply. Plus you can select speeds from 180-500 cps draft/EDP, 45-100 cps NLQ, single or multi-

mode printing, automatic sheet feeders, document inserters, multi-color printing and graphics, plus more. There's such a diversity of models, features and options, you can choose just the right printer and you don't have to pay for things you don't need.

See how long you can keep your customers satisfied... with the long lasting, field proven printers that have earned the respect of OEM's nationwide—the Genicom 3000 family.

GENICOM
The New Printer Company.

Genicom Corporation, One General Electric Drive, Waynesboro, VA 22980 In Virginia, call 1-703-949-1170

For the solution to your printing needs call
TOLL FREE 1-800-437-7468



CIRCLE NO. 45 ON INQUIRY CARD

Can Apple fill a bushel basket with Macintosh software for Japan?

Lori Valigra, Senior Editor

Apple Computer Inc. recently took its aggressive campaign to sign up independent software sources for the Macintosh microcomputer to Japan.

Although the company hopes to replicate the successful Apple II microcomputer third-party software strategy—which resulted in 17,000 packages from independent programmers—with the Macintosh in the United States, its ambitions in Japan are more modest. “Our goal is to establish our presence and be known as a high-technology, high-quality provider of personal computers,” explains Joanna Hoffman, international marketing manager for Apple’s Macintosh and Lisa 32-bit microcomputers. “We will not gain substantial market share for two to three years.”

Apple introduced its Macintosh technology to an audience of 100 Japanese independent software vendors in May. In late June, the company held a technical seminar, attended by 40 software developers and dealers that have programming staffs. By August, says Hoffman, four of them had purchased equipment at a 30-percent to 50-percent discount.

Independents are key

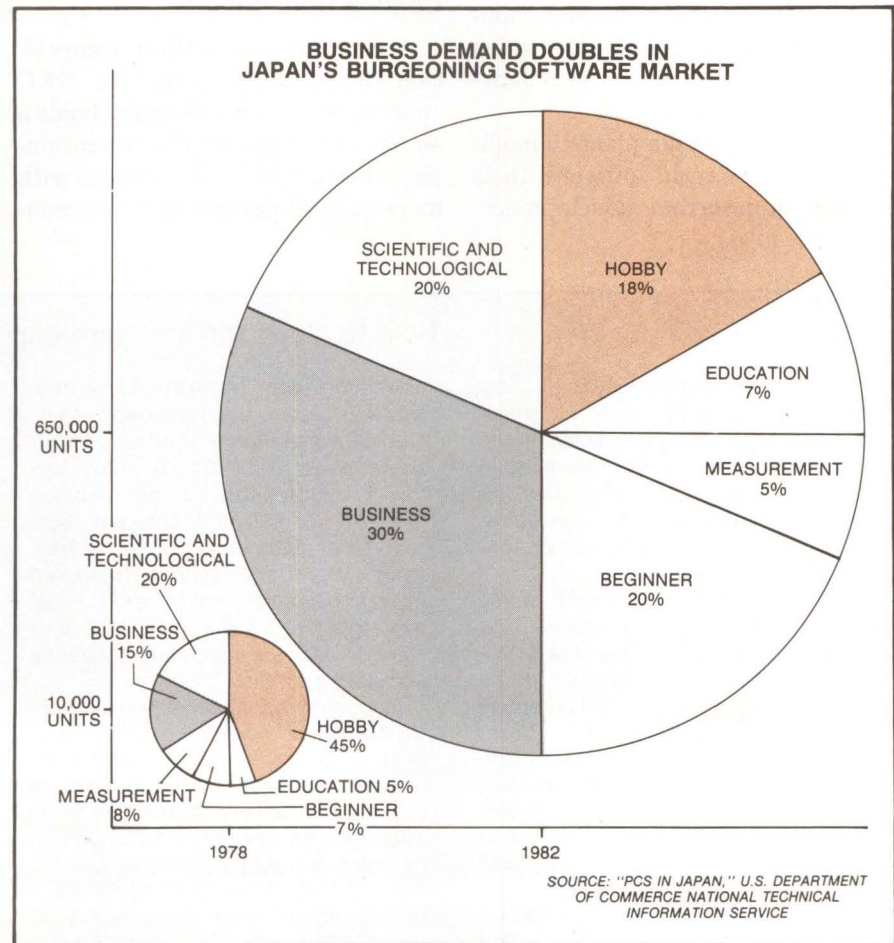
Apple’s success with the Macintosh is instrumental to the company’s future growth, according to analysts and Apple officials (MMS, February, Page 71). The Cupertino, Calif., company already has spent \$70 million on research and development for its 32-bit Lisa and Macintosh microcomputers, and has spent

more than \$25 million in U.S. advertising in the first quarter of this year. Apple sold 72,000 Macintosh computers in the first 100 days the machine was on the market. By comparison, it took the Apple II two and one half years to reach the same figures. Apple officials have said publicly that the company hopes to sell 250,000 Macintosh computers in the United States by the year-end.

The company’s U.S. application software efforts center on independent software producers, whom

Apple officials credit with being a major part of the product’s success. An Apple representative reiterated that theme to the Tokyo audience in late May. “We are sincerely interested in your success, because it is necessary for ours,” Dan Cochran, product marketing manager for Macintosh third-party software, told the audience. “We need you more than you need us,” Cochran said.

Hoffman explains that most software for the Apple II in Japan is not



Business use of personal computers should continue to gain over hobby use, indicating a demand for more business software. Business use of microcomputers may be as high as 40 percent now.

Mini-Micro World

INTERNATIONAL

for business use, because Apple never modified the machine or the software to meet Japanese language requirements. Users of the Macintosh, however, most frequently request word-processing and database programs, says Hoffman. All functions required to design and produce sophisticated applications are resident in Macintosh firmware, Cochran explains.

The quest for Kanji

Apple's goal is to get Japanese programmers to produce business software in the Kanji "alphabet." Ideogramatic Kanji is one of three "alphabets" (actually syllabaries) used in Japan. It requires high-resolution screens and printers to produce a clean image. Another popular "alphabet" is Katakana, which translates foreign words into Japanese phonetically.

For its part, Apple plans to modify basic Macintosh software tools for use in program development,

but has not decided which ones yet. Hoffman says MacWrite and MacPaint software probably will be modified into Katakana. The company also is translating the Macintosh's documentation into Japanese. A Katakana version of the Macintosh with a fully-translated manual should be available by now.

Hoffman elaborates that any translating related to art work is done in the United States, while language-specific modifications are performed in Japan at Apple Japan, a company subsidiary. Apple Japan also is charged with handling third-party developers, and supporting sales made by Apple's agent, Canon Sales.

Coming from behind

Apple faces its stiffest competition from NEC Corp. An NEC spokesman says his company holds a 45-percent share of the microcomputer market and has contracts with more than 35 percent of the person-

al computer software houses. To make some headway into NEC's territory, Apple is promising support that it claims is unequaled by other U.S. manufacturers. "We are the only U.S. hardware manufacturer supplying a high level of technical support to software developers," Cochran says. Technical support is done both on-site and via hot line to Canon and Apple Japan.

NEC has a low-end computer called the PC-100 that competes with the Macintosh. It uses a mouse and has windowing capability. "We are looking at it closely and evaluating it to see what they [NEC] did right," such as their word-processing software, states Hoffman. Hoffman expects Apple's high level of technology to attract the knowledgeable Japanese users. "Our technology is so far ahead, we can compete on this basis. There has never been an Apple in Japan to put in a technological counterpoint to NEC or Fujitsu," elaborates Hoffman. □

How to close the software gap

Differences in language and in how jobs are performed pose the major challenges to U.S. companies trying to sell software in Japan. Attending to those distinctions with programs tailored for Japanese users will determine a product's, and company's, success.

Some differences in the Japanese and U.S. markets were outlined by William Smale, executive vice president of Software International Inc., a Tokyo software modification company and reseller, in an article in *The Journal of the American Chamber of Commerce in Japan*. Last year, he said, U.S. retail sales of microcomputer software matched that of hardware. In Japan, however, hardware outsold software by 90 percent, he said.

Smale points out that the Japanese software market lags behind that of the United States because of the relatively small market size and lack of

standardization. There are many standards in Japan, because each major hardware manufacturer offers its own operating system. Smale notes further that more than 1.2 million copies of CP/M and MS-DOS operating systems are used in U.S. businesses, while only 10,000 of these standard operating systems are in use in Japanese offices. This means that software developers are writing to several standard operating systems.

It is relatively expensive and time-consuming to address the comparatively small Japanese market, Smale writes. In Japan, only 20 percent of the \$100 million in software sold in 1983 was for business. For example, he notes that suppliers of a best-seller in the United States, such as dBASE II or MicroPlan, with retail prices of about \$700, will ship about 50,000 copies of that software a year. In Japan, a maker of a popular file man-

ager priced at about \$200 will be able to ship about 4,000 copies.

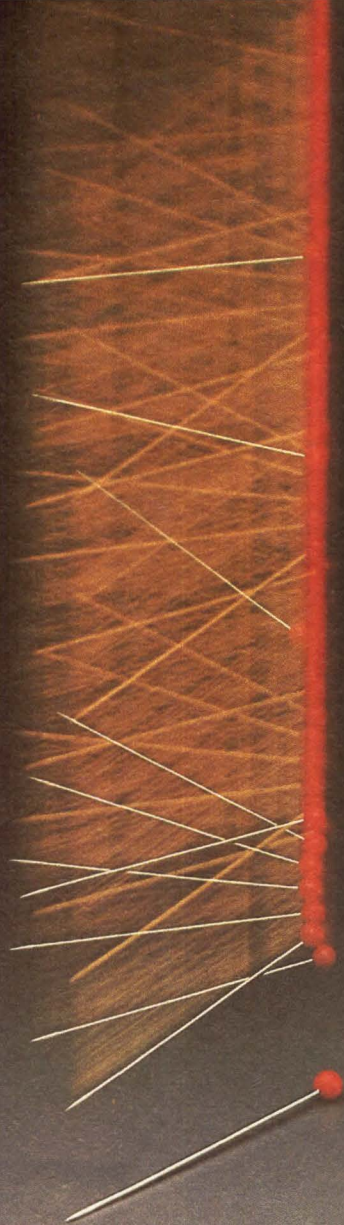
Modification of U.S. software for Japanese use requires preparing the program to accept 8-bit Kanji and Katakana code. Each Kanji symbol combines two 8-bit characters; a Katakana symbol requires one 8-bit character. U.S. software commonly uses 7-bit characters for the standard alphabet and 8-bit characters for special graphics symbols (MMS, Sept. 1983, Page 98).

Modification is not limited to code. Documentation must not be merely translated, but modified to include phraseology and methodology used when performing tasks in Japanese offices.

All this modification takes time. Presuming the product is right for the market, says Smale, the maximum time for the developer to create a Japanese version is four months.

SIEMENS

Choose your next printer on a sound basis.



A printer's moment of truth comes when you turn it on. Simply put, if your printer sounds like a jack hammer, you won't care what features it has to offer.

Listen to our PT-88 and PT-89 ink-jet printers. They're so quiet you can almost hear a pin drop. In the office or at home, you'll be completely free from the nerve wracking "clickety-clack" of noisy impact printers.

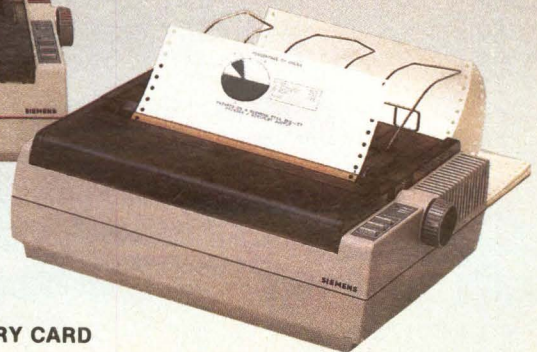
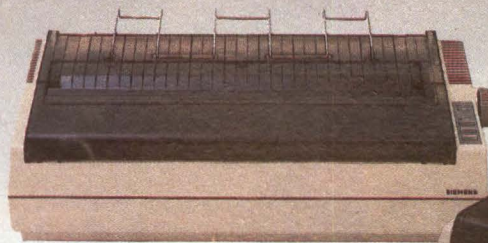
But a quiet environment isn't the only benefit. The wide carriage PT-89 handles paper widths to 15 $\frac{3}{4}$ ". That's

136 columns at 10 pitch and 248 columns in condensed print for those busy spreadsheets. The PT-88 accommodates up to 9 $\frac{3}{4}$ " width paper, 80 columns at 10 pitch, 136 columns condensed. Both offer exceptional print quality at 150 cps.

Complete IBM PC compatibility is also available. The easily replaceable, no-mess ink cartridge is good for 5 million

characters. That's more than a whole case of paper! And when you choose our printers, you may take advantage of the nationwide support of Siemens PrintaServ Service Network.

For information and the location of the dealer nearest you contact: Siemens Communication Systems, Inc., Office Printer Group, 5500 Broken Sound Blvd., Boca Raton, Florida 33431.



**Silence is golden...
The PT-88/89 ink jet printers.
Call 1-800-JETTECH.**

CIRCLE NO. 46 ON INQUIRY CARD

THE TELEVIDEO COMES WITH 2.9 MI

They're all the people who use IBM® PCs and PC compatibles. Each one's a potential customer for the new TeleVideo® Personal Mini™.

This is simply the most powerful, economical and profitable way to turn stand alone PCs into efficient multi-user networks. Systems that let people work on the same file simultaneously.

RUNS IBM PC SOFTWARE.

The TeleVideo Personal Mini runs

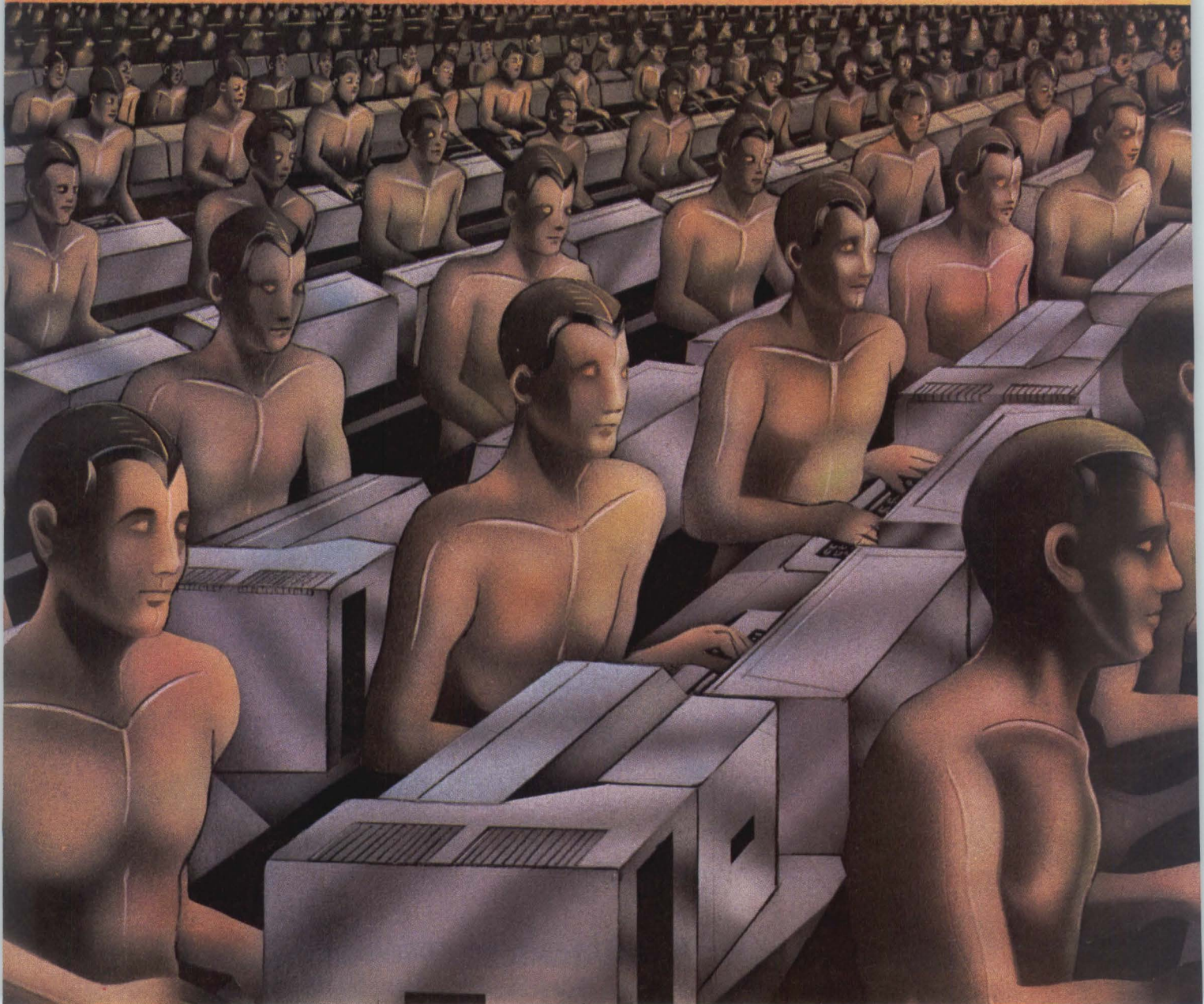
all the most popular IBM PC software, as well as hundreds of minicomputer and multi-user applications now on the market.

The Personal Mini provides excellent file and data sharing and, through InfoShare™, an exclusive TeleVideo operating system, workers get better utilization of expensive hard disk storage.

And the Personal Mini provides the highest performance—performance without degradation—regardless of



CIRCLE NO. 47 ON INQUIRY CARD



PERSONAL MILLION CUSTOMERS.

how many workstations are being served. It also enables workstations to share expensive peripherals like plotters and printers.

AS EASY FOR YOU AS IT IS FOR THEM.

Not only is the Personal Mini incredibly easy to use, it installs easily. And we supply everything you need to get the system up and running or expand it. So there's no need to coordinate components from more than one vendor.

The Personal Mini is even easy on data processing budgets. The TeleVideo line of expansion products allows the system to grow without sacrificing any PC investment. And TeleVideo workstations can be easily added for substantially less than an IBM PC.

In fact, the Personal Mini networks the entire TeleVideo compatible line—PC, XT and portable computers—as well as IBM. And it does so with plug-in simplicity, for under \$100 per node.

THE CUSTOMERS ARE BUILT IN.

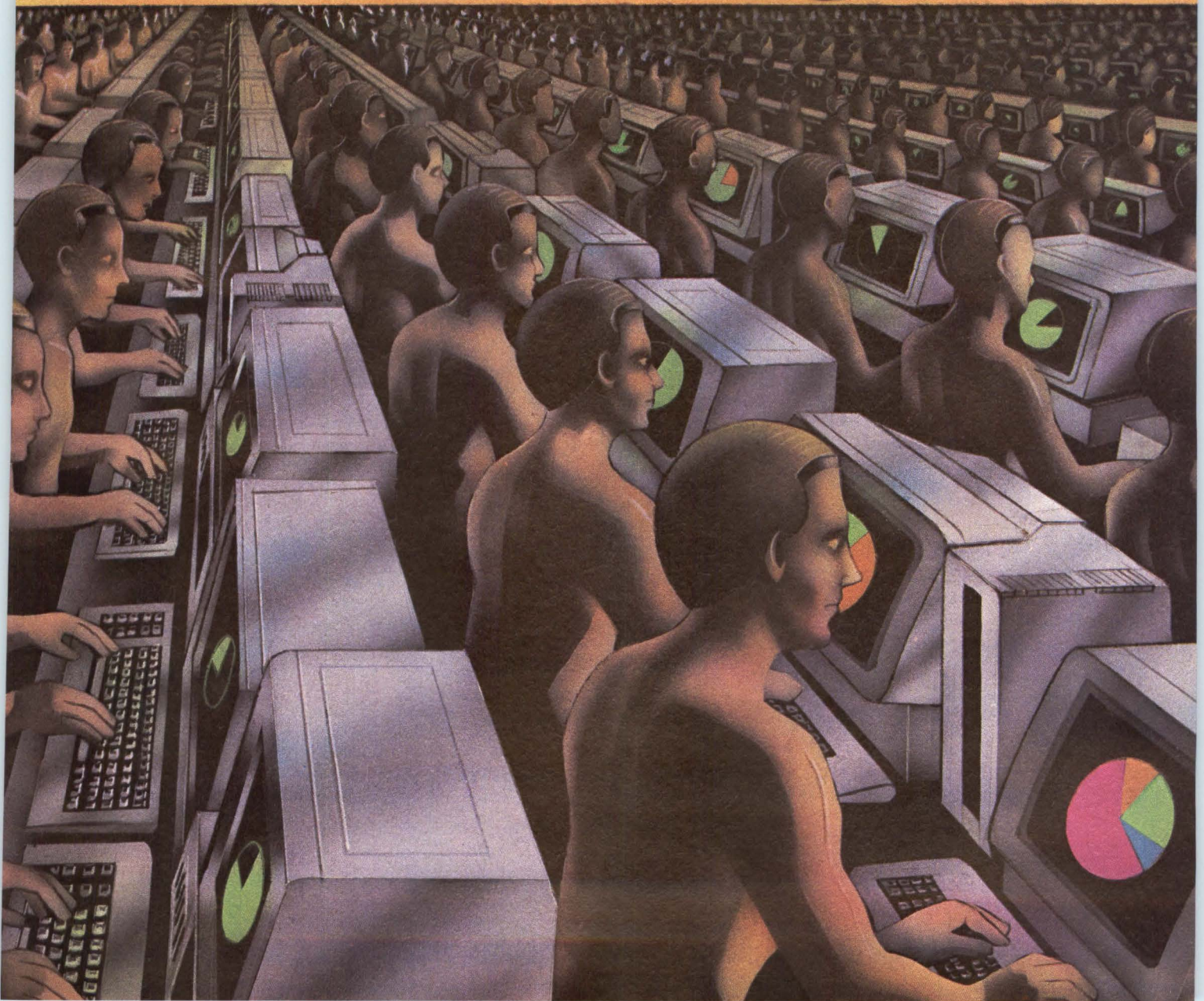
It's never been easier to identify a target audience. Because the Personal Mini makes the IBM PC installed base your customer base.

Call TeleVideo toll free at 800-538-8725. In California, call 408-745-7760.

Regional Sales Offices: Northwest (408) 745-7760, Southwest (714) 476-0244, Southcentral (214) 258-6776, Midwest (312) 397-5400, Southeast (404) 447-1231, Mid-Atlantic (703) 556-7764, Northeast (617) 890-3282, East (516) 496-4777, Rocky Mountain (408) 745-7760.

IBM is a registered trademark of International Business Machines.

THE TELEVIDEO PERSONAL MINI.
THE FIRST PC COMPATIBLE MULTI-USER SYSTEM.



Masscomp takes the risk out of choosing a high performance workstation.

How do you know the engineering workstation you choose is really going to work for you?

Considering the number of vendors in the market, and the baffling collection of workstations they offer, the choice is a tough one. With a sizable amount of capital at risk.

Masscomp is a computer company that not only builds workstations, but uses them every day. We've learned from hands-on experience that the heart of a good workstation is an extremely fast computer that delivers exceptional performance. Knowing this, we built our own very fast, high performance system: the WorkStation-500™.

The WorkStation-500 is designed with Masscomp's Performance Architecture™,

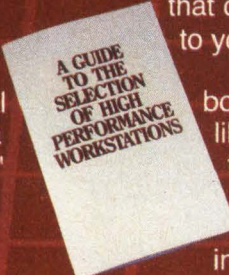
which uses floating point and array processors of our own design and can deliver over one-half million Whetstones. This architecture provides real-time computational and graphics power in a multi-tasking standalone workstation for technical and scientific users.

In applications like solids modeling, VLSI design, simulation, numerical analysis, and other CAE applications, the system is unsurpassed.

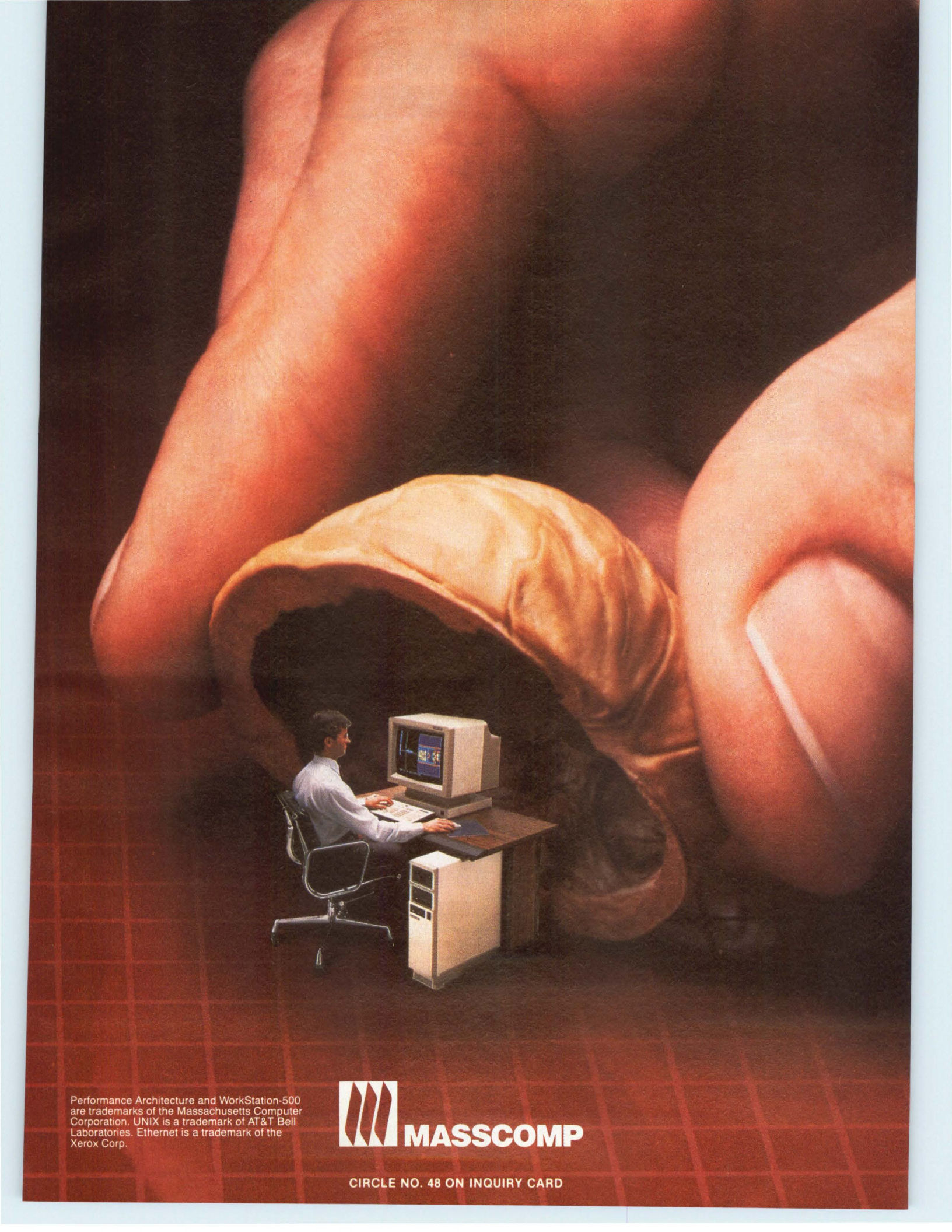
WorkStation-500 has a dual bus architecture and supports a virtual memory, real-time UNIX™ operating system, and provides a choice of many peripherals, graphic subsystems, Ethernet™, and mass storage devices.

We believe you can't find a better price/performance system. But before you commit to the purchase of any workstation, your decision should be an informed one.

That's why we're making available a free booklet, "A Guide to the Selection of High Performance Workstations." It tells you what you need to know about the important issues involved in selecting the right workstation. Reading it will help you choose the right productivity tool, and will greatly reduce the risk of buying a workstation that doesn't perform up to your expectations.



If you'd like a free booklet, or if you'd like to speak directly to one of our sales representatives, call 1-800-451-1824; in Massachusetts, (617) 692-6200. Or write Masscomp, One Technology Park, Westford, MA 01886.



Performance Architecture and WorkStation-500 are trademarks of the Massachusetts Computer Corporation. UNIX is a trademark of AT&T Bell Laboratories. Ethernet is a trademark of the Xerox Corp.



MASSCOMP

CIRCLE NO. 48 ON INQUIRY CARD

BEAT OUR BENCHMARK.

GET THIS WATCH.

Take the Plexus Challenge.

Everybody in the UNIX-based supermicro business talks performance.

Only Plexus dares to prove it... with the Plexus Challenge:

Show us a UNIX-based supermicro that can beat Plexus — running any recognized benchmark (or even your own application code*) — and we'll present you with this elegant Heuer chronograph valued at \$485.00.

How do we dare make this offer?

Simple: our multiprocessor architecture and highly-tuned version of UNIX leave the single-CPU competition in the dust.

Multibus architecture and intelligent I/O processors let you expand modularly from



5 to 40 users — without changing a single byte of object code.

Are you thinking "Fine, but I really don't need all that performance"? Well, some of our customers tried other hardware first. They used to think the same thing.

Challenge details: This offer is extended to bona fide OEM's, value-added resellers, and volume end-users in the multiuser commercial UNIX systems market. Limit one award per company. Offer expires Jan. 31, 1985 unless withdrawn earlier. For complete rules and participation information, call (800) 556-1234 Ext. 560 (in Calif. (800) 441-2345 Ext. 560)

PLEXUS

Supermicros built for speed.

Plexus Computers Inc., 3833 North First Street, San Jose, CA 95134

*Subject to prior approval © 1984. UNIX is a trademark of AT&T Bell Laboratories. Multibus is a trademark of Intel Corp.

The Interpreter

Software publishers toughen stand against pirates and pilferers

Industry battles huge revenue losses by supporting stronger legislation and developing anti-theft techniques

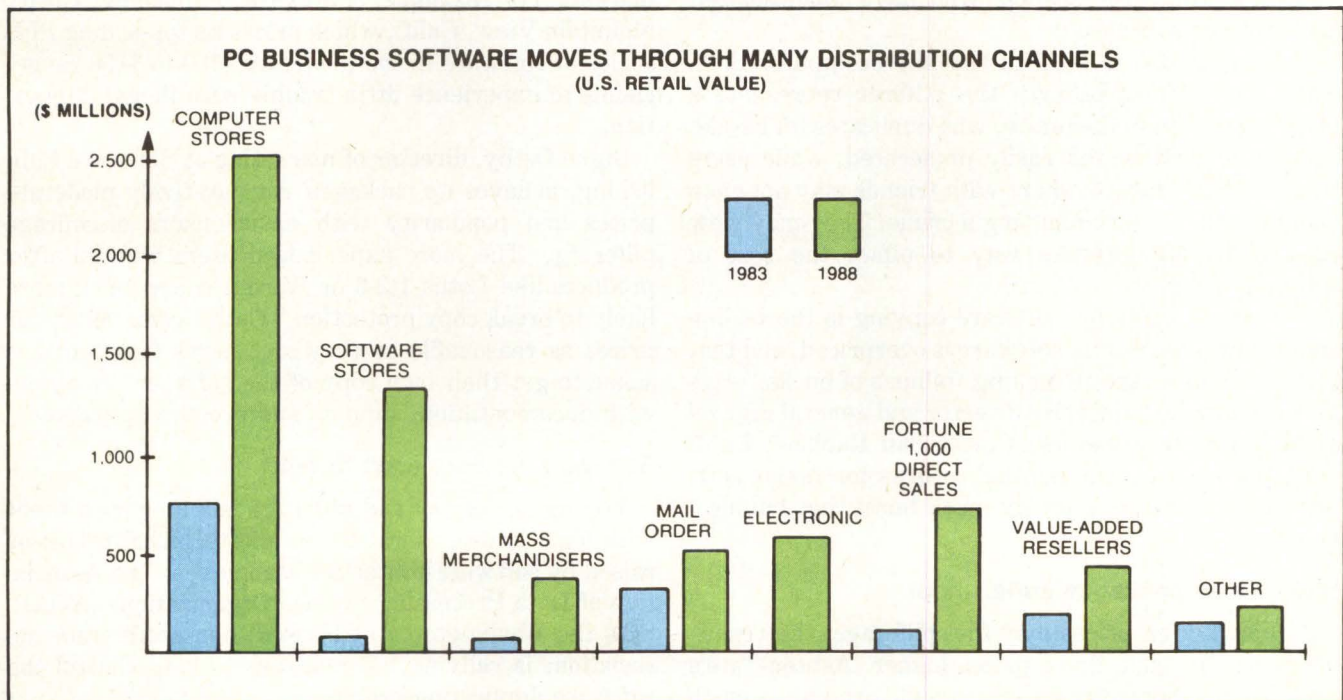
Marjorie Stenzler-Centonze
Associate Editor

The unauthorized duplication of software may be siphoning billions a year in sales from software publishers, distributors and dealers, according to industry estimates. Software publishers say that for every package sold, between two and 15 unauthorized copies are made.

Software vendors are joining forces to combat pilferers—who make copies for their own use or for acquaintances—and pirates—who duplicate disks for resale. The vendors' goal is to combine public education with clearer legislation, better law enforcement and more sophisticated software protection schemes to make copying more difficult. Their get-tough policy is de-

signed to ensure self-preservation and keep the industry growing, publishers say. Most at jeopardy is the microcomputer segment of the software industry. At stake, according to International Data Corp., the Framingham, Mass., research outfit, is a business that accounted for revenues nearing \$2 billion last year and which could gross more than \$5 billion by 1986.

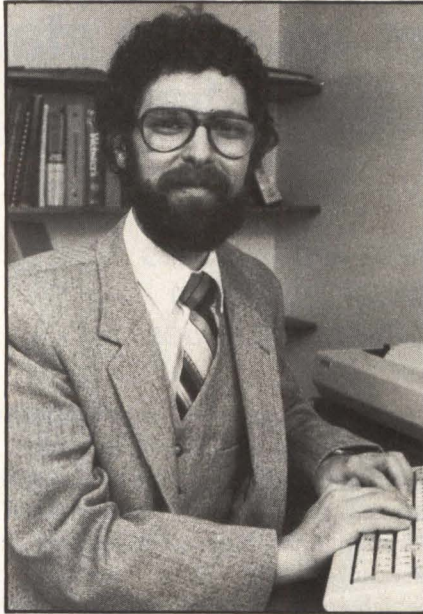
While software publishers acknowledge major pilferage and piracy problems, they agree it is difficult to assess exactly how much illegal duplication exists. In fighting the problem, "We don't really know if we are using a sledge hammer to drive in a thumbtack or a two-ounce hammer to drive in a railroad spike," comments Marv Goldschmitt, vice president of business development for Lotus Development Corp., Cambridge, Mass. "We hear estimates that, for every



Losses from software pilferage affect the entire channel of distribution.

The Interpreter

"We hear estimates that, for every legitimate software product sold, between three and 10 copies are made," says Marv Goldschmitt of Lotus Development Corp. "If that were the case, there would be a whole lot more personal computers in use than we thought there were."



MICROCOMPUTER SOFTWARE REVENUES SOAR

1983	\$1.5 billion
1984	\$2.3 billion
1985	\$3.6 billion
1986	\$5.5 billion
1987	\$8.1 billion
1988	\$11.3 billion
1989	\$15.3 billion

Source: International Data Corp.

As microcomputer software sales continue to grow, software publishers will become much more aggressive about controlling illegal duplication.

legitimate software product sold, between three and 10 copies are made. If that were the case, there would be a whole lot more personal computers in use than we thought there were." David Cole, president of Ashton-Tate, of Culver City, Calif., says of trying to estimate pilferage, "We [monitor] support telephone calls for redundant serial numbers. We track the requests for technical and customer support, and we see a huge volume of calls from people who have unauthorized copies of our software."

Cole, who also is head of the Microcomputer Software Association, believes the pilferer represents a bigger threat than the pirate, who duplicates for resale. Pirates are visible and easily prosecuted, while users who duplicate disks to share with friends may not even be aware they are committing a crime. They may view copying as a legitimate way to offset the cost of software, he says.

A strong motive for software copying is the feeling among many users that software is overpriced, and that software houses are all making "billions of bucks," says E. Ric Giardina, executive director and general counsel at MicroPro International Corp., San Raphael, Calif. "But the last several months' returns for major software companies have pretty much burst that bubble," he claims.

High-priced packages suffer most

Although high prices may fuel pilferage, the resulting losses, in turn, drive prices higher. Ashton-Tate's Cole figures that software prices could drop by as much as 30 percent if the industry were to wipe out pilferage.

Goldschmitt of Lotus warns that losses could drive prices even higher. "If we acted on the belief that the numbers being bandied about the marketplace on illegal disks are correct, then software could be priced at two to three times today's costs," he says.

Lotus and many other companies selling higher-priced business software report more pilferage than companies with products focused on the low end of the market. For example, Software Publishing Corp., Mountain View, Calif., which prices its top-selling PFS series of software in the moderate \$100 to \$150 range, claims to experience little trouble with illegal duplication.

Signe Ostby, director of marketing at Software Publishing, believes its packages' comparatively moderate prices and popularity with novice users discourage pilfering. "The more experienced users who go after products like Lotus 1-2-3 or WordStar are much more likely to break copy protection," Ostby says. "With our prices as reasonable as they are, users feel it makes sense to get their own copy of the software, complete with documentation, support and product upgrades."

Software vendors start to fight

Wiping out piracy and pilferage is a long road beset with legal issues, moral issues and technical problems raised by software-protection techniques. The Association of Data Processing Service Organizations (ADAPSO), the Washington, D.C.-based, non-profit trade association, is rallying its members to help control the software duplication problem.

In addition to committing \$70,000 toward software

Get the PDP's[®] DEC[®] Can't Deliver

We build the PDP's DEC can't. Sometimes, even the impossible ones. You get the quality and dependability of a DEC Q-bus and Unibus processor, enhanced with state of the art components from recognized leaders like Control Data, Fujitsu, Cipher, and Emulex. With our 11/73, 11/23+, 11/23, 11/24, 11/44 systems, you get performance simply not available from DEC. Each system is assembled and tested, then loaded with your choice of DEC and UNIX operating systems and applications. DEC maintenance is available. Call TOLL FREE now for a price on your impossible configuration.

CIRCLE NO. 49 ON INQUIRY CARD



Cambridge
Digital



**FREE
CATALOG**

800-343-5504

In Mass: 617-491-2700
In NY: 516-935-3111

**Cambridge
Digital**

DIVISION OF COMPUMART

The Edge in System Integration.

Dept. 7401, P.O. Box 568, 65 Bent St., Cambridge, MA 02139 Telex: 92-1401/COMPUMART CAM

*UNIX is a trademark of AT&T Technologies, Inc. DEC, PDP, Unibus, are trademarks of Digital Equipment Corporation.



**If you have one of these,
Infotron can have you
communicating data
in just 48 hours.**

**Modems and stat
muxes, to go.**

Infotron offers a complete line. And now, with our unique distributor warehousing program, we can have any of them on your doorstep within 48 hours of your call. 48 hours, max. Just say the word.



bility. Our statistical multiplexers handle from 4 to 32 channels in a range of models—with full provision for expansion.

All with the same high quality that earns us top marks in performance and reliability from our present users.

Add competitive pricing, and we start making real sense.

Then add our 48-hour delivery, and we're awfully hard to beat.

Full system flexibility.

Infotron modems combine advanced features and inherent reliability.

1-800-345-4636

**To find out more.
Your Infotron distributor.**

There are Infotron distributors nationwide, ready to give you more information, provide equipment and offer expert advice on the best way to meet your needs. For the name of the distributor near you, dial toll-free 1-800-345-4636 and ask for ISO. Or write Infotron Independent Sales Organization, 9 North Olney Avenue, Cherry Hill, NJ 08003.

**Infotron. First in
performance and reliability.**

CIRCLE NO. 50 ON INQUIRY CARD

 **INFOTRON** SYSTEMS

The Interpreter

"We [monitor] support telephone calls for redundant serial numbers," David Cole of Ashton-Tate explains. "We track the requests for technical and customer support, and we see a huge volume of calls from people who have unauthorized copies of our software."



protection issues this year, ADAPSO recently launched the Software Protection Fund, which plans to mount a major public relations and advertising campaign to increase public understanding of this problem. Founding contributions of \$50,000 each came from Ashton-Tate, Lotus, Microsoft Inc. and Sorcim Corp. ADAPSO is appealing to corporate decision-makers to audit pilferage within their organizations. "In many cases the chief decision-makers have no idea of the extent of software pilferage within their companies," Ashton-Tate's Cole states. To make users understand the seriousness of software pilfering, Cole says, they must see it as the moral equivalent of shoplifting. "People have to feel it's just as wrong to pilfer software as it is to take a package off the shelf and walk out without paying for it."

Legal protection gains strength

Legislative changes are also speeding the legal recognition of software pilferage as criminal. In 1980, copyright laws were amended to include software, but the scope of protection was unclear, according to Marybeth Peters, policy advisor to the register of copyrights. The judiciary has spent the last few years ironing out issues such as whether copyrights protect both source-code and object-code and whether programs embedded in ROM are covered, since ROM chips as tangible objects are subject to patent law. Court battles have led to decisions extending copyright protection to software in all these instances.

While many aspects of copyright law have been tested over the last few years, enforcement remains difficult. For example, one section of the law allows a user to make an archival or backup copy of a disk for personal use. Although additional copying is considered a violation, it is difficult for software publishers to find violators, Peters says.

'People have to feel it's just as wrong to pilfer software as it is to take a package off the shelf and walk out without paying for it.'

Introducing legislation

Promising help is bill H. R. 4646, introduced this year by Rep. Barney Frank, D-Mass., which is designed to increase the pursuit of offenders by raising the penalties for willful or criminal infringement of software copyrights. The bill proposes five-year jail sentences for those who make 65 copies of a program within 180 days. Those who make fewer copies could receive two years in jail and a \$250,000 fine. No companion bill has been introduced in the Senate, however, and H. R. 4646 is likely to languish in subcommittee for the remainder of this congressional session. Sources expect the bill to resurface next year.

While clearer laws and stricter enforcement should cut down on illegal disk duplication, legislation won't end the battle in the opinion of industry observers. "People will always break the law, no matter what it says, when it comes to something as easy as copying a disk," argues Kenneth T. Lim, an analyst for Dataquest, Cupertino, Calif.

Although methods to prevent disks from being copied are improving, they are far from perfect (MMS, April, Page 109). "Most of us do some sort of protection now, but the fence on the property hasn't been tall enough," Lotus' Goldschmitt quips.

One solution may lie in developing a basic software protection methodology. But it still should allow users to: copy software for backup; use both flexible and hard disks; use packages in a network and transfer them from one machine to another.

ADAPSO's approach is to define an overall protection context. Its Software Protection Committee is currently reviewing the design specifications of a protection mechanism it intends to place in the public domain that could be used for all popular machines, Ashton-Tate's Cole says.

Specific implementation will be left to software vendors. "We do not see everyone using the same protection," Lotus' Goldschmitt says. "But we do think that there are certain basic elements on the hardware side . . . that everybody would want."

Vendors also predict that the percentage of users capable of breaking copy-protection schemes will de-

The Interpreter

crease. "Certainly, as we move down the pyramid of sophistication to a wider user base, we are getting people less likely to break copy protection," MicroPro's Giardina, points out. Dataquest's Lim agrees: "The personal computer users who entered the market during the last two years are of a different breed."

Networks create additional problems

Although sophisticated protection devices are beginning to impede software pilferage, some additional areas for concern loom. "Unquestionably, there are problems to come with networking," says Ashton-Tate's Cole. One is determining how software from different suppliers will interface with various protection schemes. Cole cautions software publishers to be sensitive to the user's need for flexibility. "Users need to be free to select products from several different vendors without battling protection schemes that are fundamentally incompatible with one another."

On the positive side, Cole notes that network vendors are including features that will make it easier to protect software in the networked environment. For example,

local area networks being released this year will have unique serial numbers on board each station that can be used to limit access to software.

MicroPro's Giardina contends that software vendors can combat many of the pilfering problems networking presents only by emphasizing the advantages of ties between user and vendor. Since networking makes it possible to acquire software updates and instructions, it will be more critical than ever for software vendors to excel in service, Giardina says.

Lotus' Goldschmitt agrees that how a company supports its customers may ultimately be most important. "If we service our markets well and start shifting the value [from] the disk to the relationship with our company through support, then the problem will diminish," he says. "It will never go away—it will just be controlled." □

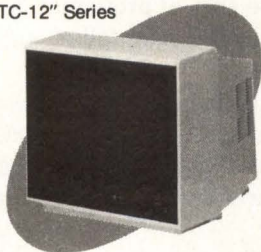
Interest Quotient (Circle One)
High 801 Medium 802 Low 803



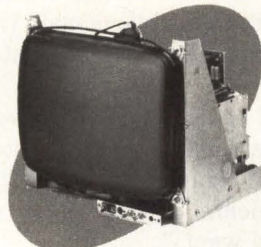
HIGH PERFORMANCE, VERSATILITY, VIVID COLOR, CRISP IMAGE TOEI COLOR DISPLAYS FTC/CDM — SERIES.

TOEI, experienced Display Monitor specialists, offer a wide selection of Color CRT Displays. You can choose from our versatile standard models or OEM versions to meet your exacting requirements.

FTC-12" Series



CDM-14" Series



FTC Series (Housed in lightweight, impact-resistant Cabinet)

Versions CRT Size	RGB Version	NTSC Version	PAL Version	NTSC & RGB Version	PAL&RGB Version	IBM PC Compatible only
12" (CRT Pitch)	FTC-1201-R* (0.47mm Stripe)	FTC-1200-N (0.64mm Stripe)	FTC-1200-P (0.64mm Stripe)	FTC-1201-NR (0.47mm Stripe)	FTC-1201-PR (0.47mm Stripe)	FTC-1203-1* (0.38mm Dot trio)
	FTC-1203-R* (0.38mm Dot trio)	FTC-1201-N (0.47mm Stripe)	FTC-1201-P (0.47mm Dot trio)			FTC-1208-1 (0.28mm Dot trio)
	FTC-1208-R* (0.28mm Dot trio)					
14" (CRT Pitch)	FTC-1423H-R (0.42mm Stripe)	FTC-1410H-N (0.52mm Stripe)	FTC-1410H-P (0.52mm Stripe)	FTC-1410H-NR (0.52mm Stripe)	FTC-1410H-PR (0.52mm Stripe)	FTC-1435-1 (0.39mm Dot trio)
	FTC-1435H-R (0.39mm Dot trio)	FTC-1416-N (0.64mm Stripe)	FTC-1416-P (0.64mm Stripe)			FTC-1455H-1 (0.31mm Dot trio)
	FTC-1455H-R (0.31mm Dot trio)					

Application/NTSC•PAL (Commodore•Apple II, IIe), RGM (IBM PC•Apple II, IIe, III•RGB TTL & Analog)

*FTC-1201-R, 1208-R: Applying for FCC Standard (Class B).

*through Interface-Module

*FTC-1203-R: Acquired FCC Standard (Class B). FTC-1203-R, 1203-1: Non-Glare

CDM Series (Unit for OEM)

Model	CRT Size	CRT Pitch
CDM-1208	12"	0.28mm Dottrio
CDM-1203	12"	0.38mm Dottrio
CDM-1201	12"	0.47mm Stripe
CDM-1455H-R	14"	0.31mm Dottrio
CDM-1435H-R	14"	0.39mm Dottrio
CDM-1423H-R	14"	0.42mm Stripe
CDM-1410H-R	14"	0.52mm Stripe

- Green/Orange CRT Displays are also available. (Included IBM Compatible.) CRT size: 9" or 12". Horizontal frequency: 15.75-64kHz. [15.75kHz version: acquired FCC Standard (Class B).]
- Conform to UL Standard.
- Special made products: Select Horizontal Frequency within 31-40kHz (Color), 24-64kHz (Monochrome). Models display providing with more than 640x400-dot-resolution are also available.
- We are looking for reliable and established distributor worldwide.

TOEI ELECTRONICS (MFG) CO., LTD.

[Japanese Name: Toei Tsusho Co., Ltd.]

Kanda Cent Bldg., 2-4, Yushima 1-chome Bunkyo-ku, 113 Tokyo JAPAN
Tel. (03) 257-1131 Telex. 0222-2555 TOEICO J FAX (03) 258-3560

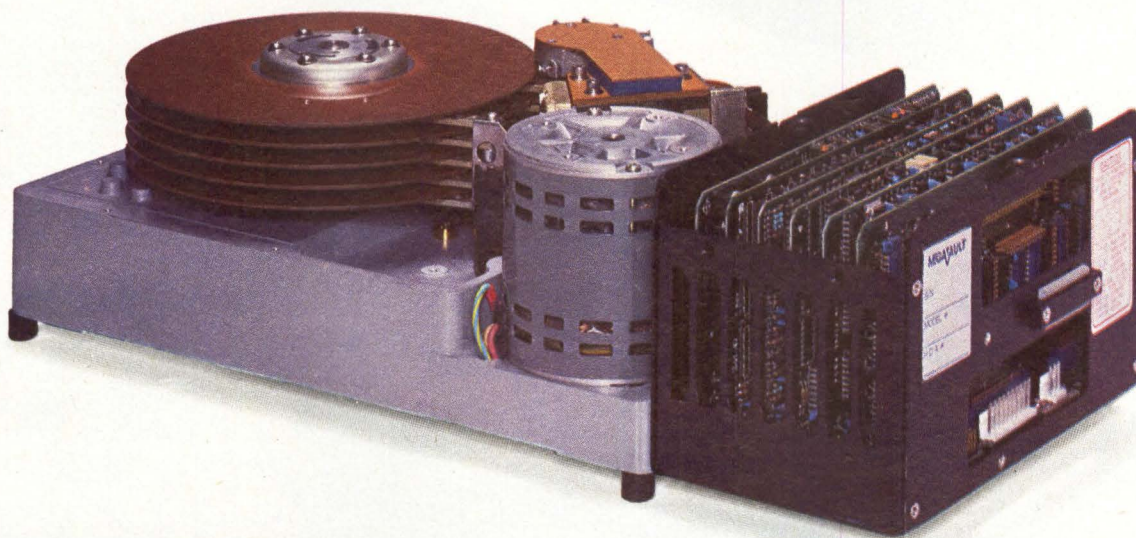
IBM PC is a Trademark of IBM Corp. Apple II, IIe, III are Trademarks of Apple Computer Inc.
Commodore is a Trademark of Commodore Business Machine Inc.

212 MB

8" Winchester Drives

■ SMD INTERFACE

■ SCSI INTERFACE



Yes! Our 212 MB, 8 inch Winchester drives are available in either SMD or SCSI interfaces immediately. Just send us your purchase order and we will ship your drives today. By the way, if 212 MB is just too large for your needs, we can ship 166 MB or 83 MB just as fast.

Call today:

MEGA V AULT

... a safe place for data

6431 Independence Avenue, Woodland Hills, CA 91367 (818) 884-7300 Outside California 1-800-MEGAULT

**DEC OFFERS EVERYTHING
YOU NEED TO BUILD A POWERFUL
Q-BUS COMPUTER SYSTEM.**

EXCEPT THIS.



It's called Cyclone™. A high-capacity, high-reliability Winchester/tape storage system that's priced to help you blow the socks off your competition.

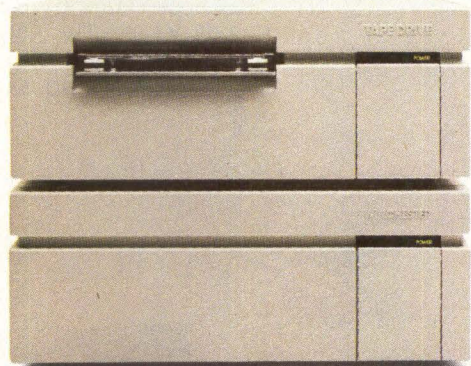
For starters, Cyclone's 5-1/4" Winchester packs formatted capacities from 36 up to 120 megabytes.

So you can sell your Q-Bus based systems (PDP®-11/23, 11/73, MICRO/PDP-11 and MicroVAX) into applications that require large amounts of storage. While providing the lowest cost per megabyte.

But, of course, we couldn't just offer you the highest capacity for the lowest price.

Rather, Cyclone is just what you'd expect from the leader in DEC®-compatible storage.

For instance, its controller



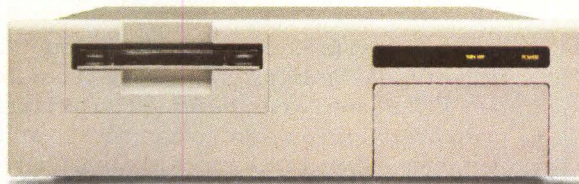
Our attractive StacPac version can be expanded to include a 6-slot backplane module.

takes data off the Winchester at non-interleaved speeds. So your system provides faster throughput.

And Cyclone's access times are twice as fast as a DEC RLO2's.

When it comes to integration, Cyclone won't slow you down one bit. It's compatible with DEC's Digital Storage Architecture (DSA), so you don't have to make a single software patch.

Even the 1/4" tape cartridge



The ever-popular rackmount model gives you tape and disk storage in one unit.

system is software compatible. It emulates DEC's TSV05/TS-11 so you can run your DEC utilities like BRU, PIP, and SAVRES. Plus it puts a day's work on a single 1/4" tape cartridge. Instead of a supply room full of floppies.

Cyclone's good looks also make you look good. For your commercial customers, it's available in our tabletop StacPac™ version. And for scientific or industrial environments, Cyclone is rackmountable.

Finally, Cyclone features HyperDiagnostics™, the industry's most comprehensive self-diagnostic system. So troubleshooting's a breeze. And our Customer Service Hotline and Rapid Module Exchange program make it easy for you to keep your customers in business.

To see what Cyclone can do for your Q-Bus system, call the Qualogy sales office nearest you. And watch the competition's socks fly.

QUALOGY

Formerly Data Systems Design

Eastern Regional Sales: Norwood, MA (617) 769-7620. Southcentral Regional Sales: Dallas, TX (214) 980-4884. Northcentral Regional Sales: Chicago, IL (312) 920-0444. Western Regional Sales: Santa Clara, CA (408) 727-3163. Distributors Worldwide. Corporate Headquarters: 2241 Lundy Avenue, San Jose, CA 95131

™Cyclone, StacPac, Rapid Module Exchange and HyperDiagnostics are trademarks of Qualogy, Inc. *DEC, PDP and MicroVAX are registered trademarks of Digital Equipment Corporation. © 1984 Qualogy, Inc.

CIRCLE NO. 53 ON INQUIRY CARD

The PC Plotter: It will change the way business looks at graphics.

The lowest-priced professional plotter on the market today is Houston Instrument's new four-pen PC Plotter. It is designed to produce the crisp graphics you need to compete — and communicate — in business. Just what makes this plotter so competitive? Let's take a look:

Price — A multi-pen, compact, single-sheet plotter at \$595* isn't just a low price — it's an unbelievably low price. What an affordable way to link the power of graphics communication to your personal computer.

Performance — Yours and Ours — Until the PC Plotter was born, it was too expensive to let the pictures do the talking. Now that's no longer true. So, the next time the boss walks into the office needing some "nice charts and graphs," you can quickly fill the request with clean, colorful, wonderful graphics. Who knows, you might even get a raise!

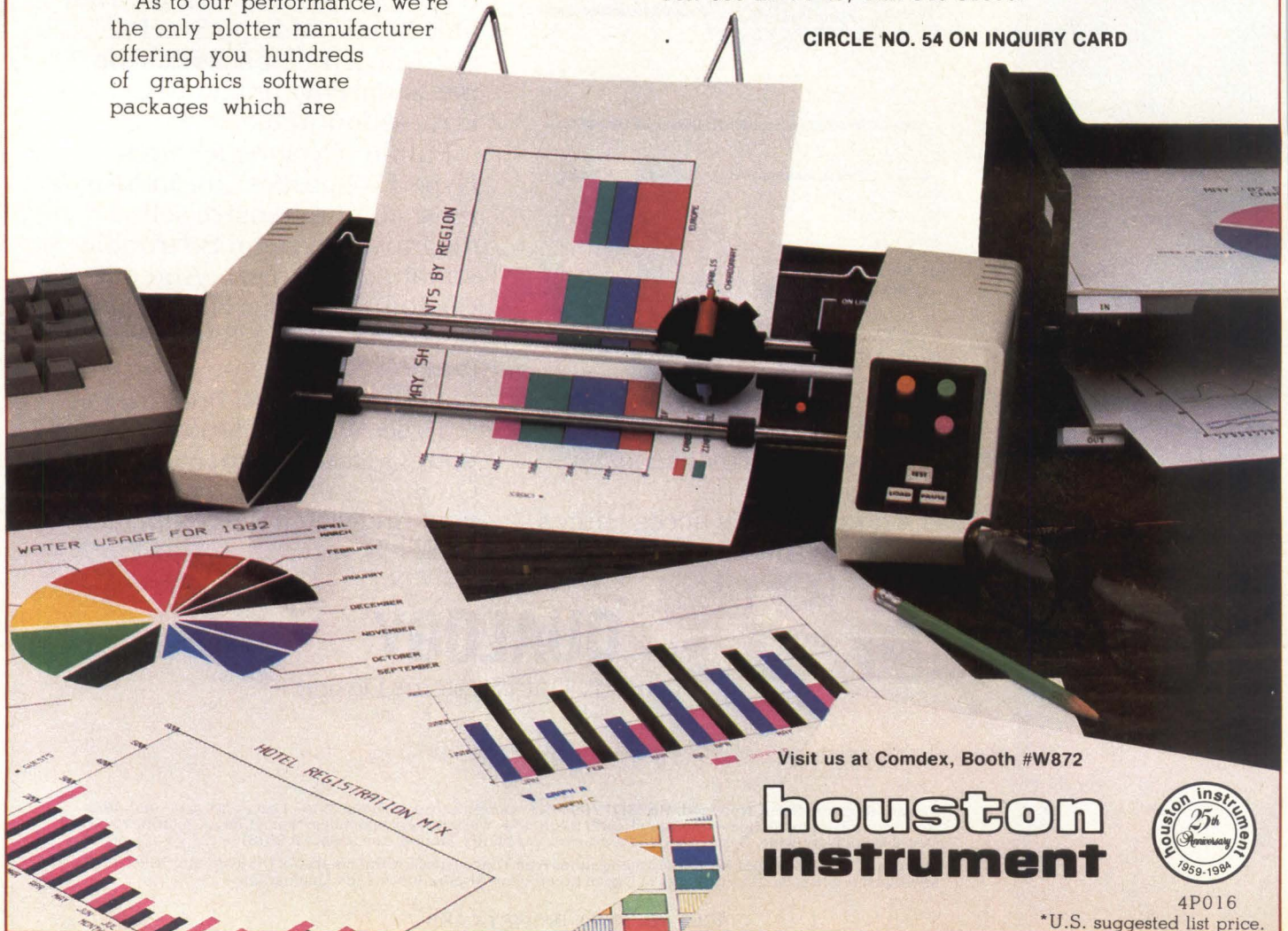
As to our performance, we're the only plotter manufacturer offering you hundreds of graphics software packages which are

compatible with the PC Plotter. That means you can produce any type of drawing you require.

Flexibility — Depending on your needs, you can select from two PC Plotter models. One (PC Plotter Model 595 for \$595.00*) allows you to produce graphics or overhead transparencies on 8½" × 11" paper or film; the other (PC Plotter Model 695 for \$695.00*) permits either 8½" × 11" or 11" × 17" graphics. And we didn't forget the OEM. Houston Instrument will work with you to configure a plotter that's perfect for your particular application.

For the name of your closest PC Plotter distributor or dealer, contact Houston Instrument, P.O. Box 15720, Austin, Texas, 78761 or call (512)835-0900. Outside Texas call 800-531-5205. In Europe, contact Houston Instrument, Belgium NV., Rochesterlaan 6, 8240 Gistel, Belgium. Tel. 059-27-74-45, Tlx. 846-81399.

CIRCLE NO. 54 ON INQUIRY CARD



Visit us at Comdex, Booth #W872

**houston
instrument**



4P016

*U.S. suggested list price.

The Interpreter

Utility software streamlines program development and operation

No longer simple scraps of code, software utilities are becoming integral to development languages and operating systems

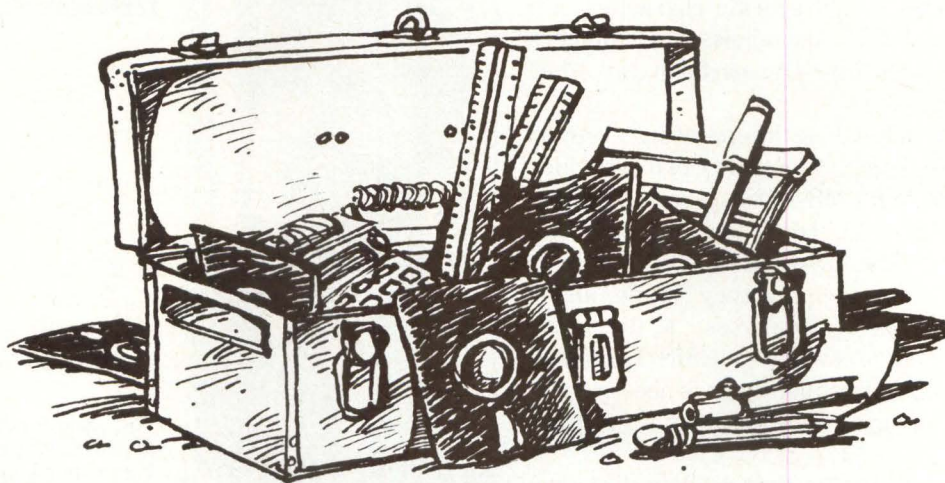


Illustration by Jon McIntosh

Carl Warren, Western Editor

Serving as specialized tools for software development, utility programs are maturing into complex applications. In addition, utility software—ranging from simple sorting algorithms and routines that control peripherals, to screen generators that define complex data formats—has become integral to many development languages and operating systems.

The most representative example of the integration of utilities as part of system software is the UNIX operating system. In fact, UNIX could be described as a superior set of utilities composing a rich software-development environment. "The key to achieving a high level of program productivity is the environment. UNIX provides this by incorporating a wide range of utilities that take the burden off the programmer," says Robert Anton Byers, an independent software engineering consultant based in Lacrescentia, Calif.

But admiration for UNIX tools is not unanimous. "Because UNIX has been around for a long time and universities and the scientific community have been encouraged to use it, a lot of functions have become

part of the total UNIX environment," observes Don Baccus, president of Oregon Software Inc., Portland, Ore. But longevity doesn't imply superiority, he contends: "Clearly, many UNIX utilities taken alone are inferior to those found as separate products on the commercial market. Each utility in UNIX represents the capabilities of its creator. Thus, the quality varies."

Because so many UNIX utilities exist, though, many computer manufacturers are migrating toward UNIX—not only to provide a powerful operating environment but also to ease software development. One such company is SGS Semiconductor Corp., Phoenix, Ariz. Director of systems Jean-Claude Monney contends that UNIX has spared the company from many extra hours of programming. "We make serious use of the system-level utilities UNIX provides," he says. "Because we have in-depth knowledge of both the system hardware and UNIX, we can enhance the operation of the software. For example, our word-processing software makes use of the UNIX utilities for sorting and for a spelling dictionary."

Despite the praise, Monney is quick to note weaknesses among the operating system's 120 utilities. For

The Interpreter

example, SGS had to modify the tool that allows UNIX machines to communicate. "Since this is basically a public-domain program, it had some problems that we [legally could] fix, and now we have a powerful tool in the utility library," explains Monney.

Building special-purpose tools

Besides containing a large library of integrated utilities, UNIX lets programmers create other utilities to solve specific problems. UNIX's command-language utility, another integrated function, also provides this capability and includes pipes and filters that can redirect output and delete or add specific characters, including control codes. UNIX also allows programmers to call additional utilities that can perform yet other actions during piping.

Such tools are now appearing in operating systems besides UNIX. For example, Microsoft Corp., includes many UNIX concepts in its MS-DOS operating system and its IBM PC version, PC-DOS. Programmers can use functions built into the MS-DOS/PC-DOS environment to create utilities much as they would under UNIX, comments Richard Steincross, a free-lance hardware engineer and president of RMS Laboratories, Long Beach, Calif., "Frequently, it is necessary to create a new tool," he says. "The result is a function-specific utility."

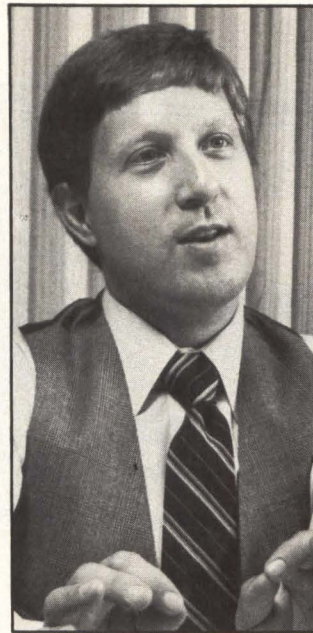
For example, a simple utility that reads a directory and pipes data to a blank portion of a disk could be specified under MS-DOS/PC-DOS as "COPY *.* NUL" and could command the system to write all files to a null area of memory. Programmers can just as easily create tools to sort files and direct them to other devices. That's the beauty of a utility-oriented operating environment, Steincross and Byers emphasize. "No matter how good the utility library is, there is never exactly the function needed for a unique situation," says Byers. "Therefore, having the ability to create exactly what is needed is important. UNIX and similar operating systems such as MS-DOS provide that capability."

Languages establish the environment

Many software experts contend that programming languages establish the development environment. Removing the programmer from "the intricacies of the machine" is the "goal of a modern high-level language," says Dave Cloutier, vice president of marketing for Oregon Software Inc. of Portland, Ore., which creates Pascal compilers for Digital Equipment Corp. (DEC) machines.

The task is no longer as simple as creating a compiler, he maintains, and developers need the help that only specialized utilities can give. "Now, we concern our-

"The key to achieving a high level of program productivity is the environment. UNIX provides this by incorporating a wide range of utilities," says software consultant Robert Anton Byers.



For some functions, especially those requiring maximum speed, it is more logical to use system utilities than to create new application program utilities, comments Richard Heaps, director of marketing for Oracle.

selves with how to properly document the source code, manage the program in the creation process, locate points that need to be optimized and locate bugs. Thus, we have to create other utilities that handle these functions," Cloutier explains. "In some cases, they are an integrated part of the compiler, and, in others, separate programs."

One product Oregon Software has created to improve programmer productivity is Pascal-2, for DEC's VAX and MicroVAX computers running the VMS operating system. The key to Pascal-2's implementation is that it remains the same across a variety of machine types, so linking, compiling, editing and debugging facilities remain consistent. The company also provides other elements of a complete development environment, including a range of supporting utilities. For example, its Profiler utility allows users to pinpoint where the CPU is spending most of its time, thus allowing the code to be optimized to enhance CPU operation.

In yet another approach, DSS Development Inc.,

A
MINICOMPUTER
NETWORK
CAN INCREASE
YOUR
PRODUCTIVITY.

OR YOUR
PHONE BILLS.



Most companies experience the same thing when they start tying remote terminals to their minicomputer.

Much higher phone bills.

But now there's an inexpensive solution to that costly problem: The new Codex 6002 Intelligent Network Processor.

This low-cost multiplexer will save you money even if you're using as few as two terminals. The 6002 boosts operating efficiency, reduces the number of needed lines and protects data from errors due to line disturbances. And it can handle any mix of up to 16 asynchronous "terminals", including graphics terminals, word processors and personal computers from virtually any manufacturer.

Plus, only with the 6002 can you add asynchronous equipment without worrying if your multiplexer is compatible or not. So not only will it save you money now, but also later as your network grows and grows.

The Codex 6002 Intelligent Network Processor. It's just one of our many products that enable minicomputer users to develop and efficiently manage a growing network.

To learn more about the 6002, call 1-800-821-7700, ext. 892. Or write: Codex Corporation, Dept. 707-92, 20 Cabot Boulevard, Mansfield, MA 02048.

codex

 **MOTOROLA INC.**
Information Systems Group

What Lear Siegler Does Best We Also Do Special.



As standard products or OEM specials, Lear Siegler video display terminals convey the look and feel of quality your systems deserve.

With Lear Siegler terminals as your primary operator interface, your products will be more attractive, more reliable, easier to use, and more marketable than ever.

We will custom tailor Lear Siegler's superior performance, ergonomic design and exclusive High Touch™ style to meet your exact requirements—from simple logo changes to

completely unique terminal designs and proprietary firmware. Our dedicated OEM sales



Complete OEM design, engineering, assembly and testing are performed at Lear Siegler's Anaheim, CA. facility.

and engineering groups are terminal experts who specialize in serving your needs. And they're backed by Lear Siegler's proven experience and reputation as an OEM supplier.

Call or write today for complete information on how Lear Siegler's OEM capabilities can work for you.



LEAR SIEGLER, INC.
DATA PRODUCTS DIVISION

901 E. Ball Road Anaheim, CA. 92803
(714) 778-3500

The Interpreter

Bloomfield, Conn., creates applications with help from utilities in the environment created by Lotus Development Corp.'s Lotus 1-2-3 integrated package. Although 1-2-3 is usually described as an application package, some programmers argue that it's a specialized software-development language. DSS company president Ian A.R. Boyd explains that 1-2-3 shoulders the burden of sorting and of manipulating data in the data file, much as a high-level language does.

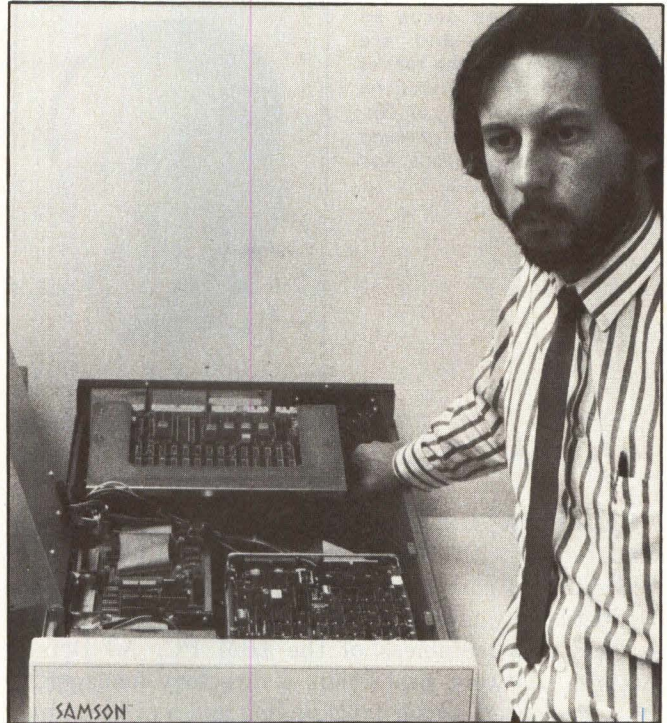
Utilities improve performance of other software

Software developers can often enhance a program's performance by taking advantage of features in both computer operating systems and languages, contends Richard Heaps, director of marketing for Oracle Corp. The Menlo Park, Calif., company makes the Oracle, a database-management system. What we call Oracle is really two things: the database kernel and a set of utilities that allows manipulation of the data file," says Heaps. "In some cases, we rely on the [operating] system to provide us with certain functions. In the VAX world, this is possible, and we can rest easy [knowing] that system functions such as 'index' will remain relatively stable from one VAX installation to another. The problem occurs when you plan to be portable across many machines. As a result, you have to build various utilities into the application."

Even though it thwarts consistency, using existing operating system utilities is sometimes more logical than creating new application program utilities, Heaps says. This is true especially when maximum speed is required. However, because operating system utilities differ—even among UNIX implementations—the application will be less portable, requiring the software developer to modify it for each type of machine. When speed is less critical, embedded application program utilities, such as screen builders maintain, portability across many machines.

Some software tool makers create a development environment by providing a complement of operating systems, languages and high-level utilities that function together. One company following this philosophy is Digital Research Inc., Pacific Grove, Calif. Defining a utility as an aid to programmer productivity, Lowell Wolf, a Digital Research product marketing manager, points to productivity as a key issue for the software industry. "The growth of the industry hinges on the number of skilled programmers," he says. "We can provide tools to leverage the growth." Modern software tools, Wolf explains, are actually combinations of many simpler tools.

Both Wolf and Oregon Software's Baccus assert that tools, especially utilities, are worthless unless they are



"We make serious use of the system-level utilities UNIX provides," says Jean-Claude Monney, director of systems for SGS Semiconductor.

easy to use. "We have spent a great deal of time ensuring that our products have a simple learning curve," claims Wolf. Toward that end, Digital Research has developed a standardized environment, which retains much consistency from one kind of computer to another. "We try to remove the learning-curve obstacle," says Wolf. "As a result, we are putting more emphasis on the user interface. This isn't for end-user consumer products, but for development tools."

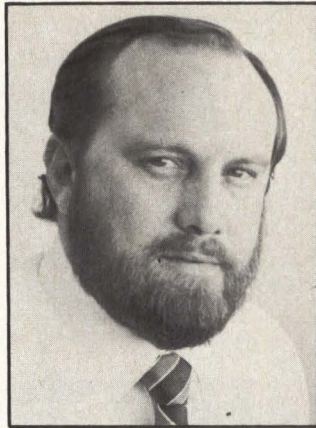
In addition, Digital Research is—like Microsoft—creating standard utility tools that enable software writers to locate problems quickly. The company also plans to include these utilities in supersets of development languages. "These 'super languages' don't currently exist," Wolf states, "but they are the next step up the ladder."

A 'building-block' approach helps

Even now, developers can save time by using a standard set of products from one vendor to create an application. To this end, Digital Research has developed a series of tools that can be linked to create applications. "By providing the proper tools, we can improve the overall productivity of a programmer," claims Wolf.

The Interpreter

"Today's utilities serve as complements to—and are complemented by—the rest of the system," says Touchstone Software president Larry W. Dingus, insisting that the dividing line between applications and utilities is disappearing.



Chas-Moore Inc., Bakersfield, Calif., is taking a similar tack with its XT-Driver, a series of utilities. According to company president Charles Moore, the product is not just a utility; it is also an application that extends the usefulness of the IBM PC. XT-Driver features password protection, a directory manager, a message center, a user-tracking log and a programmable calculator.

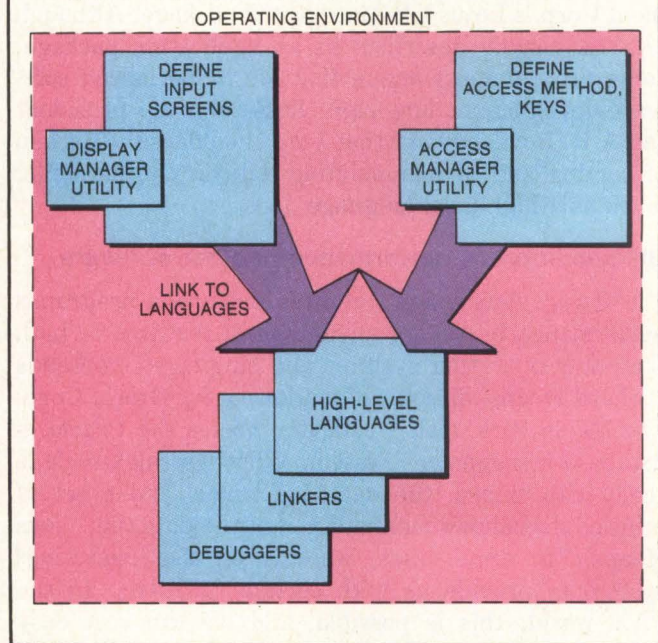
Still another company building packages from small utility modules is Softcraft Inc. The company's BTRIEVE file-management system combines such utility functions as sorting, file compression and key indexing. Moreover, BTRIEVE/N incorporates local area network handlers with file lockout and multikey access.

Have utilities become applications?

Utility software has so matured that the dividing line between utilities and applications is blurring. Because these tools are so vital to the total system, many software developers are creating products based on utility functions that work with other applications. Examples include the products from TouchStone Software Corp., Seal Beach, Calif. According to company president Larry W. Dingus, the company's aim is to improve the usefulness of the computer. Stressing the overlap between applications and utilities, he notes: "Today's utilities serve as complements to—and are complemented by—the rest of the system."

Bernd Walter, president of Advanced Software Technologies, Bloomfield, N.J., concurs. "A utility serves the role of a system assistant and, as such, must be carefully integrated into the development strategy." Walter agrees that utilities are becoming more application-like and, as a result, now often include features to make them easier to use. For example, in creating the Micro/VERSAL utility program, which reads and

TODAY'S UTILITIES PERMIT MODULAR DEVELOPMENT



Sophisticated utilities let programmers use software modules to build applications. Digital Research's library of tools includes display and access manager utilities that quickly define ways to input data and manage it in data files. By providing links between utilities, languages and operating systems, the library maintains continuity.

writes more than 20 types of 5¼-inch CP/M-80, CP/M-86 and MS-DOS disk formats, his company decided to include a menu-user interface, rather than producing just a bare-bones software tool. Micro/VERSAL also provides developers with disk-handling routines that can be customized to handle "foreign," or unknown, formats.

The future of utility software is unclear. What is clear is that the trend to free programmers from dealing with the basic machine, by creating a programming environment. "It has been the goal of the computer industry to remove the programmer from the machine for the last 20 years," says Oregon Software's Baccus. "Therefore, it is incumbent on us, the tool makers, to help create an abstract programming environment... by developing sophisticated high-level languages." Rather than simply creating utilities, he emphasizes, "We are trying to improve the utility of the machine." □

Interest Quotient (Circle One)
High 804 Medium 805 Low 806

In microcomputers today, UniSoft sets the standard.

AT&T has recently been advertising that their UNIX™ operating system will be the standard OS for microcomputers. That's true. But if you want AT&T's UNIX software on micros today, talk to UniSoft Systems.

UniSoft has been delivering AT&T's UNIX adapted for 68000-based microcomputers for two years. More than 75 different computer systems run the UniSoft software, UniPlus+.™ At each Bell release level, all these systems are object code compatible. This means that applications software developed on any UniPlus+ system will work on any other. This is where software portability pays off.

UniSoft enhances Bell's vanilla UNIX with the best features from the Berkeley BSD research version of the UNIX operating system. IP/TCP networking, record and file locking, and virtual memory from UniSoft turn UNIX into a commercial product. All this added value is still Bell-compatible.

Don't wait six months to get System V running on your hardware. UniSoft's customers can ship it now.

If you're building or selling a 68000-based UNIX system, your operating system should come from UniSoft Systems, the UNIX experts.

UniSoft
S Y S T E M S

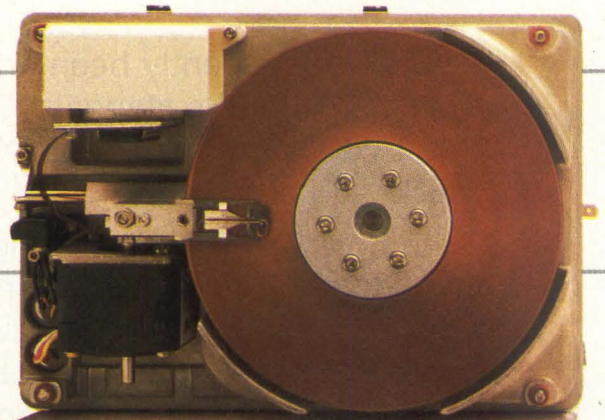
THE BERKELEY PORT AUTHORITY

*UNIX is a trademark of Bell Laboratories

739 Allston Way, Berkeley, CA 94710 • (415) 644-1230
TWX II 910 336-2145 • UUCP ucbvax!unisoft!unisoft

There Are Only Two Things New Tested Pairs

The Testing.

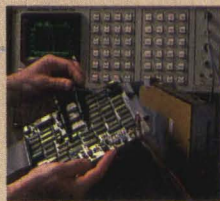


OEMs face major problems trying to decide which hard disk drives to build into their microcomputer systems. What with the wide range of drives, and so many hidden costs associated with evaluation, testing and integration, the process

becomes a time-consuming and costly hassle.

But there's a way out—from the company that's helped solve OEM disk controller integration problems more often and over a longer period of time than anybody in the business. That company is Xebec.

From standard-setting to vertical integration, from heavy investment in computer-aided design to the total commitment to the most automated manufacturing technologies, Xebec has demonstrated its leadership position in supplying micro-computer storage solutions.



Tested Pairs. The Guaranteed Match.

With its new tested pairs program, Xebec solves a major industry problem: post-delivery drive failure when interfaced to the controller. Having to do "after

the fact" drive testing for many of our OEM customers, we have decided to offer a "before the fact" program. We'll guarantee quality and reliability by assuring a match between our zero defect controllers and a choice of drives in different capacities and form factors.

It's simple. Tell us which drives you're considering and we'll test them on Xebec-designed equipment against the most rigorous standards in the industry. Standards we at Xebec have set. Then we'll tell you which of our controllers is the best match for that drive—or we'll customize a controller for you—and accelerate your time to market.

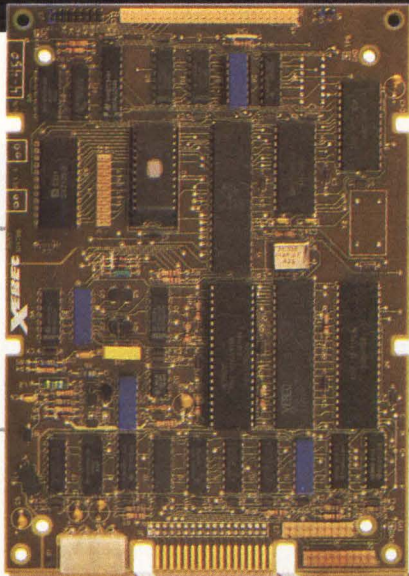


The Edge In Controller Technology.

Xebec controllers are well known as the best in the industry. Their single-board designs incorporate MOS microprocessors and the latest standard cell and surface mount IC technology. Compatible with standard interfaces, our controllers have set the pace with sophisticated data separation, advanced error detection and correction, hard-fault isolation, a high-level

CORPORATE HEADQUARTERS
2055 Gateway Place, Suite 600
San Jose, California 95110 U.S.A.
(408) 287-2700

That Distinguish Xebec's Storage Solutions.



And The Pairing.

command set and other performance and reliability features.

Now these superior controllers can be paired with high-quality, Xebec-qualified drives. And you save time and money on evaluation engineering, incoming inspection, and service—while gaining a single-source, single purchase order solution to disk drive integration.

The Front Line Of Drive Testing.

We were recently asked to design and build a disk drive tester for one of the world's largest OEMs. We'll be using that tester to analyze disk drive performance for you. Full environmental testing, including shock and vibration. Full functional testing at elevated temperatures, with read/write tests at marginalized voltages. Careful calculation of hard and soft bit error rates. Complete checking of FCC and other agency emission standards. We'll make sure any drive meets its stated specifications and performance and quality claims.



How Xebec Does It. And Why.

Xebec can offer its tested pairs service to OEMs because of our commitment to quality. Zero defect quality symbolized by our "Xero D" signature and demonstrated by our superior computer-aided design, manufacturing and testing. Our talented people. Our experience. That's *how* we can provide high-quality products for prices no more than products that deliver a lot less.



Why offer our tested pairs? Why originate a new concept in quality? Enlightened self-interest. Because if we don't, someone else will. Frankly, we want to continue to enjoy the benefits of our leadership position as much as our customers do.

Call Xebec today. Pair up with one of our representatives to find out more about how Xebec tested pairs can benefit you.

Xero D.

XEBEC
The Quality Investment

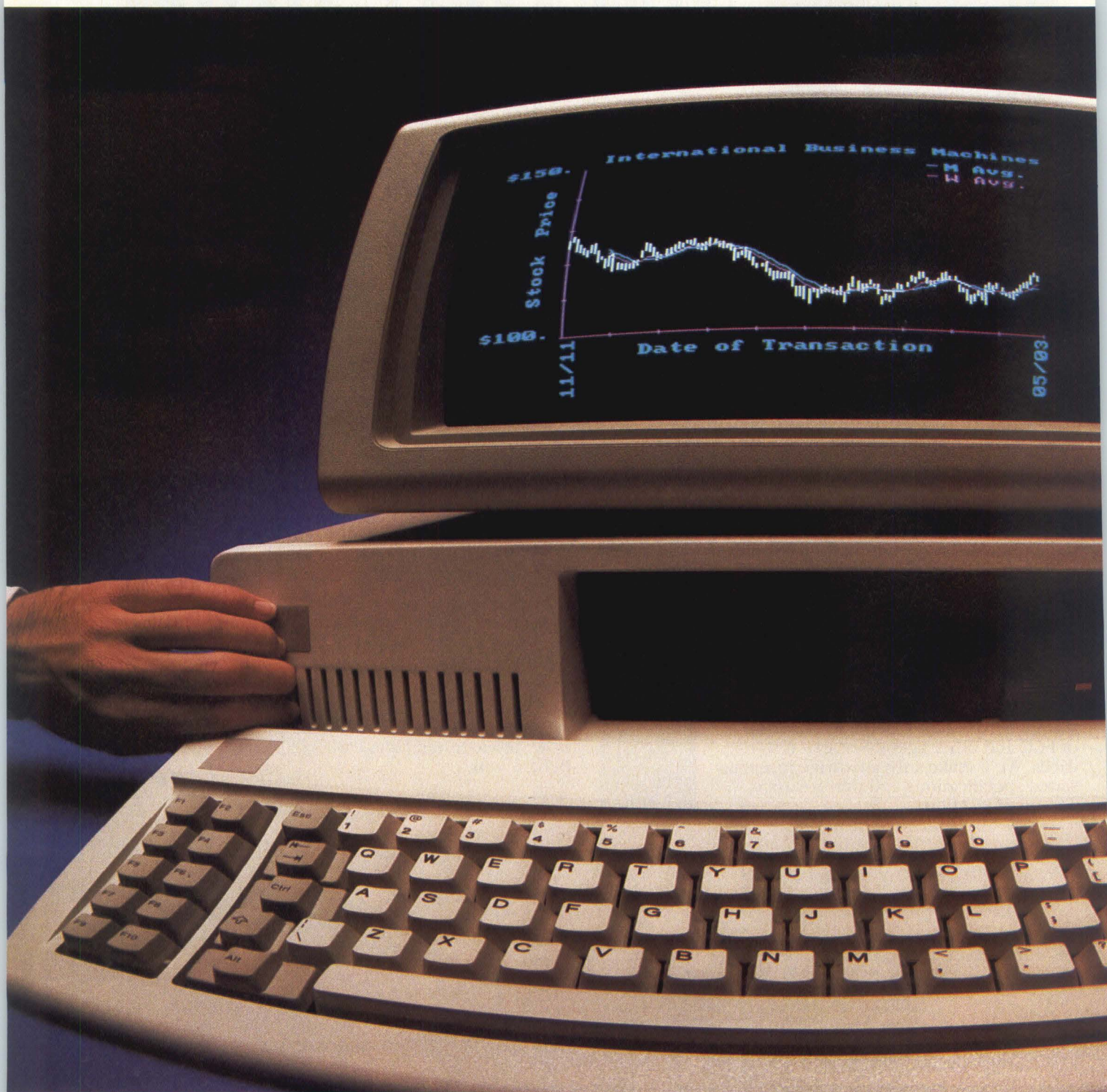
SALES, INTERNATIONAL,
Belgium
32-02-762-9494
England
44-734-693511
Italy
39-6-350201

SALES, U.S.A.
Sunnyvale, CA (408) 733-4200
Irvine, CA (714) 851-1437
Atlanta, GA (404) 457-9872
Boston, MA (617) 740-1707
Dallas, TX (214) 361-0687
Baltimore, MD (301) 992-7377
Federal (301) 621-3010
Chicago, IL (312) 931-1420

U.S.A. AND CANADA DISTRIBUTORS
Kierulff
Hamilton-Avnet
Avnet Electronics
Hamilton Electro Sales

CIRCLE NO. 57 ON INQUIRY CARD

HOW TO STRETCH A PC TO CREATE NEW MARKETS.



OR EXPAND EXISTING ONES.

When is a PC not a PC? When you turn it into a personal data base cruncher. Or a personal graphics workstation. A personal image processor. Even a personal signal processor.

You can do all that and more with the Marinc board pictured below. It's your key to unlocking new opportunities and new markets.

Power to the PC.

We've put array processor technology to work to supercharge the PC. Suddenly a spectrum of applications that were beyond that PC's capabilities are wide-open possibilities.

If your strength is software, the Marinc array processor gives you incredible performance improvements. Even the most complex spreadsheets can ripple faster than you can say 1-2-3. Enormous data bases can search, sort and report in the blink of a cursor. And high speed arithmetic calculations which slow a standard PC down to a crawl are performed in split seconds.

If you're a systems integrator, VAR or OEM looking for a competitive advantage, a PC with a Marinc array processor is a natural line extension, enabling you to offer a cost-effective "personal" version of your best-selling product.

The Race Is to the Swift.

The Marinc array processor is especially flexible and easy to program. So you can get to market quickly. Which, after all, is the name of the game.

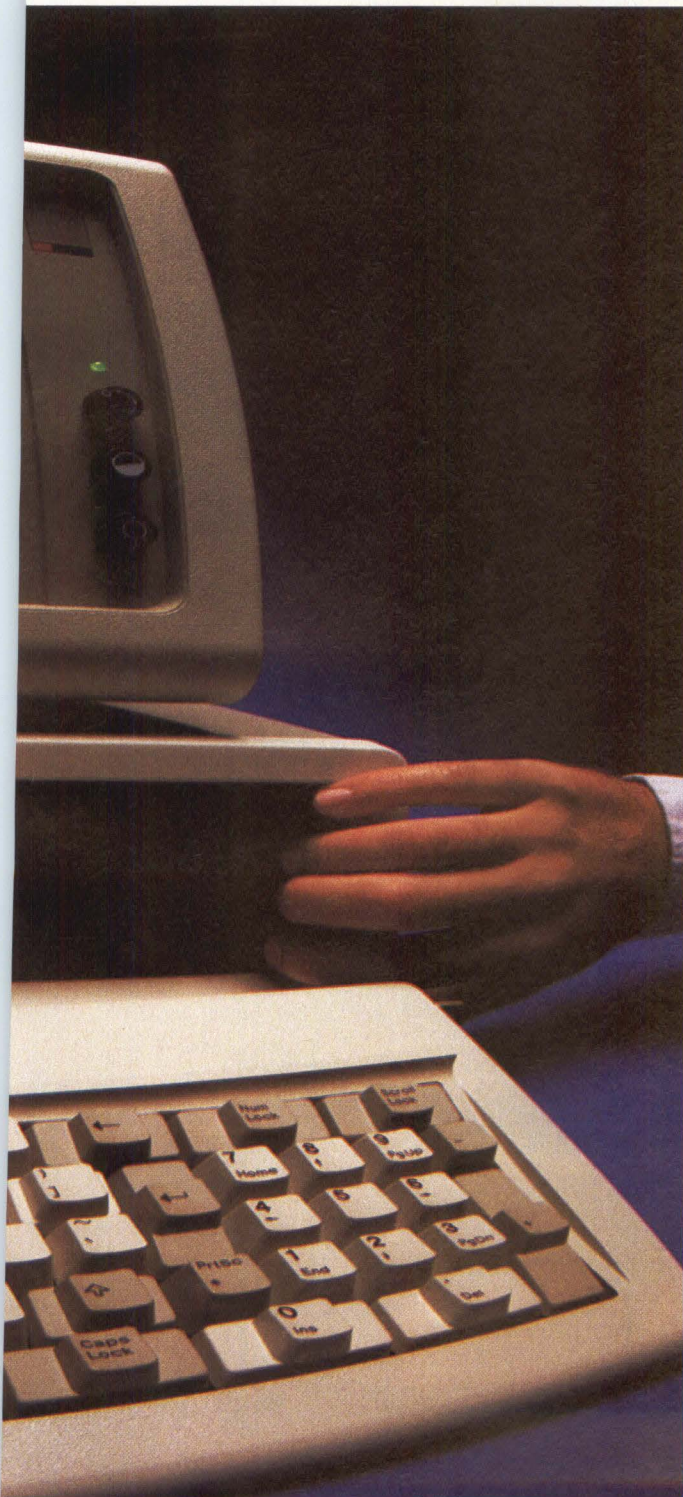
We could fill pages with pertinent performance specs on our PC-compatible array processor. So we did. We've put together an 8-page brochure that will stretch your imagination. And just might open a world of opportunity. Write for a copy. Marinc Computer Products, a Helionetics company, 3878 Ruffin Rd., San Diego, CA 92123. Or call 1-800-421-4807, in CA (619) 268-4814.

Marinc array processors include a 24-bit floating point board with optional IEEE-754 compatibility and a 16-bit integer-only board for maximum price/performance.



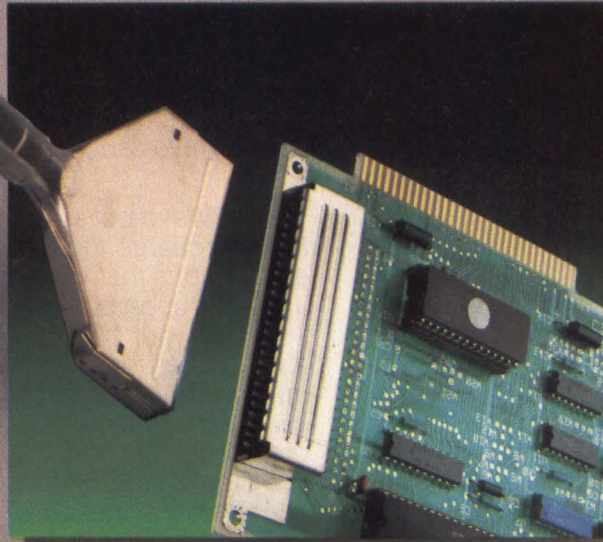
MARINCO

CIRCLE NO. 58 ON INQUIRY CARD



SCSI.

Four letters that let you hook any host...



to any peripheral.

Presenting SCSI. Small Computer Systems Interface. An interface standard that lets you connect small computers with virtually any peripheral device — even those still on the drawing board. Without overhauling your hardware and software. So the best can go with the best, period — not the best of what's compatible.

SCSI works by masking the internal structure of the peripherals from the host. It uses an eight-port bus which can accommodate either single- or multiple-host systems. Its impressive transfer rate of 1.5 Mbytes per second allows direct copying between devices, too. Freeing the host for more important work. And giving it lots of power for lots of I/O activity.

In developing SCSI as a truly versatile standard interface, the American National Standards Institute (ANSI) enlisted some of the best minds in the industry — including more than a few from NCR-Wichita.

NCR is the undisputed leader, too, in designing and manufacturing SCSI components. We offer a complete line, from host adapters for Multibus and

IBM PC architecture to ST-506 and SMDO disk controllers to PERTEC and QIC-02 tape controllers. We've also made numerous advancements in reducing the size of the components — and in reducing their price.

And this same quality of expertise in applications engineering is available to our OEM customers, as well.

SCSI is changing the face of system integration. And NCR has been there all the way. With capacity and technology second to none... and a century of quality behind us.

If you want to know more about what SCSI can do for you, call NCR at 1-800-325-SCSI.

SCSI products from...

NCR

Engineering & Manufacturing / Wichita, KS 67226

The Integrator

CMOS provides a cost-effective solution for harsh industrial environments

Although slightly more expensive than NMOS, CMOS technology can be a better choice for factory applications requiring low power dissipation and portability

Steven McGinness, National Semiconductor Corp.

Board-level monitoring systems for applications in harsh industrial environments—such as pipeline monitoring and control, food processing and robotics—must meet demands different from those of office systems. Unlike systems in clean, air-conditioned offices, factory systems must be capable of high uptime in widely fluctuating temperatures and continue to work during power failures. Developers of these systems must also consider such matters as power dissipation and form factor.

To meet the needs of factory environments, developers of industrial systems traditionally choose N-channel

metal-oxide semiconductor (NMOS) technology because of its high level of performance. However, it is not cost-effective for all applications. What's more, because NMOS devices are so power-hungry, they are infeasible for applications requiring portability.

An alternative—but traditionally more expensive—choice for industrial environments is complementary metal-oxide semiconductor (CMOS) technology. A drawback of CMOS is that it permits fewer devices within a die area, thus requiring more space per board and more boards. However, thanks to the scaling down of the CMOS designs, newer CMOS circuits are nearly as compact as—and only slightly more expensive than—NMOS circuits.

CIMBUS BEATS MULTIBUS FOR FACTORY APPLICATION

MULTIBUS SOLUTION		CIMBUS SOLUTION			
Costs	Comments	Parameters	Comments	Industrial costs	Commercial costs
\$1,843	3 0 C to 55 C (32 F to 131 F)	No. of boards Operating temperature range	6	\$3,209 -40 C to +85 C (-40 F to +185 F)	\$2,310 0 C to 70 C (32 F to 158 F)
159	NEMA 4 115W	Enclosure Power dissipation	NEMA 4 9W	112	112
190		Card cage		295	295
30		Installation*		15	15
554		Power supply	not required	0	0
15		Installation*	(integral to electronics package)		
48		Cooling fans	not required	0	0
15		Installation*			
12		Vents and filters	not required	0	0
15		Installation*			
1,300	uninterruptible power supply	Backup source	battery	65	43
	1 hour	Backup time	24 hours		
\$4,181		Total costs		\$3,696	\$2,775

* Installation costs include the hourly rate of assembly personnel, plus the burden of employing them (health and insurance benefits, holiday pay, etc.). Hourly rate used is \$5, and burden rate is 200 percent.

Source: National Semiconductor Corp.

A CIMbus monitoring system required more boards than a Multibus system would have, but using CMOS chips eliminated the need for installing a separate power supply and heating and cooling equipment.

The Integrator

Building a factory-monitoring system

Developers at National Semiconductor Corp. performed an internal comparison of a Multibus application using NMOS and an application using the company's CMOS industrial microcomputer bus (CIMbus). The CIMbus is a synchronous bus with 64 lines replicating about 30 of the functions of National's NSC800 microcomputer bus, while adding required timing and control signals. It incorporates a system-level, fail-safe timer that informs the rest of the system whenever the microcomputer fails. This allows the other boards to reset, disengaging machinery in an orderly way.

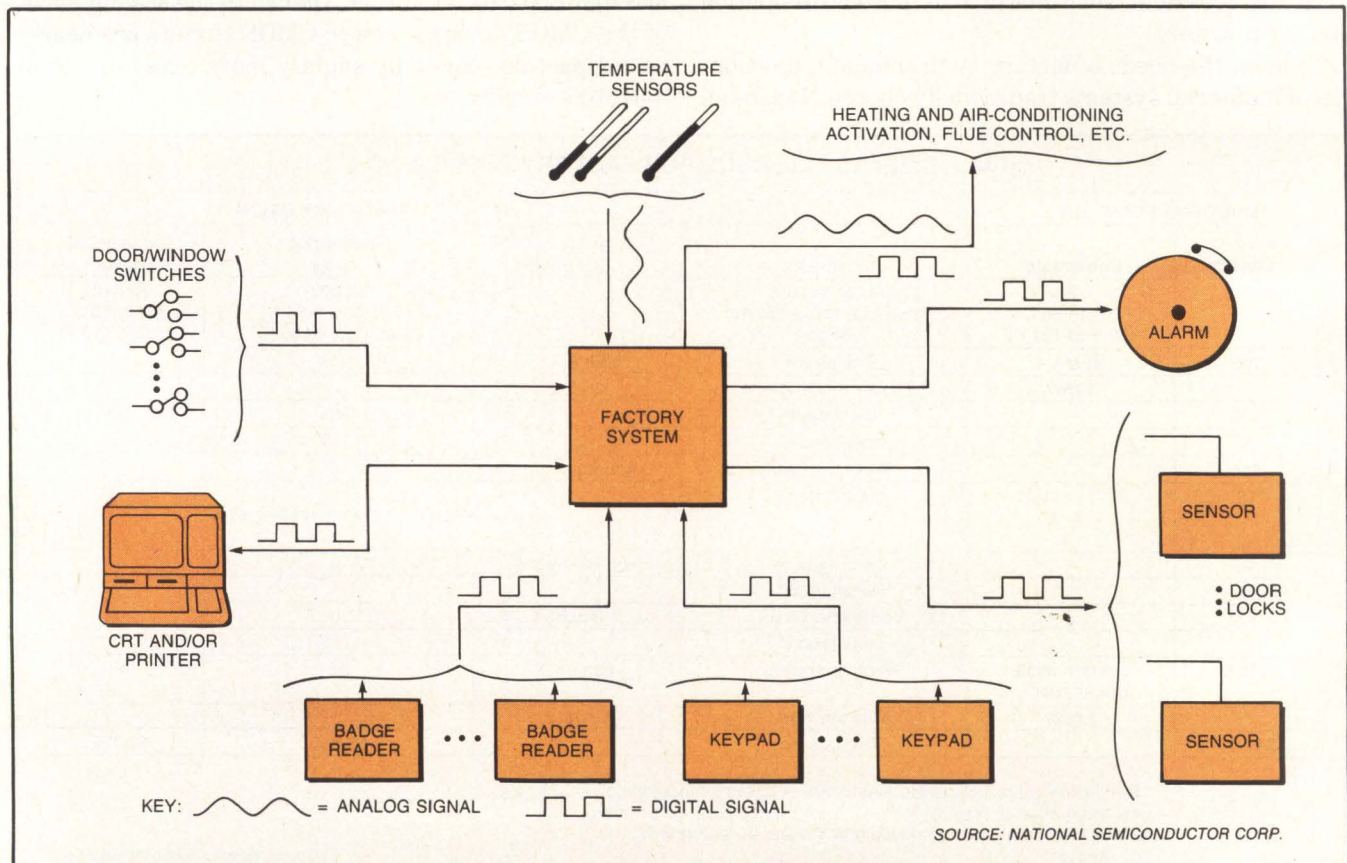
The developers of the board-level industrial monitoring system at National wanted it to provide two basic functions: to monitor a factory environment and to provide intruder-alarm and entry control. Specifically, the system had to monitor temperature sensors, heating and air-conditioning systems, the flue angles in the building's ventilation system, the magnetic switches on all doors and windows and the door locks and intrusion alarms. It also had to allow data entry via badge

readers and keyboards and the setting and resetting of entry-authorization codes. In the event of a power failure, the system had to continue to run the alarm and entry-control functions.

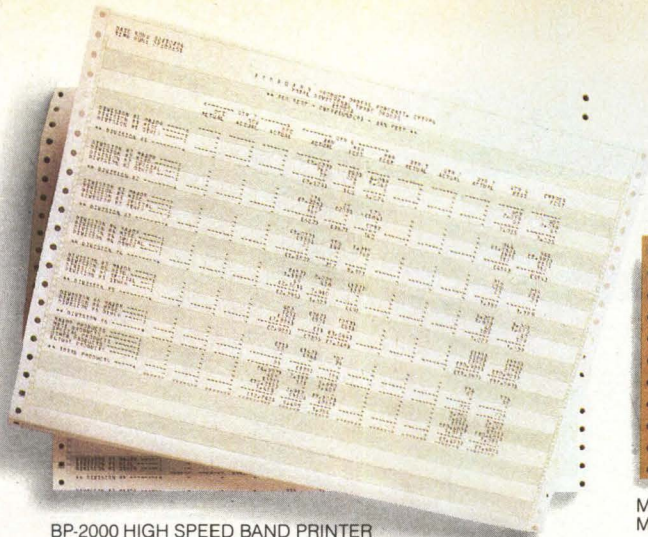
To perform all these tasks, the factory-monitoring system required a CPU for system control, RAM to store variable data such as environmental parameters and authorization codes, and PROM and ROM to store the CPU control program. It also required digital I/O to support the interfaces to the magnetic switches, door locks and alarms. A serial port was needed to interface with the CRT and the printer, to allow changes of environmental parameters and authorization codes and to monitor and log the system's activity. Digital-to-analog converters controlled the flue angle in the ventilation system, and analog-to-digital converters ran the temperature-sensor interfaces.

Lower power dissipation means less equipment

One advantage of CMOS chips is that they dissipate less power and thus can be more densely packed with



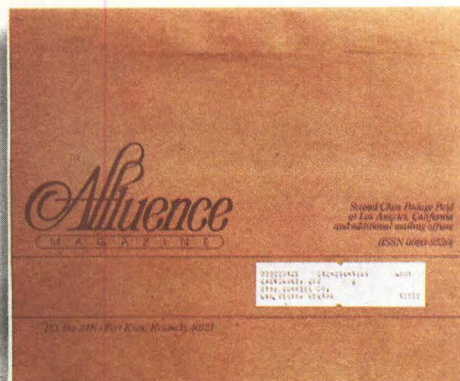
In this factory-monitoring system, developed internally at National Semiconductor Corp., a CPU provides system control. A serial port interfaces with the CRT and the printer and allows changes of environmental parameters and authorization codes. Digital-to-analog (D/A) converters control the flue angle in the ventilation system, and analog-to-digital (A/D) converters control the temperature-sensor interfaces.



BP-2000 HIGH SPEED BAND PRINTER



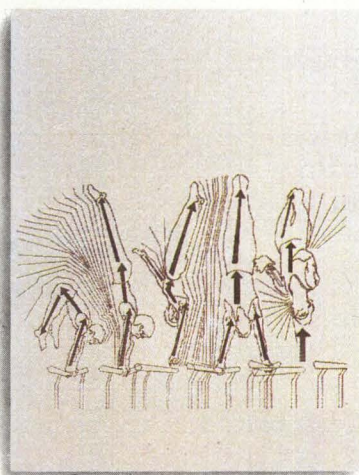
M-100L MATRIX PRINTER



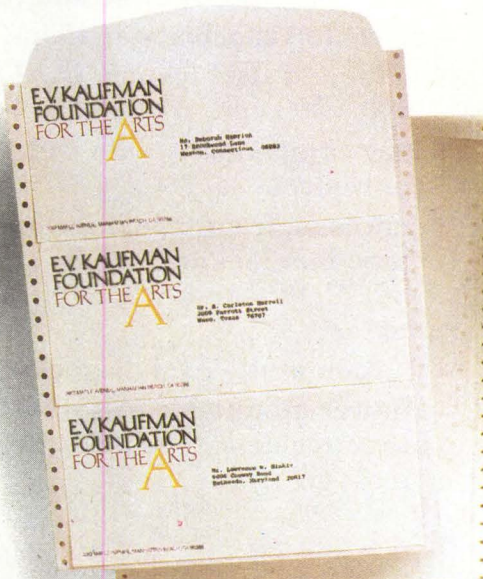
B-600 MEDIUM SPEED BAND PRINTER



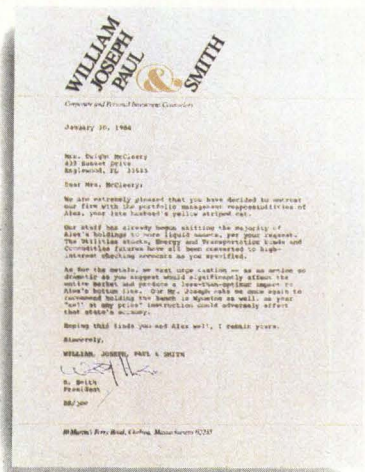
8010 MATRIX PRINTER



8020 MATRIX PRINTER



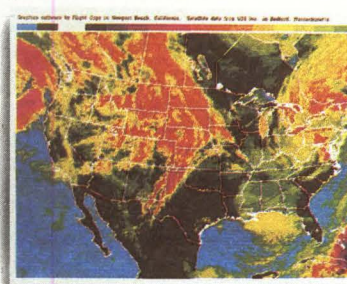
DP-55 DAISYWHEEL PRINTER



DP-35 DAISYWHEEL PRINTER



8050 MATRIX PRINTER



8070 MATRIX PRINTER



M-120 MATRIX PRINTER

...and so on.

CIRCLE NO. 60 ON INQUIRY CARD



Dataproducts printers.
Nobody puts ideas on paper so many ways.

DATAPRODUCTS CORP., 6200 CANOGA AVE., WOODLAND HILLS, CA 91365. (818) 887-3924. IN EUROPE, 136-138 HIGH ST., EGHAM, SURREY, TW 20 9HL ENGLAND.

PPC's FS-1000 Series Vindicator 1/2 inch streaming tape drive is the definitive answer. It brings you the high reliability, proven performance, and field support you need and expect from the company that has set world-wide tape standards.

The FS-1000 Series offers:

- Capacities from 46 to 138 megabytes for high performance disk backup, data storage and archival retrieval.
- Streaming speeds of 50 and 100 ips.
- Start/stop capability at 25 ips.
- ANSI and IBM format. Dual-density, 1600/3200 cpi.
- Plug compatibility with widely available controllers.
- Autoload, front tape insertion. Automatic hub locking and tape threading with 7", 8 1/2" and 10 1/2" reels, 1.5 or 1.0 mil tape.
- Built-in multi-level diagnostics.
- Drawer mountable. Also available in attractive desk-top enclosure.



Your Best Backup... Inside and Out.

FS-1000 Series 1/2 inch streaming tape drives are the ideal choice for disk backup and data storage. Uniquely designed, and backed by PPC's broad experience and commitment to excellence. Write, call or TWX for detailed technical data.

**The FS-1000 Series...
Your Design Solution
Any Way
You Look At It.**



**PERTEC
PERIPHERALS
CORPORATION**

CIRCLE NO. 61 ON INQUIRY CARD



9600 Irondale Ave./Chatsworth, CA 91311/(818) 882-0300/TWX: (910) 494-2093
Toll Free Numbers: 800-821-4126 (in California) 800-443-9577 (outside California)

The Integrator

transistors than can conventional NMOS chips, without needing special packaging. In tests on 8-bit CPU boards for the Multibus (using NMOS chips), STD-bus (using NMOS chips) and CIMbus (using CMOS chips), National Semiconductor found that the Multibus has a power dissipation of 20W; the STD-bus, 7.5W; and the CIMbus, 0.3W. In comparing the two solutions for this specific implementation, power dissipation using the CIMbus is 9W, while that of the Multibus system is 115W.

IN TYPICAL CPU BOARDS, CMOS HAS THE EDGE			
Parameter	Multibus	STD-bus	CIMbus
Technology	NMOS	NMOS	CMOS
Temperature range	0 C to 55 C (32 F to 131 F)	0 C to 55 C (32 F to 131 F)	-40 C to +85 C -40 F to +185 F
Board size (in.)	6¾ x 12	4½ x 6½	3.9 x 6.3
Supply voltage	+5V, ±12V DC (regulated)	+5V, ±12V DC (regulated)	10V to 17V DC (unregulated)
Power dissipation (watts)	20	7.5	0.3
Speed (MHz)	2 to 5	2 to 5	1 to 4
Connector type	card edge	card edge	pin-in-socket

Source: National Semiconductor Corp.

For a typical CPU board, the advantages of CMOS technology over NMOS include lower power dissipation and operation across wider temperature ranges. Comparisons were made using data relevant to commonly available CPU boards as close to each other in functionality as possible.

Using NMOS technology would give the system higher performance, but at the cost of high power dissipation. The heat thrown off requires the use of larger, more expensive enclosures, cooling fans, vents, filters and refrigeration systems. In fact, because NMOS dissipates so much power, sealing off NMOS boards from the environment with special heat-resistant packaging could in some applications cost more than the electronics being protected.

The system developers found that the total cost of a CMOS-based system was lower than that of a comparable NMOS system because of money saved by eliminating costly packaging and heating and cooling equipment. Simplifying the system also increases its reliability and reduces documentation and training required for maintenance. What's more, low power dissipation means that boards can be more inexpensively sealed off from the environment in locations requiring intrinsically safe electronics, wash-downs or corrosion resistance. Thus, CMOS is more cost-effective not only

because it eliminates the need for some system components but also because it reduces the costs of hardware installation and cabinet modification.

CIMbus boards are 69 percent smaller than Multibus boards, and the CMOS-based factory-monitoring system required six of them to the NMOS implementation's three. The larger boards can incorporate more functions, but the developers questioned whether they needed that much functionality. If not, they argued, why pay for it? The CIMbus uses the single-width Eurocard format, which measures approximately 3.9 by 6.3 inches. In contrast, Multibus boards measure 6¾ by 12 inches, and STD-bus boards measure 4½ by 6½ inches.

CMOS survives extremes, uses less power

Another problem the developers encountered was the existence of extreme temperatures in industrial environments. Because typical NMOS boards can operate only in temperatures from zero to 55 degrees Celsius (32 to 131 degrees Fahrenheit), they may need elaborate cooling or heating equipment. For example, many process-control systems are housed in refrigerators to allow NMOS electronics to survive the ambient heat.

The developers did not need to add heating and cooling equipment, however, when they used CMOS technology because CMOS circuits operate in temperatures from minus 40 to plus 85 Celsius (minus 40 to plus 185 Fahrenheit). This translated into a 25 percent wider operating range, eliminated the use of heating or cooling equipment and reduced the reliability and maintenance problems that industrial users most want to avoid.

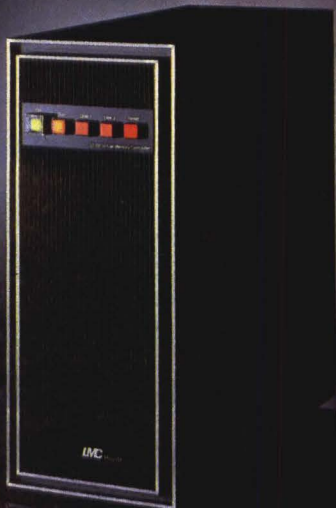
Separate power supply not required

Closely allied with the problem of maintenance in industrial applications is the need for power backup systems so that industrial processes can continue to perform in the event of a power failure. Industrial environments also require the use of portable equipment. Had the system developers used NMOS boards, they would have had to purchase an uninterruptible power supply to support the intruder-alarm and entry-control functions in the event of a power failure. An uninterruptible power supply, with prices starting at around \$1,300, would provide only 1 hour of full operation and would not be highly portable.

The developers found the power requirements of CMOS chips to be so low that they did not need to use a separate uninterruptible power supply. Instead, the CMOS-based system used a small lead-acid battery

The Integrator

An uninterruptible power supply, with prices starting at around \$1,300, would provide only 1 hour of full operation and would not be highly portable.



LMC's 32-Bit Virtual Memory MegaMicro Is The-State-Of-The-Art UNIX Microcomputer

LMC's 32-bit MegaMicro provides mainframe or super-minicomputer performance at prices competitive with today's far less powerful 8- and 16-bit microcomputers. This is made possible by use of the next generation of logic chips—the National Semiconductor 16000-series. LMC MegaMicros incorporate: the NS16032 central processing unit which has true 32-bit internal logic and internal data path configured on the IEEE 796 multibus; demand-paged virtual memory implemented in hardware; and hardware 64-bit double-precision floating-point arithmetic.

The LMC MegaMicro is supplied with HCR's UNITY* which is a full implementation of UNIX** and includes the Berkeley 4.1 enhancements to take advantage of demand-paged virtual memory. Also included are C and FORTRAN. Typical multi-user systems with 33 megs. of fast (30 ms. average access time) winchester disk storage, a half meg. of RAM, virtual memory, hardware floating-point arithmetic, UNIX, C, and FORTRAN 77 are available for \$20,000 (and even less with quantity or OEM discounts).

* UNITY is a Trademark of Human Computing Resources.

**UNIX is a Trademark of Bell Laboratories.

LMC MegaMicros *The Logical Alternative™*

LMC

The Logical MicroComputer Company

4200 W. Diversey, Chicago, IL 60639 (312) 282.9667



A member of The Marmon Group of companies

See us at Comdex Fall in Las Vegas
CIRCLE NO. 62 ON INQUIRY CARD

that—for \$65—supplied sufficient backup power for 24 hours.

The CMOS system required a voltage-regulator board, a DC-to-DC switching converter that allowed the system to use unregulated DC power, and a battery-charger board that monitored the discharge rate and output voltage of the external battery. These boards, in conjunction with a 10V to 17V battery and an external 24V DC power supply, essentially provided a portable, low-cost, uninterruptible power supply that users could simply plug into the card cage. The developers did not have to add any more emergency equipment because the system was capable of full operation whether or not the primary power source was present.

The developers found that an NMOS implementation of the monitoring system would cost \$4,181—\$485 more than if they had used the \$3,696 CMOS. This included the costs of electronics, the enclosure and its required modifications; the time of the draftsmen who generated the assembly drawings and of the manufacturing personnel who assembled and tested the system; and the other costs of constructing the system. It excluded the devices with which the system interfaced. Thus, the system developers concluded that the harsh environment and need for portability made using CMOS more economical than NMOS, although CMOS was more expensive on a function-by-function basis. □

Steven McGinness is product marketing manager for OEM microcomputer products at National Semiconductor Corp., Sunnyvale, Calif.

Interest Quotient (Circle One)
High 807 Medium 808 Low 809

NEXT MONTH IN MMS

The Integrator section of Mini-Micro Systems will profile a computer-aided publishing system that allows professional quality typesetting, graphic arts and paste-up to be achieved in house. The system integrates a 32-bit microcomputer with high-resolution graphics, multiple-font text-processing and business-graphics software.

World's largest
local distributor
with 49 locations
stocking the finest
lines of electronic
components and
computer products

TWO-MILLION-AND-TWENTY-SIX REASONS YOU SHOULD BUY...

ALABAMA
Huntsville (205) 837-7210

ARIZONA
Phoenix (602) 231-5100

CALIFORNIA
Avnet, L.A. (213) 558-2345
Avnet, S.F.V. (818) 700-2600
Avnet, O.C. (714) 754-6111
Hamilton, L.A. (213) 558-2121
Hamilton, S.F.V. (213) 558-2323
Hamilton, O.C. (714) 841-4100
Sacramento (916) 925-2216
San Diego (619) 571-7510
San Francisco (408) 743-3355
San Gabriel (714) 989-4602

COLORADO
Denver (303) 779-9998

CONNECTICUT
Danbury (203) 797-2800

FLORIDA
St. Petersburg (813) 576-3930
Miami (305) 971-2900
Orlando (305) 628-3888
Melbourne (305) 725-2700

GEORGIA
Atlanta (404) 447-7507

ILLINOIS
Champaign/Urbana (800) 625-8654
Chicago (312) 860-7700

INDIANA
Indianapolis (317) 844-9333

KANSAS
Kansas City (913) 888-8900
Wichita (800) 532-6720

KENTUCKY
Louisville (800) 428-6012
Lexington (800) 543-4783

MARYLAND
Baltimore (301) 995-3500

MASSACHUSETTS
Boston (617) 273-7500

MICHIGAN
Detroit (313) 522-4700
Grand Rapids (616) 243-8805

MINNESOTA
Minneapolis (612) 932-0600

MISSOURI
St. Louis (314) 344-1200

NEBRASKA
Lincoln/Omaha (800) 255-6702

NEW JERSEY
Fairfield (201) 575-3390
Cherry Hill (609) 424-0100

NEW MEXICO
Albuquerque (505) 765-1500

NEW YORK
Long Island (516) 231-9800
Syracuse (315) 437-2641
Rochester (716) 475-9130

NORTH CAROLINA
Raleigh (919) 878-0810

OHIO
Cleveland (216) 831-3500
Columbus (614) 882-7004
Dayton (513) 433-0610

OREGON
Portland (503) 635-8831

PENNSYLVANIA
Philadelphia (215) 831-1300
Pittsburgh (800) 321-6890

SOUTH CAROLINA
Columbia (800) 334-1597

TEXAS
Dallas (214) 659-4111
Houston (713) 780-1771
Austin (512) 837-8911

UTAH
Salt Lake City (801) 972-2800

WASHINGTON
Seattle (206) 453-5844

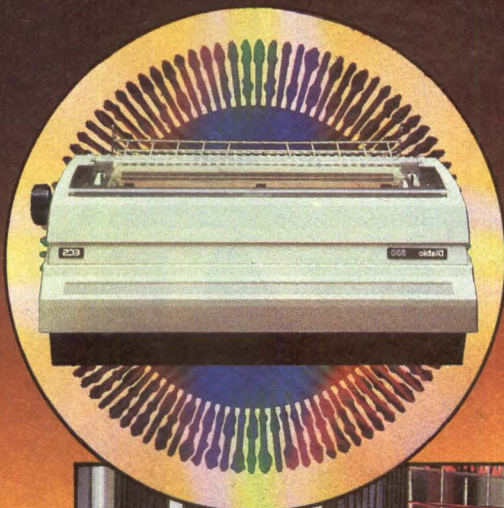
WEST VIRGINIA
Charleston (800) 543-4783
Huntington (800) 543-4783

WISCONSIN
Milwaukee (414) 784-4510

INTERNATIONAL EXPORT
Los Angeles (213) 558-2441
New York (516) 997-6868
Telex 66-4329

CANADA
Toronto (416) 677-7432
Montreal (514) 335-1000
Ottawa (613) 226-1700
Calgary (403) 230-3586
Vancouver (604) 272-4242

JAPAN
Tokyo (03) 662-9911



...DIABLO from HAMILTON/AVNET

Reasons 1—2,000,000: Our dollars invested in Diablo printer inventory typically add up to \$2 million at any given time. That means we always have more than enough Diablo printers on hand to fill requirements like yours. When you call Hamilton/Avnet, your printers can be on their way in an instant, without waiting for delivery from the factory.

Reasons 2,000,001—2,000,026: Our location near you; our Demonstration Centers; our Diablo evaluation units that you can try online with your system; our factory-trained Computer Product Specialists; our full line of system-level products; our system support services; including system integration and testing; our knowledge of mil-spec requirements, including TEMPEST, our Diablo spares and supplies program; our Leasing Program, offering terms to meet your financial needs; our volume discounts for OEMs;

our free luggage bags for interested prospects; maintenance contracts and warranties that give you access to 92 Xerox Service Centers; our complete library of literature and support materials; our computerized inventory management system; our own communications network between branches; our excellent communication with Diablo factories; our Used Equipment Department for spectacular one-shot deals; our accurate responses to your inquiries; our fast, dependable service; our dependable delivery; our track record for customer satisfaction, our technical seminars; the resources and support of the Fortune 500 Avnet corporation; our pride in maintaining our position of world leadership; our stability—to ensure that you are supported long after your Diablo purchase; and our continual development of better ways to serve you.

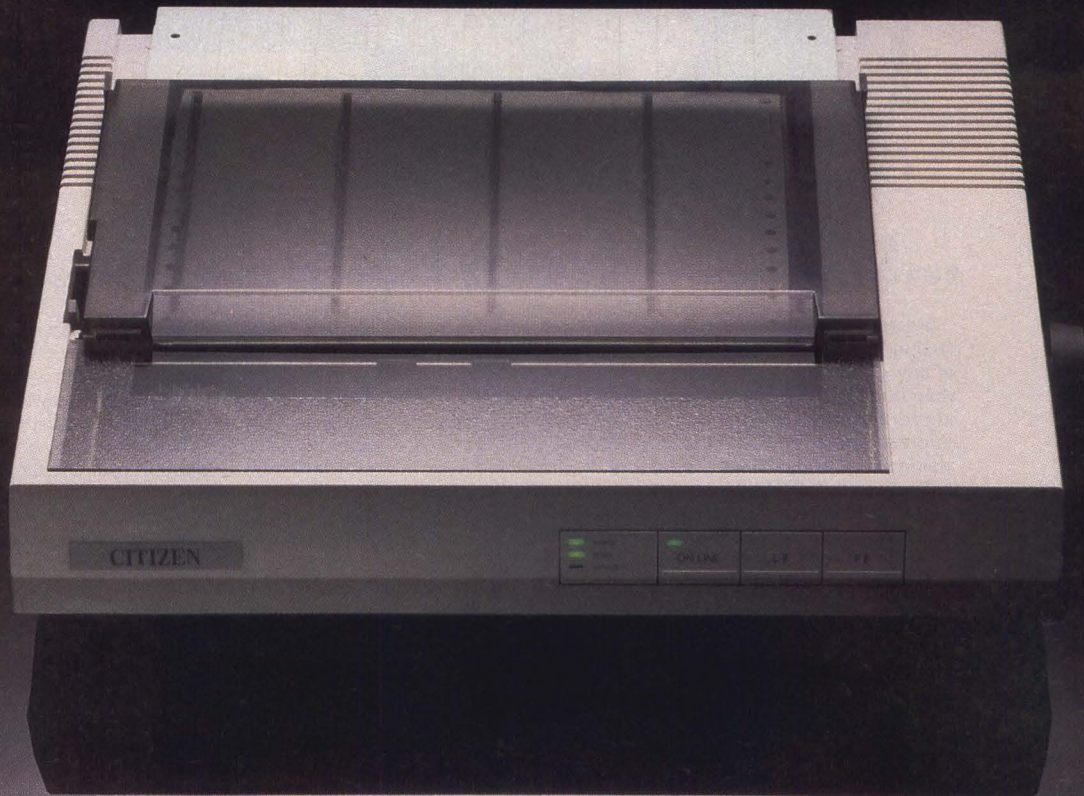
CIRCLE NO. 63 ON INQUIRY CARD

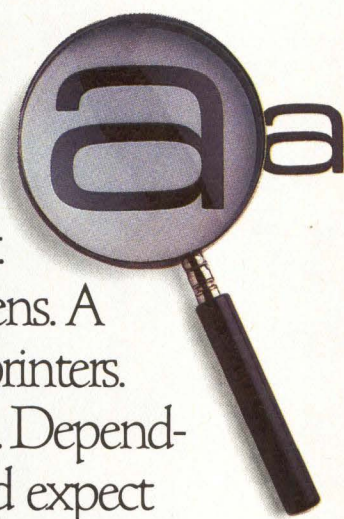
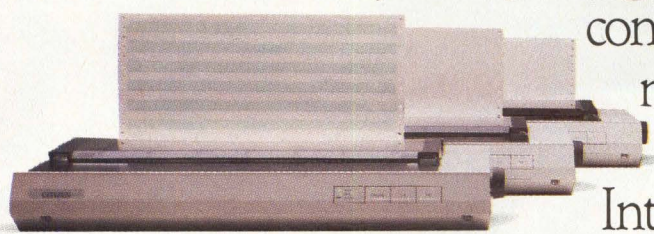


Hamilton/Avnet
ELECTRONICS
AN AVNET COMPANY

A commitment to stock and serve your local market!

SOLID CITIZEN.





When you're putting together a micro-computer system, you need a printer that's really put together.

Introducing the Citizens. A whole new line of economical dot matrix printers.

They're designed to be rugged. Dependable. And quiet. Just what you'd expect from a company famous for precision-engineered watches.

Citizen™ printers are IBM®- or Epson®-compatible, with output speeds of 160 cps or, with the flick of a switch, 40 cps correspondence-quality. That gives you added flexibility. Plus, all our printers have a unique, easy-to-use, push-feed paper loading system. And that gives you happy customers.

Citizen printers. Because reliability and dependability are just part of being a good Citizen.

For more information, call 1-800-556-1234, Ext. 34. In California, 1-800-441-2345, Ext. 34.

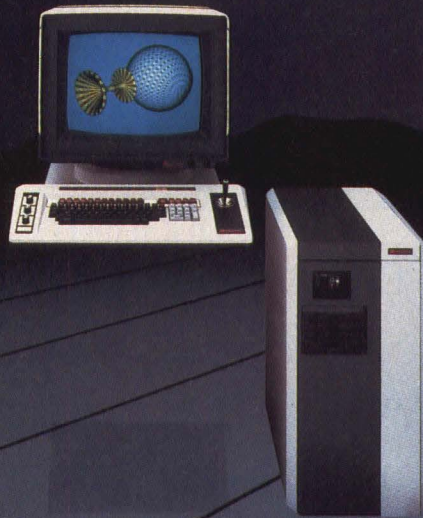
Or write Citizen America Corporation, 2425 Colorado Avenue, Santa Monica, CA 90404.

© 1984 Citizen America Corporation. Citizen is a trademark of Citizen America Corporation. IBM is a registered trademark of International Business Machines Corporation. Epson is a registered trademark of Epson Corporation.



CITIZEN

CIRCLE NO. 64 ON INQUIRY CARD



Merlin. The Result of and a Pinch of

More than 15 centuries ago, Merlin—the world's greatest sorcerer—took magic truly beyond state-of-the-art. He not only made the impossible possible—he made it easy.

The same way Megatek is doing today. In computer graphics.

We've taken tomorrow's technological magic to produce graphics miracles today. In other words, what Merlin did for his world, Megatek can do for yours now. The Merlin™ 9200 to be exact.

The most completely interactive, high-performance, high-resolution graphics rendering system yet created. Advanced graphics capabilities combined with high reliability and the first intelligent approach to graphics database management and system networking.

The Merlin 9200 offers graphics capabilities that virtually leave the leading edge of technology behind. Translucents and opaque solids, for example. Flat, Gouraud or Phong shading. X, Y and Z axis clipping of objects. Depth cueing. Perspective. Surface texturing, patterning and meshes. And a unique, proprietary Pixel Phaser™ that gives ultra-sharp 3056x2304 virtual screen addressability. Plus, 64 or 256 or 4096 colors from a palette of 16.7 million.

And behold the system-supported miracles Merlin creates.

Communications. A database editor. Local task processing and display.



1500 Years of R&D Megateknology.

Print, set-up and configuration managers. Peripheral devices including color hardcopy output, a graphics tablet and full-function keyboard with joystick and valuator dials.

Plus, Merlin's hierarchical database allows graphics and non-graphics information integration in up to 4 megabytes of dedicated memory. You can create or modify screen graphics while automatically changing the system's database. You can even store and recall data from either the host or, thanks to an optional Ethernet[®] interface, from other networked Merlins. Sheer wizardry.

Then there's VT-100[™] emulation, hardware diagnostics, status checking, error recovery and a configurable error routing capability.

Merlin 9200 from Megatek. The ultimate high-performance graphics solution that takes you far beyond state-of-the-art. Thanks to Megateknology.[™]

Pure and simple graphics magic—1500 years in the making, but well worth the wait.

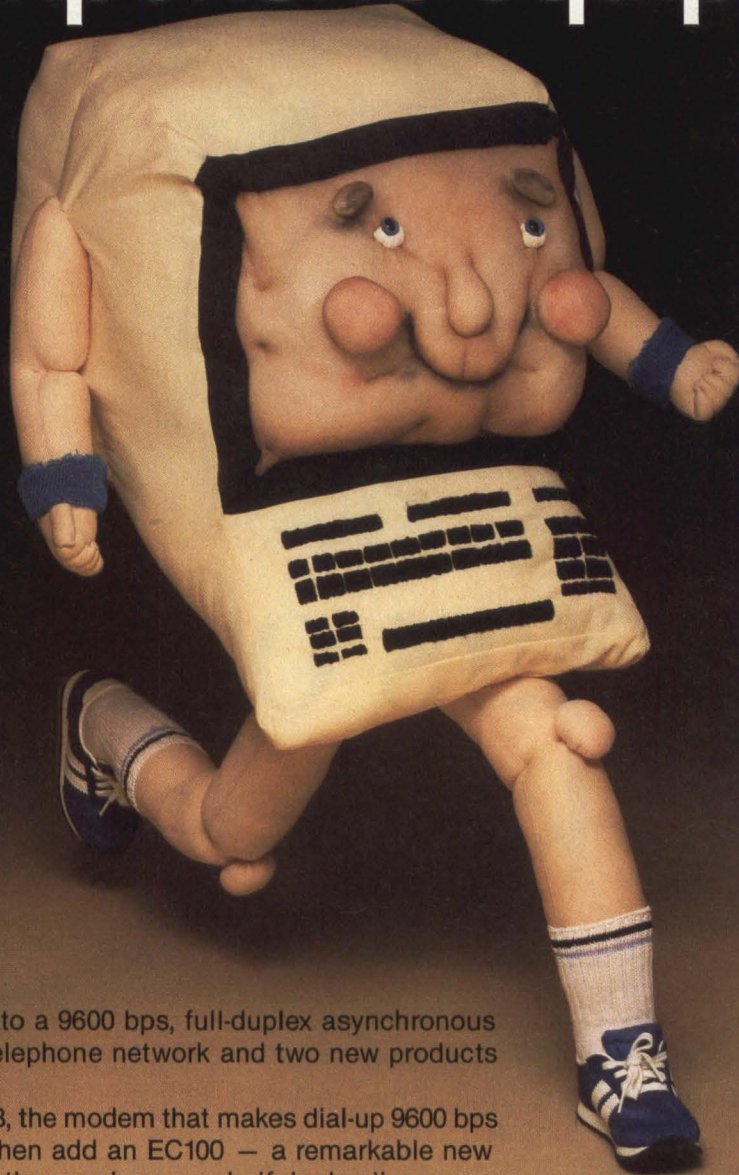
Merlin

World Headquarters, 9645 Scranton Road, San Diego, CA 92121
619/455-5590, In CA, 800/824-4489, In USA, 800/854-1975, TWX: 910-337-1270

Merlin, Megateknology and Pixel Phaser, are trademarks of Megatek Corporation. Ethernet is a registered trademark of Xerox Corporation. VT-100 is a trademark of Digital Equipment Corporation.

 **MEGATEK
CORPORATION**
A UNITED TELECOM COMPANY
Making History out of State-of-the-Art

Make your dumb terminal run circles around more expensive equipment



Turn your dumb terminal into a 9600 bps, full-duplex asynchronous genius, using the dial-up telephone network and two new products from UDS.

Start with a UDS 9600 A/B, the modem that makes dial-up 9600 bps communication a reality. Then add an EC100 — a remarkable new UDS product that converts the synchronous, half-duplex line signal to asynchronous full-duplex for presentation to your terminal. As a bonus, the EC100 also performs error correction for any synchronous modem, limiting message errors to one every several years.

Save on equipment investment and line charges by putting your terminals on a faster track. For details, phone 800/633-2252, ext. 356. Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35805. Telephone 205/837-8100; TWX 810-726-2100.



 Universal Data Systems

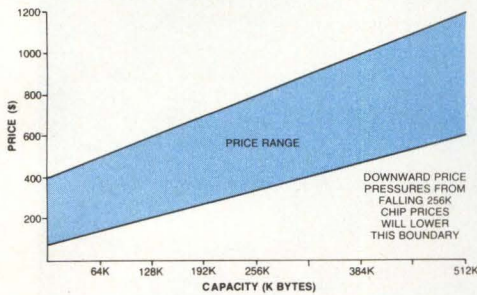
 **MOTOROLA INC.**
Information Systems Group

UDS modems are offered nationally by leading distributors. Call the nearest UDS office for distributor listings in your area. DISTRICT OFFICES: Atlanta, GA, 404/998-2715 • Bellevue, WA 206/455-4429 • Blue Bell, PA 215/643-2336 • Boston, MA, 617/875-8868 • Columbus, OH, 614/895-3025 • Englewood, CO, 303/694-6043 • Glenview, IL, 312/998-8180 • Houston, TX, 713/988-5506 • Huntsville, AL, 205/837-8100 • Mountain View, CA, 415/969-3323 • Old Bridge, NJ, 201/251-9090 • Richardson, TX, 214/680-0002 • Silver Spring, MD, 301/587-0166 • Tampa, FL, 813/684-0615 • Tustin, CA, 714/669-8001

CIRCLE NO. 66 ON INQUIRY CARD

Created by Dayner/Hall, Inc., Winter Park, FL

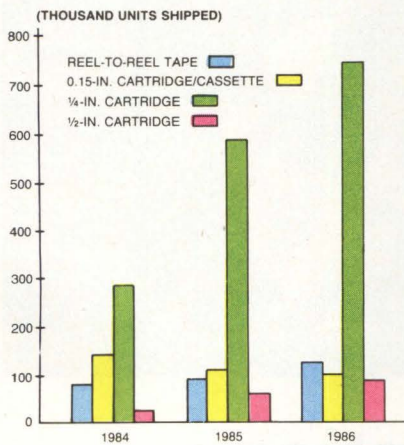
FEATURE HIGHLIGHTS



MEMORY: Because applications that require disk-intensive operations are slowed considerably by sluggish disk-response times, users have turned to **disk emulators** for higher throughput. For an analysis of the disk-emulator market, turn to **p. 139**.

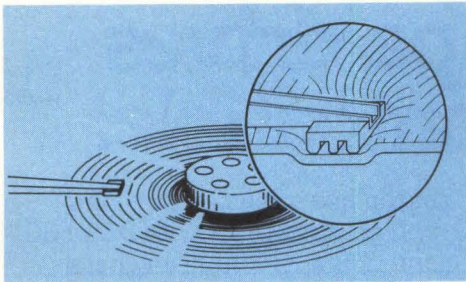
The market for **removable drives** continues to soar due to an increasing demand for low-cost, high-performance mass storage in personal and portable computers, workstations and test devices. The two major market segments, magnetic-tape and disk-drive devices, stay competitive with Winchester through lower prices and increased storage capacities. See **p. 155** for more details.

As memory capacities improve, OEMs and end users seek greater reliability and lower cost. High-performance rigid disks are expensive, while affordable diskettes have limited capacities. **Stretched-surface-recording (SSR)**, detailed on **p. 165**, combines the best of both medias.



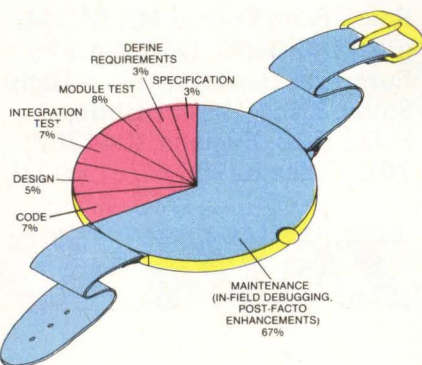
COMMUNICATIONS: Telex has entered automated offices with the help of SofGram, a UNIX-based software package from SofTest Inc. With SofGram, users can create, transmit and receive messages on Telex and TWX between different computers and between operations on the same computer. See **p. 171**.

GRAPHICS: To answer the growing demand for color and monochrome graphics, personal-computer makers are incorporating more graphics capability into their machines, and board vendors are offering more sophisticated add-in graphics-adaptor boards. Our view of the market begins on **p. 185**.

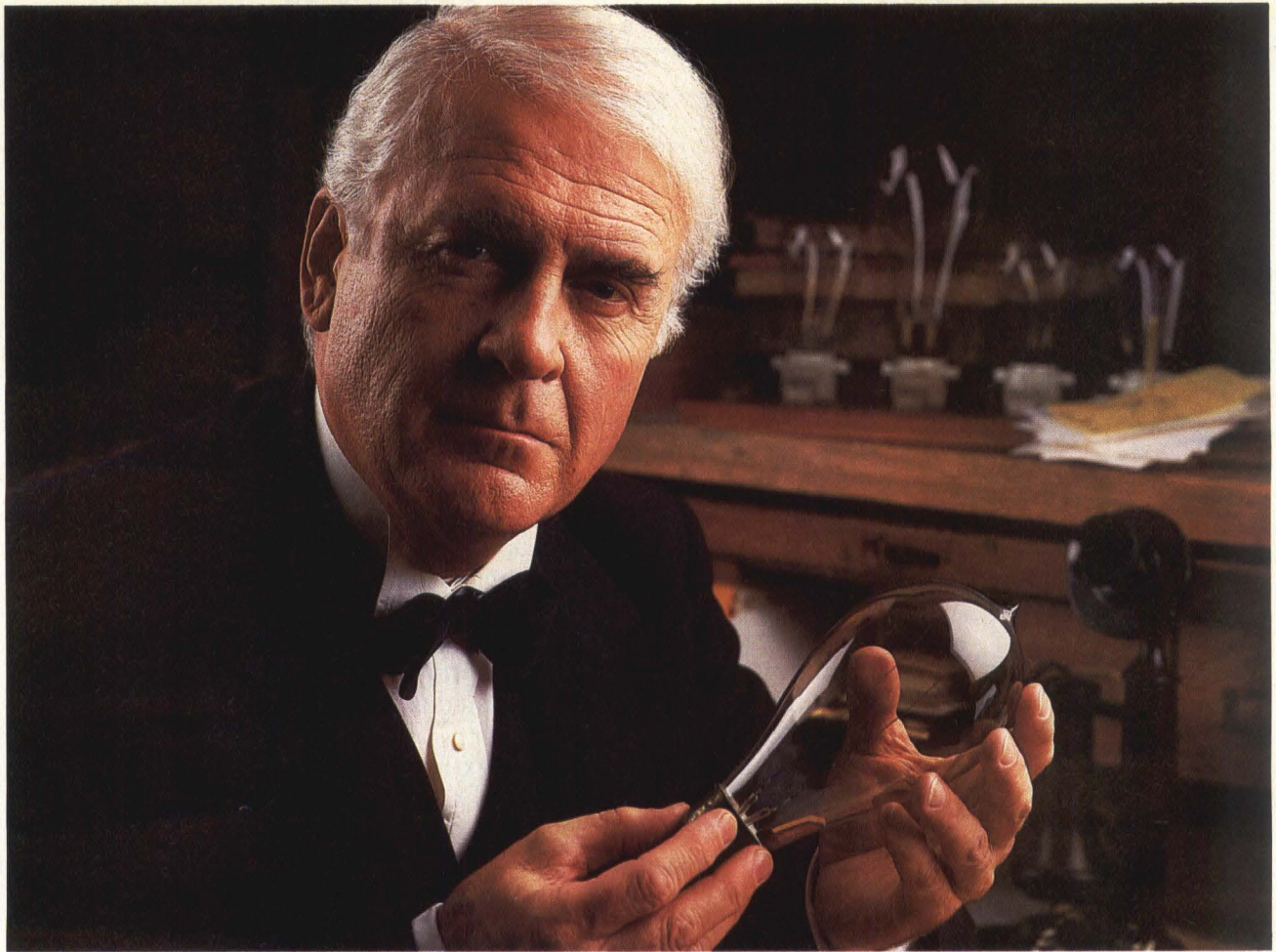


SOFTWARE: Database design architectures, a transplant from mainframes and minis, were not designed to maximize the capabilities of microcomputers in the personal and business environments. DayFlo, a **word-oriented, database package** from DayFlo Inc., bridges the gap between powerful but complex products that require detailed programming and software that is easy to use but limited in performance. Turn to **p. 197**.

The use of **microcomputers to develop COBOL applications** for mainframes has come of age. Micros no longer function as mere standalone systems; today, they can serve as both mainframe program development stations and as delivery vehicles for distributed processing. To find out how, see **p. 207**.



OFFICE PRODUCTS: Today's automated office is a crowded place; a variety of unfunctional office machines is inefficient, expensive and takes up valuable office space. One multifunctional machine, such as the M3071 integrated-printer module from Fujitsu America Inc., which combines printing, copying, image scanning and optical image overlay functions, can help alleviate space problems. See **p. 221**.



Zetaco's latest inventions make 86 disk and tape drives Data General BMC compatible.

Zetaco's BMX-1 disk drive controller and BMX-2 mag tape coupler give the user of Data General's high-speed BMC (Burst Multiplexor Channel) full compatibility with the newest high-speed, high-capacity, non-DG drives.

These two bright ideas let you choose virtually any high performance SMD-type disk drive or 1/2" tape drive to run on the BMC or Data Channel on DG's newest Eclipse or MV Series mini.

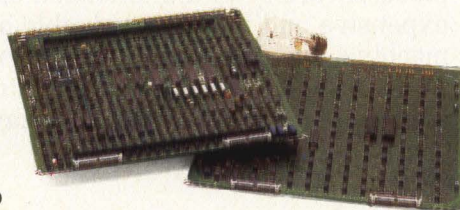
Each BMX-1 supports up to 4 SMD-interfaced hard disk drives. Each BMX-2 supports up

to 8 streaming or start/stop tape drives.

Zetaco's full emulation of DG's 60XX and 61XX series disk and 6026 and 4307 tape subsystems means no software patching is required. E² PROMs eliminate switches, making drive configurations and functions selectable via downline loaded software. And Zetaco's exclusive

backplane cable design is plug-and-go compatible with DG's FCC and non-FCC compliant chassis.

Discover the BMX Series from Zetaco, 6850 Shady Oak Road, Eden Prairie, MN 55344, (612) 941-9480. Telex 290975. European Headquarters: 9 High Street, Tring, Hertfordshire, HP23 5AB, England. (044282) 7011. Telex 827557. ZETACO G.



ZETACO

Controller Division, Custom Systems Inc.

Disk emulators accelerate computer system performance

Formatting RAMs to mimic disk drives improves speed sixfold

Paul Sniger, Senior Editor

Because applications that require disk-intensive operations are slowed considerably by sluggish disk-response times, users have turned to disk emulators for higher throughput.

"The future for disk emulators seems obvious," states Richard McCormick, marketing manager for Intelligent Computer Integration Inc., Brea, Calif., a maker of disk emulators. "Almost all advances will be concurrent with advances made by the RAM makers, be it more bits per chip, lower costs, increased speeds, [or] smaller size and the like."

Define the field first

Floppy and hard disk drives involve mechanical movements, rotational latency and seek times, and thus are slow compared to CPU operations. In contrast, disk emulators—boards and boxes that are based upon semiconductor RAM—prove faster than disk units. They provide driver software and operate like one or more disk drives. They, too, have a directory, and permit files to be written, read, executed or modified. On the other hand, disk emulators do not generally require extended-addressing, and data goes through I/O ports that can be easily re-addressed. In short, disk-emulator software formats the RAM to mimic a disk drive.

Disk emulators can be categorized by their associated operating systems and computers. They also can be distinguished by their memory capacity, which runs the gamut from small microcomputers to large minicomputers.

The backbone of the disk-emulator business is to be found within the minicomputer marketplace. The mini-



The Ramdisk320's 320K bytes of 200-nsec RAM function either like two 35-track or two 40-track drives, or one 80-track, floppy disk drive. Four such units, made by Axlon Inc., provide 1.3M bytes of RAM.

computer-type disk-emulator cards and boxes predominantly sell in small quantities. George Boardman, marketing manager for Ampex Corp., Cupertino, Calif, says, "Most minicomputer disk-emulators are sold in low quantities, if they go to end users. They are certainly sold in greater numbers if they go to system integrators, but still not in the volumes of microcomputer disk emulators, which are beginning to resemble commodity items." Despite this rapid growth in the microcomputer market, Boardman says the minicomputer markets still provides the cornerstone for disk emulators, with many products available.

For example, MiniMeg, a disk-emulator board from Integrated Digital Products provides as much as 2M bytes per board and compatibility with Nova-type computers and stores the most frequently used data. The MiniMeg costs \$4,200 to system integrators, but the price drops to \$2,400 in OEM quantities. By com-

STRONG STATEMENTS FROM PEOPLE WHO GIVE YOU ...

STRAIGHTTALK

No claims. No boasts. Just straight facts and commitments from Jeffrey Liu, president of Microscience, on our growing family of half-height Winchester disk drives.

"By introducing the new HH-725 20 MB 5.25" and HH-312 10 MB 3.5" half-height Winchester disk drives to our product line, we now offer the proven quality and performance most OEMs need in volume today.

"Combined with our HH-612 10 MB 5.25" half-height disk drive, Microscience now provides a product family of superior quality and better performance than any other drives available.

"Time after time, we have proven that Microscience has the performance, quality, and price personal and portable computer manufacturers demand.

"The secret is the way we design and manufacture drives for you.

"Microscience disk drives have extremely low voltage requirements because small business and portable computers don't have the luxury of excess power or cooling capacity.

"We've used procedures and components that will be power misers, yet they still provide long-term performance and reliability.

"Our drives feature a thermally isolated stepper motor for precise head alignment and optimum seek performance. A proprietary linear actuator assembly was employed to ensure data reliability

and provide greater drive durability.

"A buffered seek mode and highly accurate proprietary micro-processor-controlled closed-loop servo positioning system keeps the head precisely on track. This maintains data integrity through a wide range of operating conditions regardless of thermal expansion, system hysteresis, or long-term wear.

"Microscience drives are not limited to functioning horizontally. Because of the growing use of portable computers and increasingly compact packaging, we designed our Winchester drives so you can use them in almost any position.

"While volume production is important, what you're really concerned about is the quality of product you use in your system or application. We have made a major commitment to

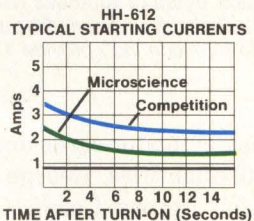
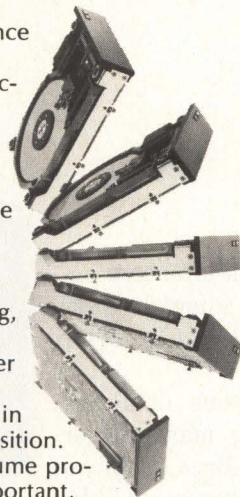
manufacturing and quality programs.

"Microscience test equipment and tooling have been carefully selected to meet our exacting standards.

"This ensures Microscience ships only zero defect half-height Winchester product that does not eat away at your profits... and your reputation.

"There's a lot more I could say about the Microscience half-height Winchester disk drive family. But what will convince you is using a Microscience drive in your application.

"For more straighttalk regarding your half-height Winchester needs, call or write us today."



Microscience
International
Corporation

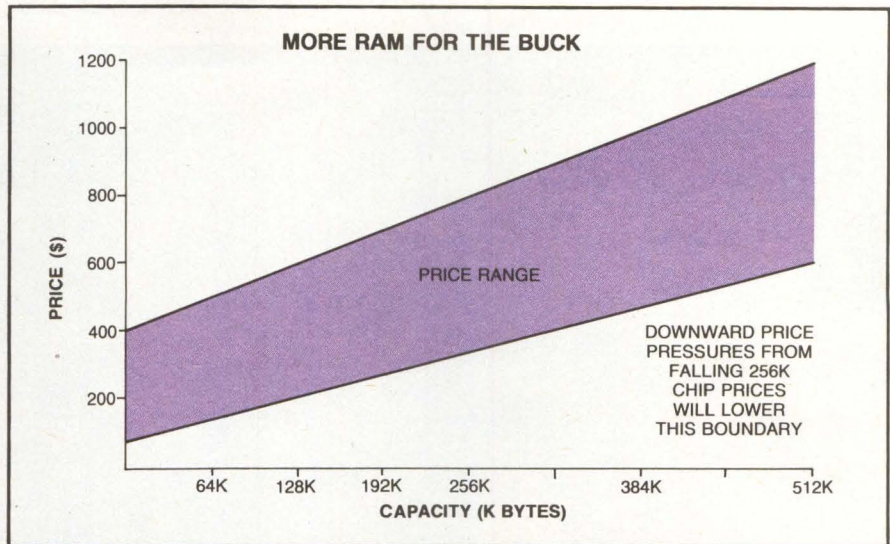
575 E. Middlefield Road
Mountain View, CA 94043 (415) 961-2212

Area Sales Offices: Orlando, FL (305) 339-8283 • Boston, MA (617) 229-5823 • Mountain View, CA (415) 961-2212
International Sales Office: Munich, West Germany, Tel. 0894315669, TTX 5213442 Distributors: U.S. - Gulf Stream, Weatherford, North East Peripherals, Orion • International - Multitek, Canada • Pericomp, Australia • Dataguild, U.K. • Wide Trade Foundation Ltd., Hong Kong

CIRCLE NO. 68 ON INQUIRY CARD

Versatile uses of disk emulators

- Disk swapping
- Image processing
- Array processing
- Seismic buffering
- CAD/CAM/CAE
- Data acquisition/capture
- Shared memory
- High-capacity buffering
- Main memory
- Disk cache memory
- Dual-port memory
- Swapping files
- Rapid data interchange formatting
- Graphics
- Interactive applications
- Word processing
- Real-time systems



RAM disk prices vary as a function of memory capacity. Their price range was determined by plotting 65 IBM PC RAM disks. Price variations are due to several factors, including functions per board and board sophistication. As 256K-chip prices decline, the lower boundary slope will decline.

parison, disk-emulator boards for microcomputers often sell for under \$1,000.

Intelligent Computer Integration, also offers Data General (DG) Corp.'s compatible disk emulators. Its DS01 offers storage capacity in 2M-, 4M- and 8M-byte versions and a 1.25M-word-per-second data-transfer rate.

One firm that is a dominant player in the DG and Digital Equipment Corp. (DEC) disk-emulator market is Dataram of Cranbury, N.J. Dataram president John F. Gilligan, states that "In the past the major activity in the market was in the area of disk-emulation systems on 16-bit systems, typically to replace fixed-head disk systems or for disk swapping in I/O limited systems." Gilligan adds that this was true of Dataram's Bulk Memory line, but feels that with the advent of 32-bit superminicomputers, the emphasis has changed. The interest is now for high-performance, dual-ported systems to augment the capacities of the newer and more powerful minicomputers."

To meet the requirements of the fastest minicomputers in real-time applications, Dataram's Wide Word unit provides 128M bytes of disk-emulator memory that transmits data at 200M bytes per second. This is achieved by utilizing 80 or 160 bits per word and eight-way interleaving. Real-time applications include image processing, array processing, data acquisition, high-speed buffering, seismic processing, cache memory and radar-type applications.

Wide Word units also allow system integrators to take advantage of the company's extensive library of Bulk Semi controllers. A Wide Bus Translator (WBT) module adapts the Bulk Semi board size and electrical

interface to Wide Word's unique board size and interface. As many as 16 WBT modules can be packaged on one board. Wide Word units interface with more than a dozen brands.

PC RAM disks offer multiple utilities

Although greater-capacity minicomputer disk emulators with high performance are extending this traditional mainstay of disk emulators, microcomputer applications are seeing new developments.

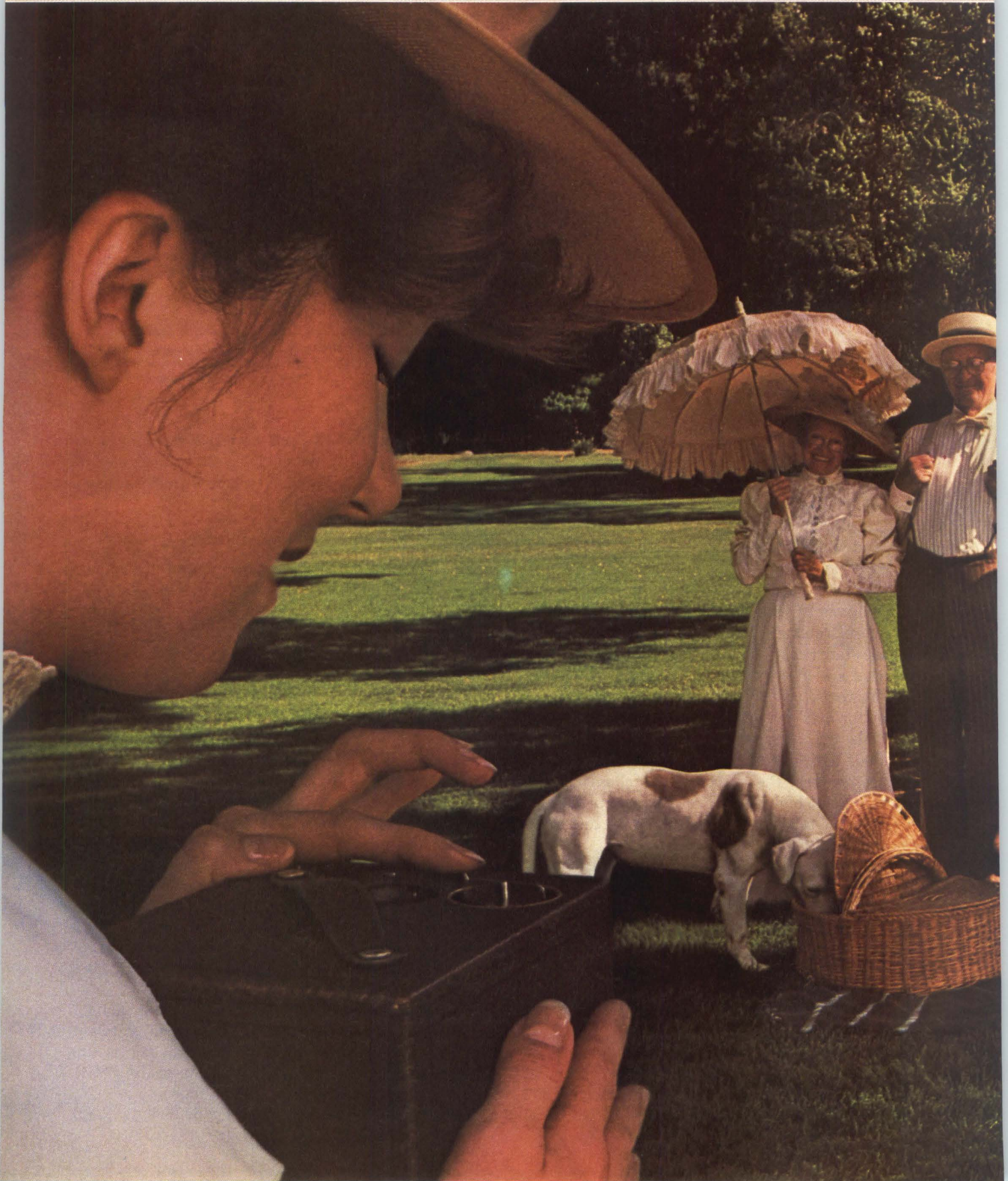
Disk emulators for the microcomputer market fall into several groups, and the Apple and IBM PC/XT microcomputers control market share.

The Quadboard II disk emulator board, available from Quadram Corp., holds 384K bytes maximum, incremented in 32K segments, and draws on or subtracts from the IBM PC's RAM space. Its Quadram Multidrive creates one, two or three RAM disks. To save time, several applications can run at once, with files transferred between them. The board uses the Qspool print spooler, and the Qswap utility permits switching between two matrix and character printers. It has a clock/calendar, battery backup, I/O expansion bracket (to organize expansion port connectors) and a serial and parallel port. For high-capacity requirements, another similar board, the Quad 512+, offers 64K, 256K and 512K bytes.

Dilog PC Products Corp. states that its 368K-byte Electronic Disk board does not require special software or operating system modification, and does not use up program memory because it has an on-board Z80A. Such boards run faster, but also cost more.

Image Technology Inc. provides a 512K-byte RAM

GEORGE EASTMAN DIDN'T
HE JUST MADE



INVENT PHOTOGRAPHY. IT A SNAP.



A hundred years ago, taking photographs meant using a camera the size of a crate, a glass plate holder, a tripod, a darkroom tent and a silver nitrate bath.

But in 1888, George Eastman built a small, hand-held camera whose instructions read simply, "Push the button." Photography—once the province of a few skilled craftsmen—was now literally at everybody's fingertips.

At Priam, we build high-performance disk drives with a similar focus: bringing proven, large-scale technology down to size for an easy fit into today's supermini and supermicro systems. It's a commitment that has made us the leading U.S. manufacturer of high-quality 8" voice-coil Winchesters—from 35 to 500MB. A commitment we're now making to our new 86MB 5¼" drives as well. It's why we provide total, industry-standard interface support, including ST412, SMD, ANSI, SCSI, IPI-3, and our own Priam interfaces. And it's why we've just opened a new, automated U.S. production facility, one of the largest and most modern in the OEM world.

Priam. For big performance in small-size disk drives, we make it a snap.

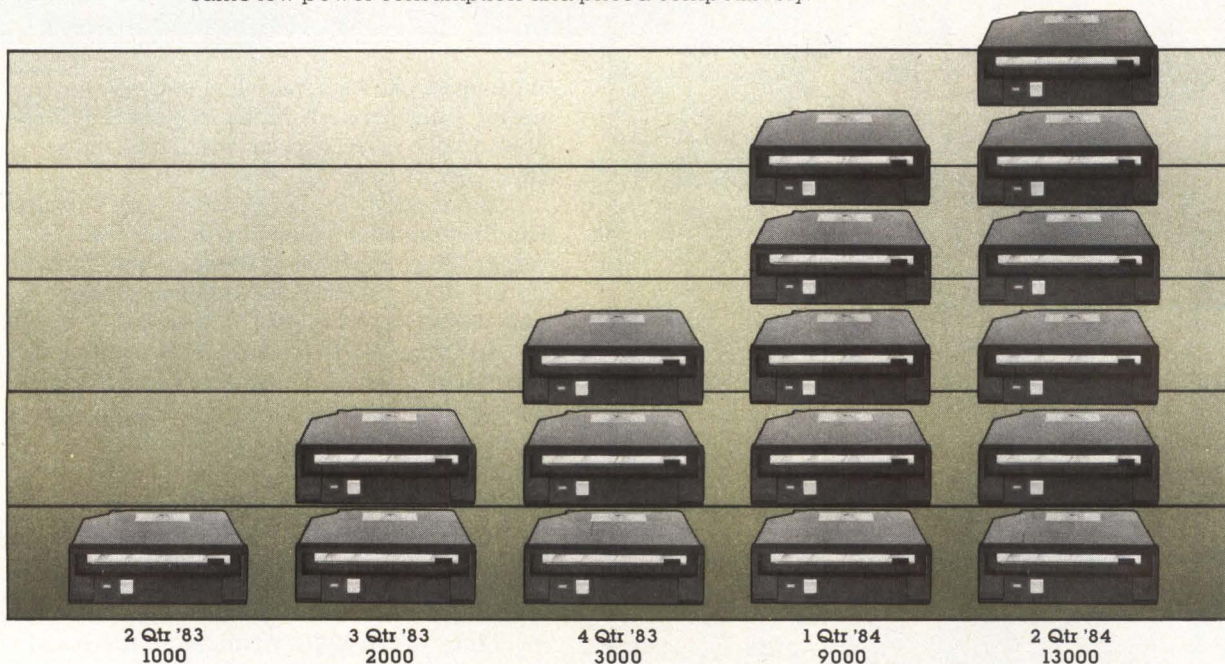


20 West Montague Expressway,
San Jose, CA 95134 (408) 946-4600
Boston (617) 444-3973; U.K. (44) 734-884-788
CIRCLE NO. 69 ON INQUIRY CARD

THE COMPETITION JUST DOESN'T STACK UP.

SyQuest has set a new industry standard for Removable Winchester Cartridge Drives. It's our sales figures. To date, we've shipped more than 30,000 Sub 5.25" half-height removable drives—more than triple the figures of **any** removable Winchester cartridge drive competitor. To top it off, SyQuest is the **only** manufacturer of **half-height** removable Winchester cartridge disk drives.

In fact, the competition plainly doesn't stack up in another way. Performance. Our Sub 5.25" half-height removables have a long list of features including 6.38 MBytes of storage and low power dissipation. In addition, SyQuest's popular line of half-height Winchester Fixed Disk Drives have capacities up to 38 MBytes, the same low power consumption and priced competitively.



SyQuest

LEADER IN WINCHESTER REMOVABLE
CARTRIDGE DRIVES.

See us at Comdex, Las Vegas,
November 14-18,
Booth #H8706

SYQUEST SALES: WEST COAST (415) 490-7511; CENTRAL (214) 692-7277; EAST COAST (617) 862-6410

HAMILTON/AVNET • U.S.A. CANADA AMPEC ELECTRONICS PTY LTD. • AUSTRALIA, NEW ZEALAND HAL COMPUTERS, LTD. • GREAT BRITAIN (U.K.) SOUTH CONTINENTAL DEVICES • SOUTH AFRICA SYNELEC DATENSYSYSTEME GMBH • WEST GERMANY SCANCOPTER AB • SWEDEN, FINLAND, DENMARK, NORWAY NORON, S.A. • BELGIUM, LUXEMBOURG, NETHERLANDS KONTRON ELECTRONIQUE • FRANCE COMPREL • ITALY RDT • ISRAEL • BRASCOM • BRAZIL LATINDATA S.A. • ARGENTINA TAKACHIHO KOHEKI CO., LTD. • JAPAN

Pak 512 combination board. It can quadruple this capacity to 2M bytes by repopulating with 256K chips. The board comes with disk emulation and print-spooling software, and has serial and parallel ports, a clock/calendar and battery backup. It is also available with 64K (at under \$350) and can be customized to specific needs. Depending on price, boards can have no memory, a minimum amount, or various increments. This variable memory feature permits capacity upgrading.

JRAM (under \$800) from Tall Tree Systems can provide 640K bytes. And three such disk-emulator boards can add an extra 512K-plus of RAM to the 256K of the IBM PC motherboard. Its JFormat utility includes a high-speed file transfer, print spooler and disk emulator. It supports quad density and 8-inch floppies and Winchester.

Some disk emulators offer extra features at increased costs. The Versa-RAM Plus II from Memory Technologies Inc., offers all the multifunctions of other boards, but accepts optional Versa-modules up to 512K (at under \$1,130), and offers a second modem, color graphics board, and an SDLC/HDLC synchronous/asynchronous board for PC-to-370 linking. Offering more functions per board saves slots, but also means less disk-emulator space may be available for memory.

Versions compatible with 8-bit systems

Non-IBM microcomputer users have many disk-emulator offerings to choose from, as well. For example, the SemiDisk disk-emulator board from SemiDisk Systems, has versions for the S-100/IEEE-696 bus, and the IBM PC microcomputer. The IBM PC disk emulator offers as much as 1M byte per board. By installing additional boards—one set for each different address space—the board is expandable to 8M bytes.

Self-installing driver software on the disk emulator links into the PC-DOS operating system without modifications, and an extra driver is available for running CP/M-86 programs. Program run-times are claimed to be five to thirty times faster than with floppies and two to five times faster than with Winchester for access-intensive activities. Such activities include editing Pascal and using assemblers, compilers, spelling checkers and database managers. However, these activities require print jobs that can tie up a computer for hours. SemiDisk's SemiSpool with its built-in print buffer frees the computer for other tasks while printing is carried on from the print file.

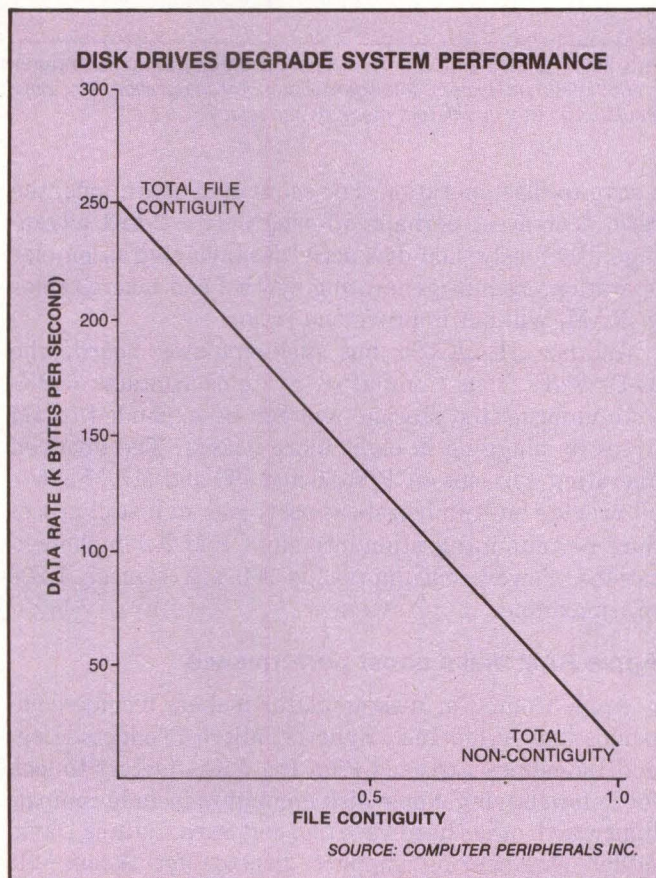
Board specifications include 110K-byte-per-second data-transfer rates and 250-nsec DRAMs. As for power consumption, a 512K-byte board consumes 600 mA at 5V DC (typical); a 1M-byte board draws 900 mA at 5V. A blackout battery provides backup time of four

hours. It is specified for an ambient range of 10°C to 40°C and can withstand humidity extremes that disk drives cannot. Moreover, Winchester's are heavily heat-sunked, use noisy fans and cannot tolerate high altitudes.

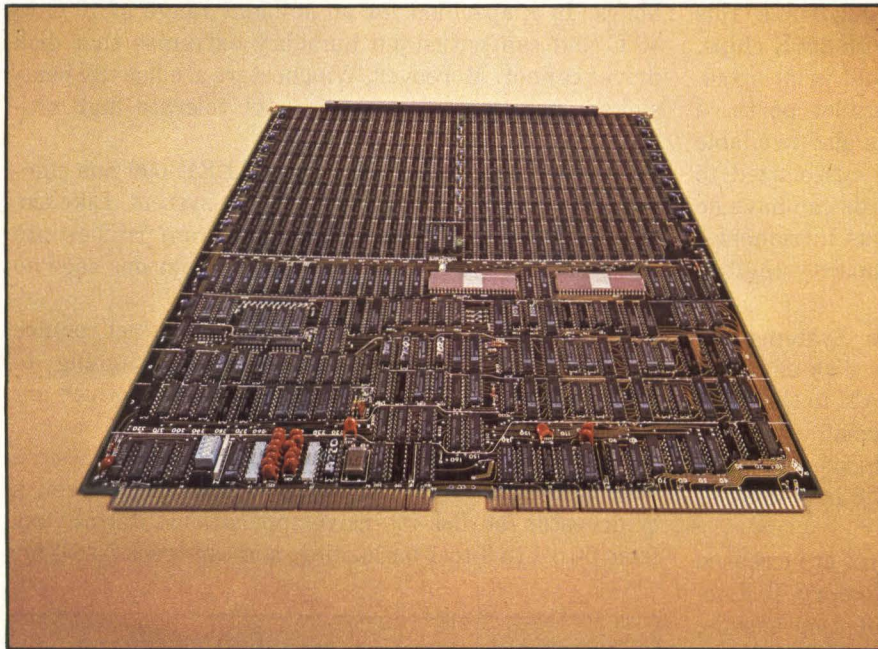
Another SemiDisk board offers IEEE-696 bus compatibility for the CP/M 2.2 operating system. Like the PC-DOS version, the installation program patches into the operating system as a disk drive. Programs need no modification to run.

SemiDisk is hardware compatible. It does not require extended-addressing or complex bank-switching to store data. All data goes through I/O ports, which are easily re-addressable.

SemiDisk boards' speed-ratio improvement is 20-to-1 over a 5-inch floppy disk drive, and 2-to-1 over a Winchester for disk-intensive applications. Ratios vary from 5-to-1 to 3-to-1 for loading, and can reach 5-to-1 for



File fragmentation significantly reduces system throughput. Average data-transfer rate for file-oriented access and backup operations linearly decrease from 250K bytes per second to 10K bytes per second at total fragmentation, assuming 512 bytes per sector and 50-msec access time. File non-contiguity increases, also, as disk capacity increases. Disk latency and head seek times increase, contributing to mechanical disk-drive wear and media wear. Disk intensive application software can thus shorten system lifetime and decrease system performance. RAM disks alleviate this problem by their random-access nature and faster access times.



This 8M-byte disk emulator board for Data General minicomputers appears to the CPU as a 6063/6065 subsystem. Intelligent Computer Integration Inc., provides this and other disk emulator boards in different memory capacities.

a save-to-disk operation. For sequential operations, the ratio decreases, perhaps offering only a 2-to-1 advantage. Obviously, non-disk activities involving assembler operation, such as generating symbol and macro tables in RAM, will not improve the ratio.

Another IEEE-696 bus disk-emulator board, the M-Drive/H from CompuPro Systems contains 512K-byte unformatted storage and can be expanded to 4M bytes by plugging in eight more boards. The involved operating systems—CP/M-80 and -86 and MP/M-816—all provide built-in board support, and an install procedure permits integration into any CP/M 2.2 implementations. Power consumption is 900 mA typical; 1,200 mA maximum.

Apple RAM disks boost performance

Apple Computer disk-emulator makers include companies like Axlon Inc., Syntex, Micro Products, Legend Industries Ltd. and Pion Inc. "Key factors to look for before buying Apple disk emulators include compatibility with other hardware and software," states David Miller, engineering support director for Axlon. "It helps if it is slot-independent, so it can be used with slot-dependent peripherals, such as 80-column boards and printers. Memory capacity is important, as is whether or not it can function like two 35-track drives, two 40-track drives or one 80-track drive. Expandability permits several disk emulators to be hooked up to give more megabytes."

Miller also feels that special features should be con-

How disk emulators compare to drives

Advantages

- Saves wear on disk drives and media
- Lower power consumption
- Greater portability
- Function in hostile environments (humidic, gaseous, thermal, vibrational and shock)
- Simultaneous program storage
- Less chance of dechained file clusters
- Expandable with two to eight boards
- Multifunction capability
- Emulation software can reformat most memory expansion boards
- Databases run and sort more quickly
- Units often configured for several systems

Disadvantages

- Higher costs per bit
- Greater volatility
- Difficult to load copy-protected software
- Rocker switch reconfiguration types are frustrating for multi-program use
- Integration difficulties

sidered, such as a self-contained power supply with a rechargeable-battery backup system that lasts for several hours in the event of a blackout. Other firms concur. McCormick at Intelligent Computer Integration, feels that backup is critical. "Volatile memory is probably the single largest problem with RAM disk emulators. Any type of power failure anywhere at anytime will cause total loss of data in the emulator," he warns. "The solution is battery backup to keep power applied to the RAMs to maintain data integrity."

The disk emulator Ramdisk320 from Axlon boasts a 400K-byte-per-second data-transfer rate and emulates as many as 12 drives under the Apple DOS 3.3 operating system, six drives under Pascal 1.1 or 4.0, and one drive under CP/M. It also runs under Apple III SOS, the predecessor of ProDOS, and under Apple II and IIe software. Its 320K-byte RAM emulates two 40-track floppy disk drives or one 80-track drive.

Physically, the 320 is an externally connected 8-pound, 8.625-by-6.125-by-3.750-inch box with a 9.5-by-2.875-inch interface card and ribbon cable. The box contains its own 3-hour backup battery in case of power failure. Its 40-by-64K DRAM matrix and logic consume 30W during access, 21W in standby memory refresh mode, and 8W in battery trickle-charged mode.

The Flashcard disk emulator from Syntex Micro

The best way to choose the best drive is to test it yourself.

When you're designing your systems to handle more work faster and more reliably, you'll want to use half-height, high-capacity floppy disk drives so your system will run longer and more efficiently hour after hour.

We designed our family of drives to keep up with your hard-driving technology.

Drives that incorporate our field-proven technology, Philips patents, and manufacturing experience.

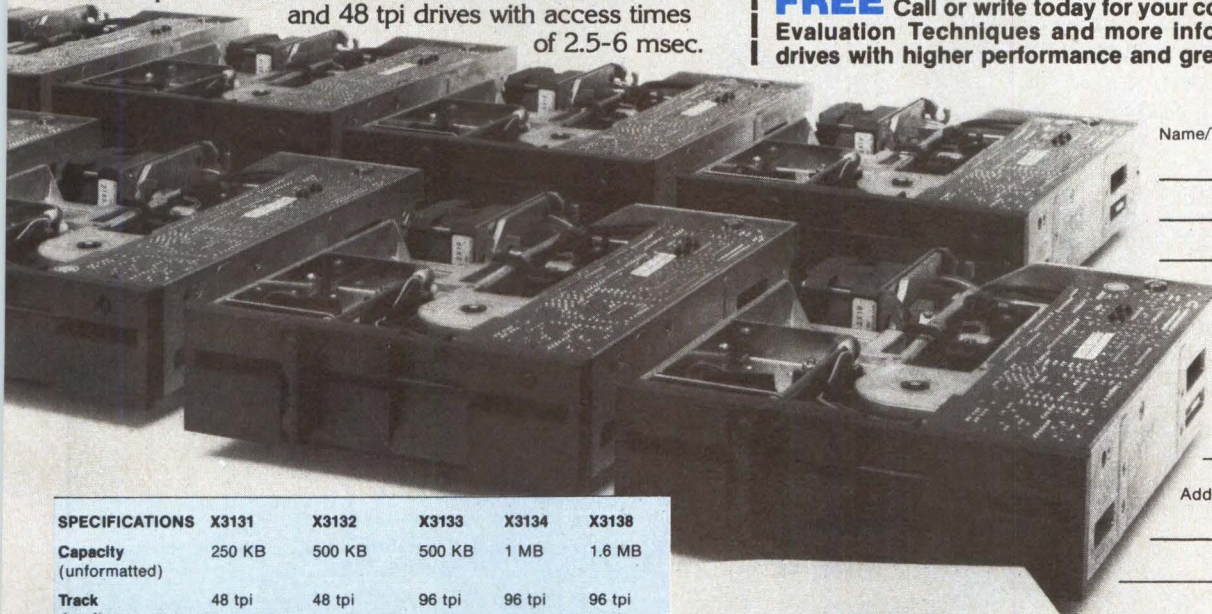
Drives with up to 1.6 MB capacities and data transfer rates that are compatible with 8-inch drives.

96 tpi drives with access times less than 3 msec and 48 tpi drives with access times of 2.5-6 msec.

Philips has a full family of drives for today. And an aggressive development program that is keeping pace with the worldwide requirements of people such as you who are planning tomorrow's systems.

We're so confident in our Philips half-height floppy drives, we'll give you a comprehensive testing guide to help you prove Philips drives are unsurpassed in performance.

And unequaled in reliability.



FREE Call or write today for your copy of **Disk Drive Evaluation Techniques** and more information on the drives with higher performance and greater payloads.

Name/Title _____

Company _____

Address _____

City _____

State/Zip _____



SPECIFICATIONS	X3131	X3132	X3133	X3134	X3138
Capacity (unformatted)	250 KB	500 KB	500 KB	1 MB	1.6 MB
Track density	48 tpi	48 tpi	96 tpi	96 tpi	96 tpi
Positioning time (track to track)	2.5-6 msec.		<3 msec.	<3 msec.	<3 msec.
Interface	ANSI/INDUSTRY STANDARD				
Media	ECMA 66	ECMA 66/70	ECMA 78	ECMA 78	ECMA 78
Recording density	5876 (MFM)	5876	5876	5876	9870
RPM	300	300	300	300	360

Warranty: 1 year on all parts and labor (seldom used).

But what will really impress you are the low part count and exceptional simplicity of design.

Our precision split band actuator, stepping motor, and performance-proven clamping cone assure highly reliable data interchange...even under extreme conditions.

Mail to: Philips Peripherals, Inc. 385 Oyster Point Blvd., Unit 12, South San Francisco, CA 94080, (415) 952-3000



PHILIPS

**Unsurpassed in Test
After Test After Test...**

CIRCLE NO. 71 ON INQUIRY CARD

Products offers 147K- and 294K-byte boards for the Apple II computer, and can emulate as many as 12 drives with six 11½-inch cards running under CP/M software. The latest CP/M software permits a 2-card configuration to emulate one 576K-byte drive. Utility programs segment and reconstruct large files for backup on 126K-byte floppies. The 294K-byte version can run under DOS 3.3 as a single .32-segment drive.

The 7½-inch Legend Industries 128 DE Sofdisk expansion card features 128K bytes; a 64K-byte card is also available. It emulates as many as four drives under DOS 3.3 (four cards) or under CP/M (four cards), and six drives under Pascal (six cards). The cards do not need refresh straps to the motherboard, as earlier versions did, and each has its own refresh circuitry.

The Pion Interstellar Drive, an external box emula-

Disk emulator manufacturers

Amperif

21345 Lassen St.
Chatsworth, Calif. 91311
Circle 771

Ampex Corp.

10435 North Tantau Ave.
Cupertino, Calif. 95014
Circle 772

Axon Inc.

70 Daggett Drive
San Jose, Calif. 95134
Circle 773

BGL Technology Corp.

19151 Parthania St., Complex C
Northridge, Calif. 91324-3676
Circle 774

Centennial Computer Products

6100 Executive Blvd.
Rockville, MD 20852
Circle 775

CompuPro

3506 Breakwater Court
Hayward, Calif. 94545
Circle 776

CTC Electronics

2237 Colby Ave.
Los Angeles, Calif. 90064
Circle 777

Dataram Corp.

Princeton Road
Cranbury, N.J. 08512
Circle 778

Dilog PC Products Corp.

Distributed Logic Corp.
12800 Garden Grove Blvd.
Garden Grove, Calif. 92643
Circle 779

DY-4 Systems Inc.

888 Lady Ellen Place
Ottawa, Ontario
K1Z 5M1, Canada
Circle 780

Gould Inc.

6901 W. Sunrise Blvd.
Fort Lauderdale, Fla. 33310
Circle 781

IBM Corp.

Old Orchard Road
Armonk, N.Y. 10504
Circle 782

Ikon Research

2157 Park Blvd.
Box 60456
Palo Alto, Calif. 94306
Circle 783

Image Technology Inc.

5994 S. St. Paul Way
Littleton, Colo. 80121
Circle 784

Imperial Technology Inc.

831 S. Douglas St.
El Segundo, Calif. 90245
Circle 785

Integrated Digital Products

4208 E. La Palma Ave.
Anaheim, Calif. 92807
Circle 786

Intel Corp

3065 Bowers Ave.
Santa Clara, Calif. 95051
Circle 787

**Intelligent Computers
Integration Inc.**

570 W. Lambert, Suite K
Brea, Calif. 92621
Circle 788

Legend Industries Ltd.

2220 Scott Lake Road
Pontiac, MI 48054
Circle 789

Memorex Corp.

1200 Memorex Drive
Santa Clara, Calif 95052
Circle 790

Memory Technologies Inc.

4343 Grand Prix Drive
Logansport, Ind. 46947
Circle 791

Microcomputer Systems Corp.

432 Lakeside Drive
Sunnyvale, Calif. 94086
Circle 792

Pion Inc.

101R Walnut St.
Watertown, Mass. 02172
Circle 793

Quadram Corp.

4357 Park Drive
Norcross, Calif. 30093
Circle 794

Rianda Electronics Ltd.

2535 Via Palma
Anaheim, Calif. 92801
Circle 795

SemiDisk Systems

Bldg. 6
14816 N.E. 95th St.
Redmond, Wash. 98052
Circle 796

Storage Technology Corp.

2270 S. 88th St.
Louisville, Colo. 80028
Circle 797

Synetix Micro Products

15050 N.E. 95th St.
Redmond, Wash. 98052
Circle 798

Tall Tree Systems

1032 Elewell Court, #124
Palo Alto, Calif. 94303
Circle 799

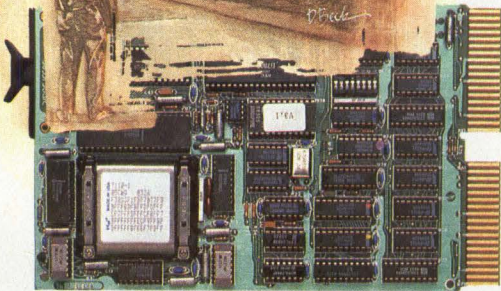
Targa Electronics Systems Inc.

3101B Hawthorne Road
Ottawa, Ontario
K1G 3H9, Canada
Circle 800

Solid-state magnetic-bubble memory from Bubbl-tec®

Mass storage that works where disks don't

Q-Bus™ Bubble Systems emulate DEC® RLO2™ RXO2™ RXO1™ TU58™



Once upon a time, computing was done only in nice, clean places, and a spinning disk could handle the mass storage job quite nicely.

But, no more. Now computers are down on the factory floor, up in airplanes and out in the field. For this new world of applications, you need *solid-state* mass storage, like Bubbl-tec magnetic-bubble memory systems.

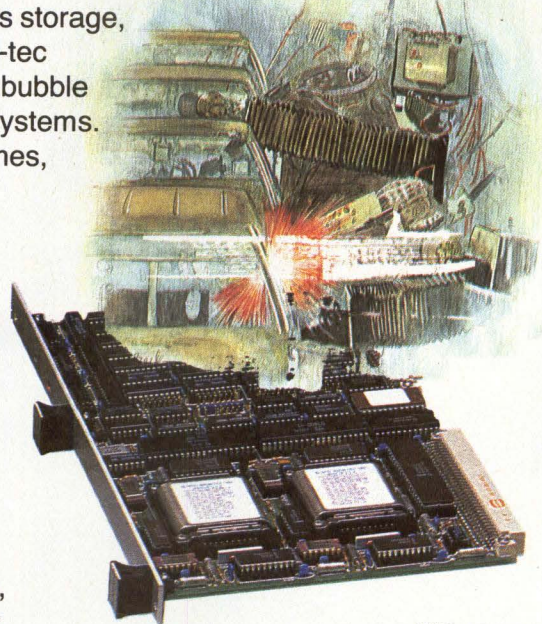
They can stand up to the dirt, dust, temperature extremes, shock and vibration that knock out disks.

Bubbl-tec systems provide battery-free, non-volatile mass storage from 32 Kbytes to 8 Mbytes, with extremely fast access to every data block. And our systems plug directly into your microcomputer bus – no need for another chassis or power supply.

Since 1979, we've been shipping solid-state mass storage systems for every popular


microcomputer bus, including Q, MULTI, STD, S-100, VERSA and VME. In fact,

we have more systems in the field than any other bubble-system supplier.



VMEbus™ Bubble Systems provide up to 8 megabytes of mass storage

So, if you don't want to contend with disk deterioration, head crashes, and mechanical breakdowns, contact Bubbl-tec. Our mass storage solutions have a solid foundation.

 **Bubbl-tec**®
Division of PC/M Inc.

6800 Siera Court, Dublin, California 94568
Telephone: 415/829-8700 • TWX/Telex: 910/389-6890

STDbus Bubble Systems are available for 8088, 8085, Z80, 6809

BUBBL-TEC INTERNATIONAL DISTRIBUTORS: West Germany: Scantec GmbH 089-859-8021 • Italy: Telcom 02-4047648 • France: Microel S.A. 6-9070824 • Switzerland: Micro-System-Technik, AG 01-520355 • Norway: HCA Melbye 02-106050 • Sweden: TH Elektronik AB 08-362970 • South Africa: Electronic Building Elements PTY, Ltd 12-46-9221/7

Bubbl-tec is a registered trademark of PC/M, Inc.
DEC is a registered trademark of Digital Equipment Corp.
Q-Bus, RLO2, RXO2, RXO1, TU58 are trademarks of Digital Equipment Corp.
VERSAbus and VMEbus are trademarks of Motorola, Inc.

CIRCLE NO. 72 ON INQUIRY CARD

**WE PUT
THE BEST
IDEAS INTO
STORAGE.**



At Cipher, good ideas for storage devices come in a range of packages. In fact, we're the only manufacturer who offers a full line of 1/2" and 1/4" tape drives.

Our first idea became the industry's standard for 1/2" streamers. It was the Microstreamer.[®] Two other products, CacheTape[™] and GCR CacheTape[™], round out our 1/2" line.

What's the Cache?

Cache is a high-speed, solid-state memory found in our CacheTape drives. It replaces more costly — and less reliable — vacuum column and compliance arm mechanics.

Cache gives you better performance in all applications. For example, both our P.E. CacheTape and our GCR CacheTape drives allow you to stream or optimize your system without changing your existing start/stop software. And they do this for less money than any competitive drives.

Your 1/4" headquarters.

We took our expertise in the 1/2" world and applied it to 1/4" products, too. Take our FloppyTape[™] for instance. It's the first 1/4" streamer to use the standard floppy interface, format and controller. It stores up to 32 megabytes, fits the 5 1/4" form factor, and is very economically priced.

For QIC users, there's the 540 1/4" streamer. It fits the 5 1/4" form factor and gives you up to 60 megabytes of capacity. QIC products for the 8" form factor are also available.

Tomorrow's drives today.

Already, Cipher has the next generation of drives. Our new 540S is a 1/4" streamer that uses the industry-standard Small Computer System Interface. We'll soon be using SCSI on our 1/2" products, too.

Another new drive is the IPI Microstreamer.[™] It combines a 1/2" streamer with the new Intelligent Peripheral Interface, Level 3. A GCR drive with IPI will be coming soon.

Cipher has plenty of other new products also on the way. To learn more about these ideas in storage, call (800) 982-8808. Or write Cipher Data Products, P.O. Box 85509, San Diego, CA 92138.

cipher[®]
data products, inc.

**WE PUT THE BEST IDEAS
INTO STORAGE.**



See us at Comdex, Booth #4127, Las Vegas



Microstreamer, CacheTape, GCR CacheTape, FloppyTape, and IPI Microstreamer are registered trademarks of Cipher Data Products, Inc.

CIRCLE NO. 73 ON INQUIRY CARD

TWO TERMINALS IN ONE

(for only \$795.00)

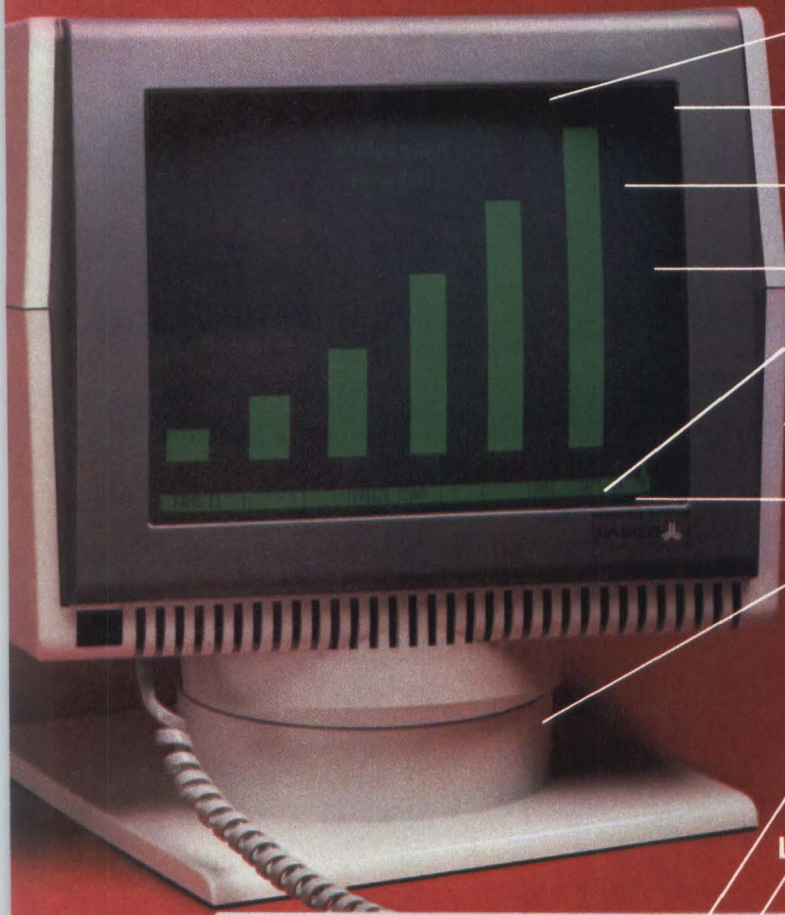
ANSI x3.64

In ANSI mode Fame II gives you Dec VT 100* and VT102* compatibility.

ASCII

In ASCII mode Fame II gives you Televideo 925* compatibility with 2 pages of memory.

You can get full information on all the unique features of the Fame II or other great terminals from Falco Data Products by calling 800 835-8765 or 800 538-5383 in California.



Hidden Video Attributes

High Contrast Non-Glare Green Screen

14 Inch Screen

80/132 Characters per Line

24 or 25 Line Display Status Line or User Line

Two Bi-Directional RS232 Ports

Screen Saver

Tilt and Swivel Housing

Keypad and Edit Mode

User Programmable Function Keys

Low Profile Keyboard

Block Mode

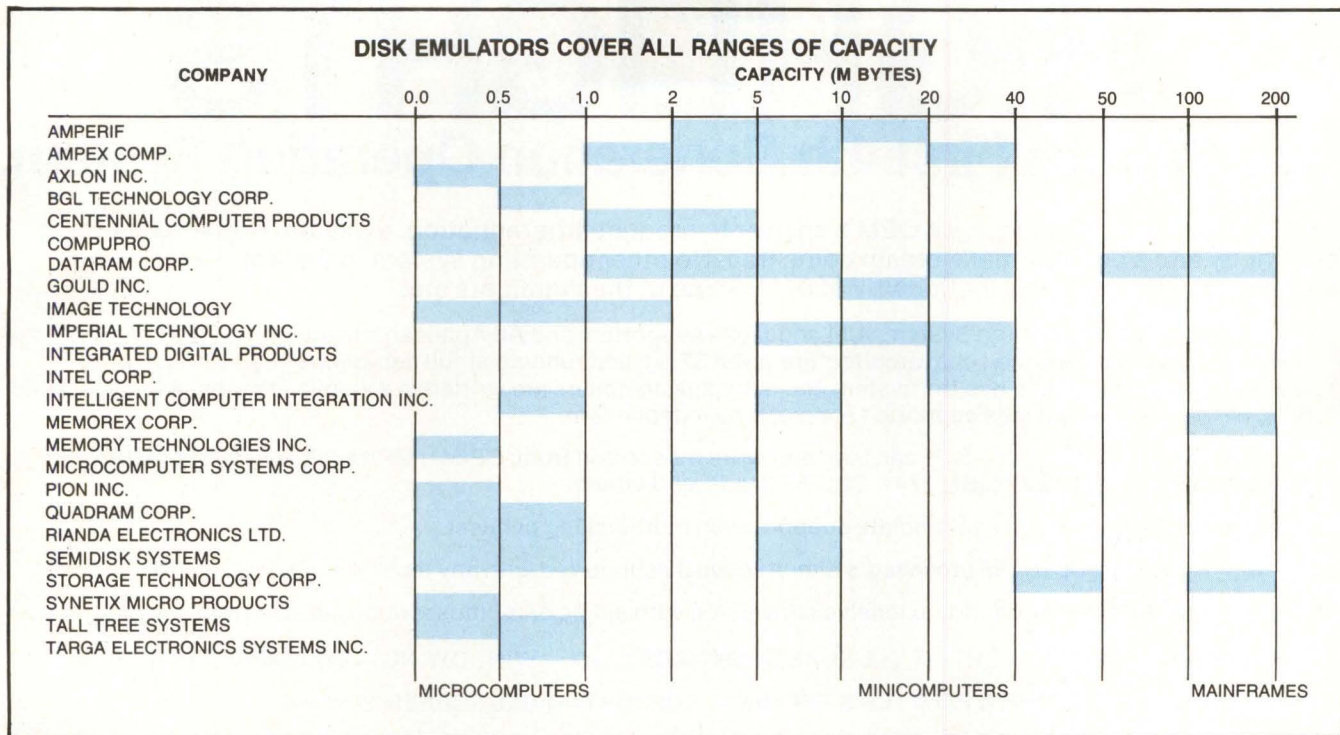
IBM Style Correction Key

Dec VT 100/VT 102 is a Trademark of Digital Equipment Corp.

FALCO DATA PRODUCTS

1286 Lawrence Station Road • Sunnyvale, CA 94089 • (408) 745-7123

CIRCLE NO. 74 ON INQUIRY CARD



tor, measures 9 inches by 8½ inches by 4 inches and houses a half-hour-rated backup battery; it therefore does not need reloading. It emulates two drives under DOS 3.3, two under Pascal and one under CP/M.

Its 256K bytes are expandable in 256K-byte increments to 1M byte, so it can thus emulate eight drives by using mapping software, or large 1,768-block drives under Pascal or CP/M. Hardware-error detection circuits prevent faulty data. Using different host interfaces, this disk emulator runs on IBM PC and IEEE-696 bus systems, and many others. It supports such operating systems as MS-DOS, DOS 3.3, MP/M, CP/M and TURBODOS.

Operating systems affect disk emulators

A discussion of disk emulators that support DOS 3.3 is incomplete without mentioning the ProDOS single-user, single-task operating system. ProDOS promises easier use and integration with less patching. Its performance surpasses that of DOS 3.3., although software written under DOS 3.3 will run under ProDOS. When accessing text-file records, it runs six times faster than DOS 3.3. Indeed, ProDOS's read/writing of files and records represents a five-fold speed improvement over DOS 3.3, except for binary file-storing or writing, which still can be tripled. ProDOS uses Apple's 64K-byte extended 80-column text card as a disk emulator. File-buffer opening and directory-accessing overhead time aside, ProDOS transfers data to or from disk at 8K bytes per second, an eightfold increase over the DOS

3.3 rate.

The ProDOS disk-emulator capability is also improved over DOS 3.3. Randomly accessible, ProDOS file sizes range from 1 byte to over 16M bytes. ProDOS organizes disk and disk-emulator storage by its UNIX-like hierarchical directory structure. Because ProDOS reads/writes 512-byte blocks, each disk's drivers convert sectors to 512-byte blocks. Thus, ProDOS is independent of physical disk-sector sizes or sectors per track. A growing-tree-file storage structure automatically handles file-size variation.

The future of the disk emulator appears bright. With 256K chip prices dropping, the cost advantage of a disk emulator over a second floppy disk drive will further improve. And the incorporation of higher-capacity chips onto motherboards by computer makers will also accelerate the trend to widespread disk emulators use.

Innovative packaging also will enliven the disk-emulator industry. To maximize expansion slot usage, many memory-expansion boards are multifunction, combination boards populated with 64K chips that can be replaced later with 256K chips, thus quadrupling memory. Other techniques include Wang Laboratories Inc.'s Straight-In-Line Memory Modules (SIMMs) that hold nine 64K chips, permitting a SIMM and 256K RAM mix to reach 8M bytes per board. □

Interest Quotient (Circle One)
High 810 Medium 811 Low 812

S1 HIGHLIGHTS

The World's First 4th Generation Operating System.

The S1™ Operating System is an OEM's answer to product differentiation, a System House's answer to continuity and a programmer's dream come true. No other operating system in the world even comes close to the features and functionality of S1™. Some of the highlights are:

PORTABLE: The S1™ Operating System, All Languages supported, and All Applications running on S1™ can be ported to a newly announced chip architecture (even 32 bit) and running at full compiled speed within five (5) months. This is possible since the system and language compilers are written in a single common language called SL™. S1™ and All Languages supported are machine independent.

FILE SYSTEM COMPATIBILITY: S1™ can read and write files to and from: CP/M®, MP/M II™, MS-DOS™, UNIX®, XENIX®, p-System®, FLEX™, IBM 3741, DEC™ Files 11 and others.

MULTIUSER — MULTITASKING: Complete support: even multitasking per user.

MULTIPROCESSING: Up to **256 processors simultaneously** supported with any task running on any CPU.

NETWORKING: Complete support: extensive networking with single or multiuser nodes usable from any program.

EXTENSIVE GRAPHIC SUPPORT — FULL SCREEN MANAGEMENT — WINDOWING — BIT MAPPED DISPLAYS

FULL BIT MAPPED PRINTER & PLOTTER & TERMINAL SUPPORT — FULL SCREEN EDITING

EXTENSIVE UTILITIES: Assembler — relocating loader — linkage editor — high level assembly & language debuggers — sort — extensive O.S. managed error recovery — operating system debugging tools — desk calculator.

SUPPORTS ALL FORMS OF MEMORY MANAGEMENT, INCLUDING VIRTUAL MEMORY — BUT NOT REQUIRED

MODULAR: Unneeded system components can be omitted saving memory and load time such that the system can be configured for: REAL TIME — DATA ENTRY — PROFESSIONAL WORK STATION — PERSONAL — BUSINESS — MULTIUSER/MULTITASKING — DISTRIBUTED NETWORK — DEVELOPMENT.

UNIX® USER PROGRAM SOURCE COMPATIBILITY — RECORD LOCKING — EVEN BYTE LEVEL LOCKING

USER COMPATIBILITY: All configured versions of S1™ "Look" and "Respond" the same to all users, regardless of which chip or configuration is used.

VERY USER FRIENDLY: Menu driven, command driven, or prompting command processors.

PRESENTLY RUNNING ON: 68000, Z80®, 8080 and 8085. By July 84: 8086/88 — Aug. 84: 80186 — Sept. 84: 80286 — Oct. 84: 16032

LANGUAGES AVAILABLE: Pascal (ISO compatible) + Extensions, FORTRAN 77 + Extensions, C (Kernighan + Ritchie) + Extensions, BASIC (ANSI) + Extensions; by Dec. 84: COBOL 74 + Extensions, Modula 2 + Extensions; by Feb. 85: PL/I + Extensions, Ada + Extensions, LISP + Extensions, SNOBOL + Extensions. All our languages are extended to provide many of the advantages of the S1™ Operating System (i.e., 64 character file names) and are supersets of most popular language compilers, and can be made compatible with these languages using our available converters.

HIERARCHICAL DIRECTORIES & KEYED FILES (ISAM & VSAM & B-Tree)

ELECTRONIC MAIL & FILE TRANSFER

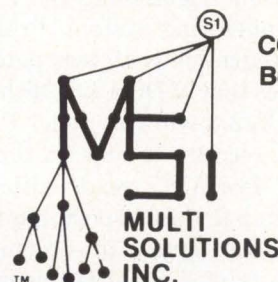
SEMAPHORES AND LOCKS — REAL TIME SUPPORT

SOFT FONTS & SOFT KEYS (up to 64,000)

PLEASE SEND FOR ADDITIONAL INFORMATION

*Registered trademarks: CP/M of Digital Research; UNIX of Bell Laboratories; UCSD p-System of Regents of University of California; XENIX of Microsoft, Inc.; Z80 of Zilog, Inc.

Trademarks: MS-DOS of Microsoft, Inc.; FLEX of Technical System Consultants; Pick of Pick and Associates; MP/M II and PASCAL/MT + of Digital Research; S1 and SL of Multi Solutions, Inc.
HP of Hewlett Packard; DEC™ of Digital Equipment Corporation;
BASIC PLUS of Digital Equipment Corporation



COMDEX-FALL '84
Booth #0739

Suite 207, 123 Franklin Corner Rd.
Lawrenceville, N.J. 08648
609-896-4100 Telex 821073

S1-The only operating system that does it all

CIRCLE NO. 75 ON INQUIRY CARD

Removable mass storage market sales remain strong

Despite inroads by fixed-disk drives, removable magnetic-tape and disk-drive models stay competitive through lower prices and increased storage capacities

Larry Sarisky, SyQuest Technology

Although fixed Winchester drives dominate the trade news, the largest selling storage devices are still removable drives. The market for removable drives continues to soar due to an increasing demand for low-cost, high-performance mass storage in personal and portable computers, workstations and test devices.

The removable drive market can be divided into two major segments: magnetic-tape and disk-drive devices. Of the two, the disk-drive market is larger and growing faster.

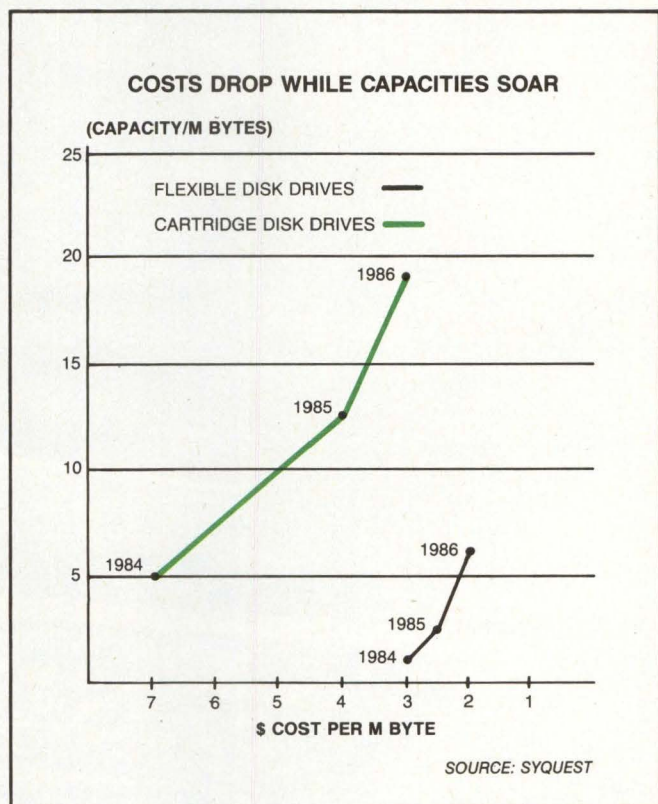
Three types of disk drives

Disk drives are random-access devices using either of two basic storage media—flexible diskettes or rigid disks. These media are further divided into three types of devices: floppy disks (flexible), cartridge disks (rigid) and removable pack drives (rigid).

Over the past 10 years, the floppy disk drive industry has grown to include more than 50 manufacturers selling more than 300 models. The market is growing quickly: floppy-disk sales rose from \$2.2 billion in 1982 to near \$4 billion in 1983.

The floppy industry is classified by drive size. Current sizes available include the established 8-inch and 5¼-inch models and, below them, the 3½-inch, 3¼-inch and 2½-inch competitors. Important to the floppy industry's revenues is the annual disk-to-drive consumption ratio of approximately 50-to-1.

Although storage capacities have increased greatly (from the original 0.125M byte to 1M byte), floppies pose problems of access time and unit degradation. Other technologies have evolved to combat these problems with alternative products. The most important of



Although the cost of floppy disk drives will decrease 25 percent in the next two years, their storage capacity will increase almost threefold. The price of cartridge disk drives will halve in two years, and their capacity will increase fourfold.

these is the cartridge disk drive, which today is the second most popular random-access removable storage device.

The storage capacity of cartridge disk drives is now 10M bytes per cartridge—five times that of floppies.

At \$795, our DEC-compat
a sophisticated image



Compatible terminal projects even when it's off.

The WY-75 is the one VT-100 software-compatible terminal that looks intelligent even when it's not on.

And at \$795, it looks as smart to the people who pay for it as it does to the people who look at it all day.

Like all our terminals, the WY-75 combines an unusually small footprint with a very generous 14" diagonal display. The non-glare screen tilts, swivels, and displays a full 132-column format. The sculpted, low-profile keyboard adjusts, too.

We've done everything to make the WY-75 the best looking, best feeling, best performing terminal anywhere. On or off.

Can such a beautiful piece of equipment be the workhorse we say it is?

Try it, hands on, and see your application software on the screen.

To find out where you can see the WY-75 demonstrated, call the regional office nearest you.

For more information about our complete line of products, write or call Wyse Technology, 3040 N. First Street, San Jose, CA 95134, (408) 946-3075. Outside of California 800-421-1058.

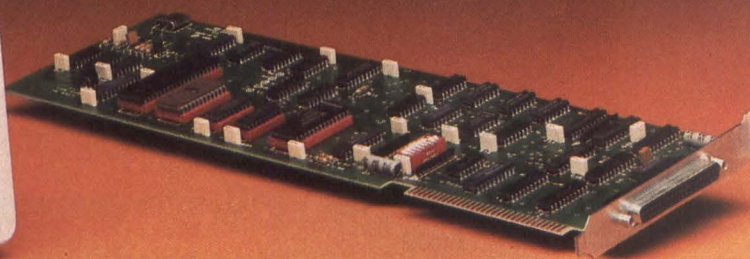
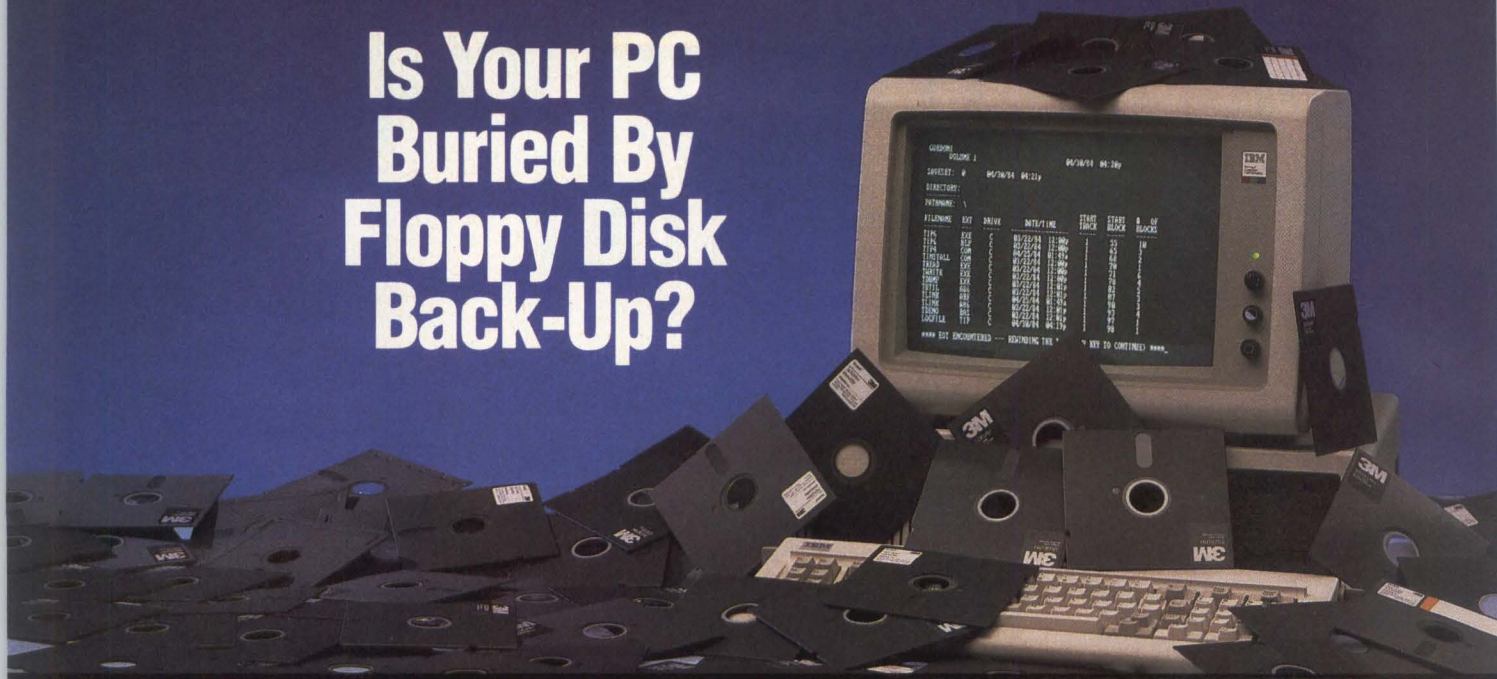
WYSE
| | | |

Regional Offices: Northeast (201) 725-5054; Southeast (305) 862-2221; Midwest (313) 471-1565; Southwest (213) 340-2013; Northwest (408) 559-5911.

DEC and VT-100 are trademarks of Digital Equipment Corporation.

CIRCLE NO. 76 ON INQUIRY CARD

Is Your PC Buried By Floppy Disk Back-Up?



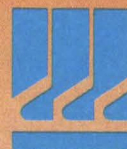
Dig Out With Model 70 PC Cartridge Tape System

Digi-Data's Model 70 PC cartridge tape system lets you back-up your PC's Winchester drive without getting buried in floppies. One cartridge holds 16.5 Mbytes of data, more than you can put on 51 floppy disks! And you can back-up your 10 Mbyte PC XT[®] drive in less than 15 minutes of *unattended* operation. That is a small fraction of the time it would take with the PC's floppy, with you standing there changing disks.

Our file-oriented structure makes it possible for you to back-up only what has to be changed on your disk. That saves still more time and storage capacity.

70 PC comes ready to run on your IBM PC XT and most compatibles like Compaq, Columbia Data Products and Eagle. Complete with controller board, driver software and cables.

Digi-Data's products also include 1/2 inch and 1/4 inch start/stop and streaming drives and systems.



DIGI-DATA
CORPORATION
®... First In Value

8580 Dorsey Run Road
Jessup, MD 20794
(301) 498-0200 Telex 87580

In Europe contact:

DIGI-DATA LTD
Unit 4
Kings Grove
Maidenhead, Berkshire
England SL6 4DP
Tel. 0628-29555-6
Telex 847720

See us at booth 2780

COMDEX™/Fall '84

Las Vegas Convention Center

® PC XT is a registered trademark
of IBM Corporation

CIRCLE NO. 77 ON INQUIRY CARD

Since their invention more than 15 years ago, cartridges have increased in capacity tenfold, decreased in physical size threefold (from 14 inches to 3.9 inches) and dropped notably in price. Wherever a floppy is used today, a cartridge can be used tomorrow with significantly higher capacity and performance.

Approximately 350,000 cartridge units will be sold this year, creating a \$175-million market. This market will grow rapidly, due in part to a continuing drop in cartridge and drive prices. In 1985, 1.3 million cartridge drives will be sold and, in 1986, approximately 2.5 million will be sold. Although those numbers are still considerably less than comparable figures for floppies (manufacturers will sell 16.5 million floppy drives in 1986), the situation might reverse later. Compare the dollar cost per M byte of floppies to that of cartridges. By this measure, cartridge cost is now almost twice that of floppy diskettes; by 1986, the two costs will be equal. The fastest growing segment of the cartridge market will be the smaller-sized devices, which will be integrated eagerly by portable- and personal-computer vendors and used to protect data.

Magnetic tape devices re-emerge

At the high-end capacity of the disk market is the removable pack drive, which stores from 80M bytes to 600M bytes. These devices, designed for integration into large computer systems, retain an active market acceptance. This should continue for several years

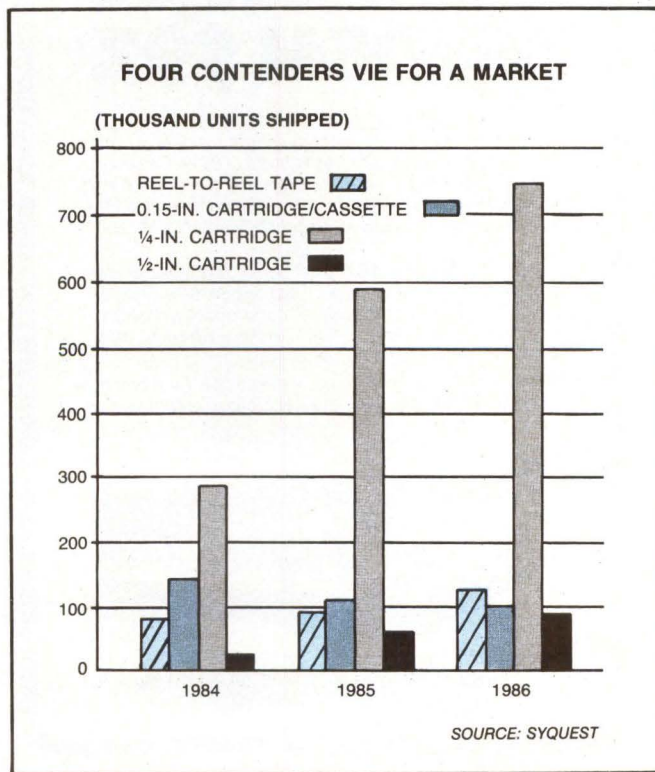
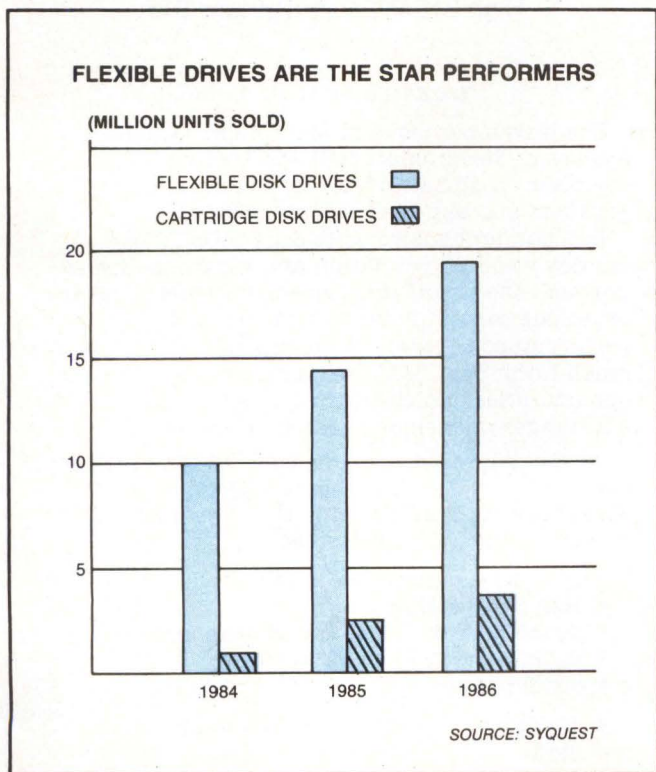
because of the large installed base and the large cash outlay associated with replacing them.

Magnetic-tape products—serial access devices for archival-applications—are used to store large off-line databases for future recall. Apparently in danger of extinction a few years ago, magnetic tape devices were saved by the emergence of nonremovable drives, themselves a \$9-billion industry in 1983. Nonremovable devices require much attention to backup procedures that prevent data loss. Large organizations typically turn to removable magnetic tape to protect their data.

The five categories of magnetic-tape products will create a combined market worth more than \$700 million in 1985, but their limited growth as compared to disk drives is apparent from the projected 1987 sales figure of \$825 million.

The five magnetic tape devices include the 0.15-inch-cassette; three different cartridge models (0.15-inch, ¼-inch and ½-inch) and reel-to-reel tapes. Cost effectiveness is related to the amount of data stored.

Cartridge drives are the most successful group when measured by quantity of units shipped and number of companies shipping. The ¼-inch cartridge drive is currently the most popular, but it might become eclipsed by the arrival of a reliable ½-inch cartridge. Approximately 275,000 ¼-inch cartridges will be sold in 1984; that number will jump to 750,000 units in 1986. Only about 10,000 ½-inch cartridges will be in the field this year. But that number will dramatically increase to



Solid-State Disc Replacement

Dramatic increases in throughput.
Outstanding reliability.

- Capacities to 80 megabytes
- 10 megabytes in 7-inch chassis
- Interfaces to most minicomputers
- Battery back-up



VISIT BOOTH #3011 DEXPO WEST

When used as a disc replacement, the high speed, non-rotating MegaRam provides the software compatibility of a disc with the performance of main memory. Ideal for swapping, scratch files, overlay storage, process control, telecommunications, graphics, data acquisition, array processing, etc.

Let us show you how the MegaRam can enhance the performance of your computer while providing outstanding reliability.



Imperial Technology, Inc.

831 S. Douglas Street • El Segundo,
California 90245 • Telephone: (213) 536-0018

CIRCLE NO. 78 ON INQUIRY CARD

9600bps MODEM \$97.*

The MADZAR Z9600® series of short haul modems are a cost effective way to get your asynchronous data down the hall or down the street at rates from 75 to 9600 bps. The MADZAR Z9600® series out performs any other brand in its price range and it's available in a rack mount version that packs 16 short haul modems in only 5-1/4 inches of rack space.

Try a pair of our MADZAR Z9600® series short haul modems for 30 days on credit approval. Then decide. Be particular. Buy the best and join the ranks of our growing list of customers like General Electric, NASA, Aerojet Strategic and General Dynamics to name just a few.

Want more information? Call or write us now for a brochure and complete pricing. (We have generous discounts for quantity buyers).



37490 Glenmoor Drive
Fremont, CA 94536-9990
415/794-7400

*100 Unit Price

CIRCLE NO. 79 ON INQUIRY CARD

REMOVABLE STORAGE

HOW MAGNETIC TAPE DEVICES COMPARE

Capacity	Performance	Cost effectiveness	Product (in.)
1-5M bytes	low	fair	cassette 0.15
1-5M bytes	low	fair	cartridge 0.15
5-60M bytes	medium	fair	cartridge 0.25
100-350M bytes	medium	good	cartridge 0.5
1G byte +	medium	excellent	reel-to-reel 0.25

Source: SyQuest

about 100,000 units in 1986.

The most cost-effective units are the reel-to-reel tapes but, because of their high price tag, these units are found only on large computer systems. Nevertheless, their acceptance should grow at a healthy 25-percent annual rate for the next few years.

The one dark spot on the reel-to-reel tape's future is competition from the optical disk drive. This non-erasable device will be random-accessible and hold upwards of 1G byte of data. Though none has yet been shipped, the optical disk could eventually replace tape for high storage. □

Larry Sarisky is vice president of sales and marketing and co-founder of SyQuest Technology, Fremont, Calif. He has been in the disk-drive industry for 15 years.

Interest Quotient (Circle One)
High 813 Medium 814 Low 815

NEXT MONTH IN MMS

The November issue of Mini-Micro Systems focuses on terminals. MMS will present an overview on alphanumeric terminals, the key products and expected market trends.

In a comprehensive software profile, MMS studies terminal emulation and control software. Through the use of this type of software, display terminals can emulate the features and performance of other, often superior terminals at a much lower cost. MMS will examine networking opportunities and software compatibility advantages of various product offerings.

Be sure to watch for your issue of Mini-Micro Systems' next Fall Peripherals Digest, coming November 15. This comprehensive reference guide will cover the following topics:

- disk drives (up to 5¼-inch)
- disk subsystems
- cartridge tape drives (up to ¼-inch)
- alphanumeric terminals
- serial printers

A directory of manufacturers will also be included.

THE COGITO HALF-HEIGHTS.

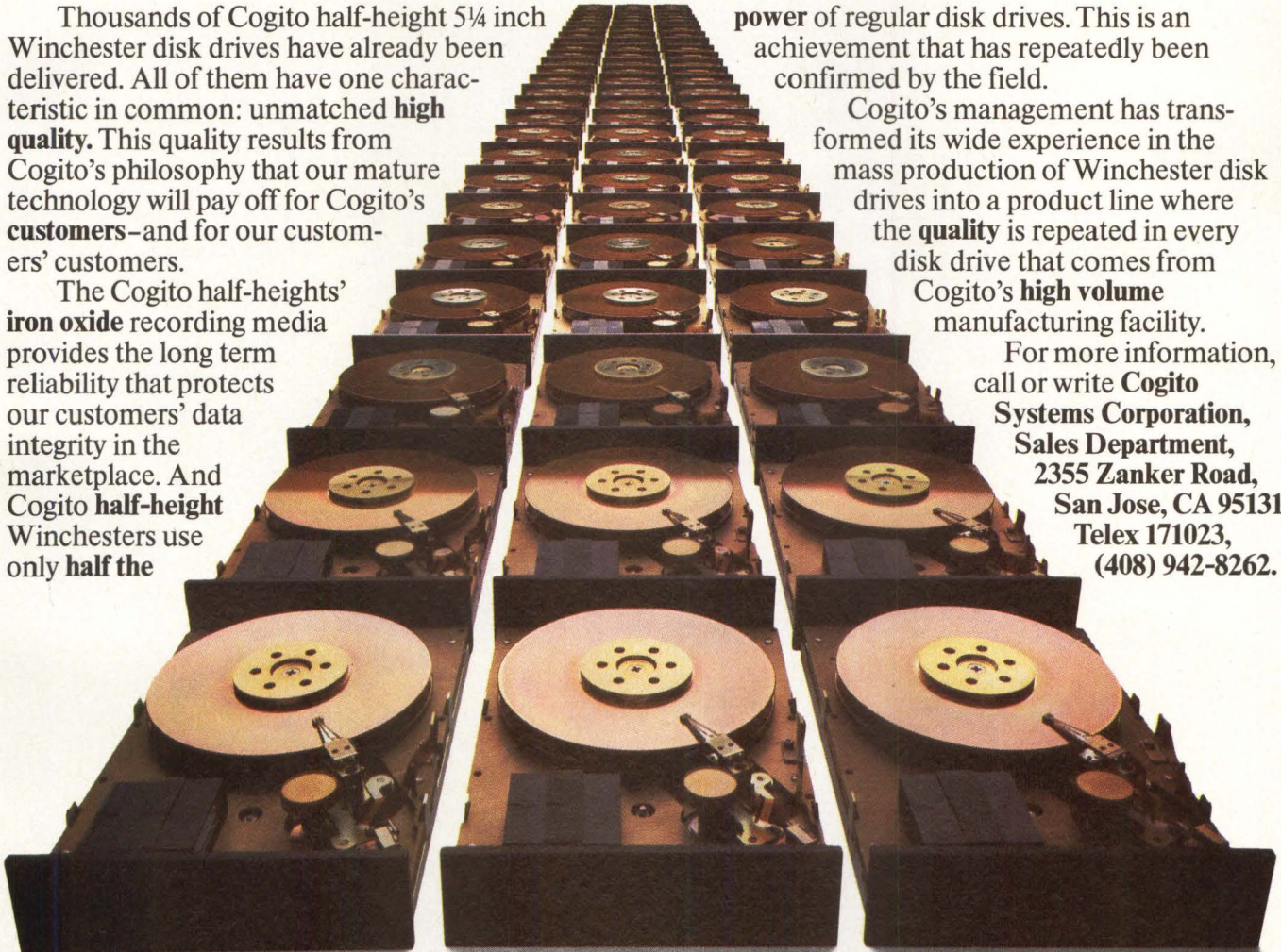
Thousands of Cogito half-height 5¼ inch Winchester disk drives have already been delivered. All of them have one characteristic in common: unmatched **high quality**. This quality results from Cogito's philosophy that our mature technology will pay off for Cogito's **customers**—and for our customers' customers.

The Cogito half-heights' **iron oxide** recording media provides the long term reliability that protects our customers' data integrity in the marketplace. And Cogito **half-height** Winchesters use only **half the**

power of regular disk drives. This is an achievement that has repeatedly been confirmed by the field.

Cogito's management has transformed its wide experience in the mass production of Winchester disk drives into a product line where the **quality** is repeated in every disk drive that comes from Cogito's **high volume** manufacturing facility.

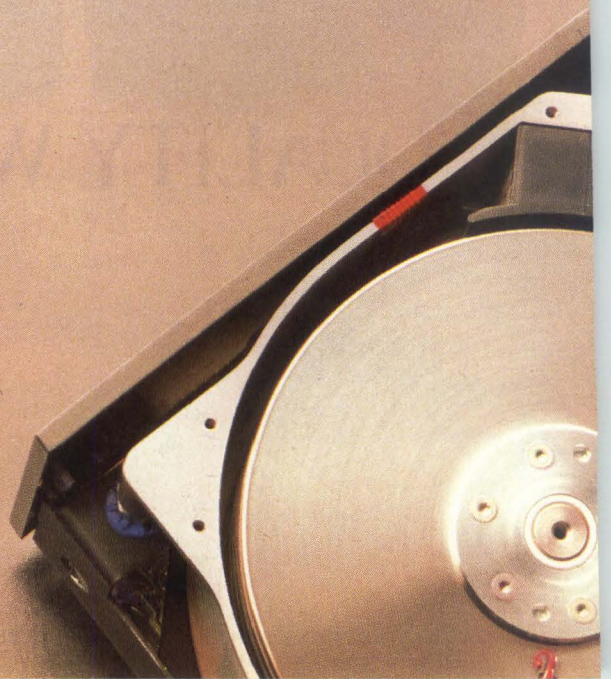
For more information, call or write **Cogito Systems Corporation**, Sales Department, 2355 Zanker Road, San Jose, CA 95131, Telex 171023, (408) 942-8262.



QUALITY WORTH REPEATING.

COGITO
S Y S T E M S

You can't build
tomorrow's systems
with yesterday's drives.



You've seen one small disk drive, you've seen them all, right?
Not exactly. One disk drive stands above all the rest.

It comes from Maxtor.

The company that refuses to produce disk drives merely as good as everybody else. Instead, we set new standards by producing the only 5¼" disk drives worthy of the next generation of supermicros. Winchester with 65 to 380 megabytes of storage. And average access times of less than 30 msec.

And we don't mean prototypes. We mean full production. So, you can build the systems of tomorrow, today. And that can be a big advantage.

For you. Or your competition.

Maxtor Corporation, 150 River Oaks Parkway,
San Jose, California 95134,
(408) 942-1700, TELEX: 171074.

Eastern Regional Sales Office:
(617) 872-8556.

Southwest Regional Sales Office:
(714) 859-3100.

Maxtor

CIRCLE NO. 81 ON INQUIRY CARD



Stop tying up 90% of your time solving 10% of the problem.

Where does the time go in creating a technical document or manual?

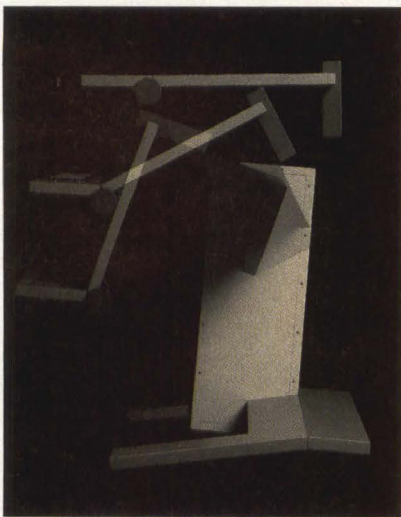
In a word — art. It occupies about 10% of the finished product. But it consumes 90% of the effort.

Introducing the Qubix WorkSurface.™

Now there's a better way. The Qubix WorkSurface.

Using the latest in CAD technology, the WorkSurface lets you interactively and simultaneously create both art and text on screen. Using the actual type styles. In their actual point size — from 4.5 point. The comprehensive batch and interactive composition and pagination software produces completed pages.

So what you see on screen is exactly what you'll see in print.



Up, down, all around. The WorkSurface electronically adjusts to how you like to work.



With the WorkSurface, it takes seconds. Simply display the appropriate page. Then, using the digitizing pen, draw the changes directly on the screen. That's all.

You can create illustrations from scratch in 1/4th the time. And make revisions in 1/10th the time. In fact, in little over a year, you'll save enough in time to pay for the system.

Now, once is always enough.

Any art elements you create can be stored in the system's memory. So commonly used elements need only be drawn once — and then recalled for use whenever and wherever needed. In any size you choose. And in combination with any other elements.

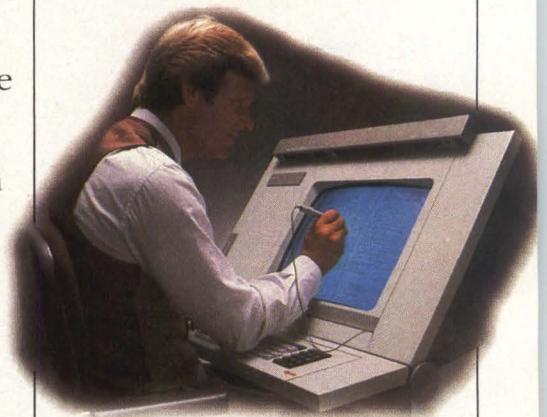
It uses a language you already know. English.

For all its sophistication, the WorkSurface is very easy to use.

Menus, in plain English, are displayed on the screen at all times. Select a command. And the system responds.

Making changes won't put you through changes.

With any document, there are always changes. And changing art has always been the most difficult. It might take hours. It might take days.



Draw your conclusions. Instantly. Redesign a page and evaluate several different layouts in seconds. Not hours.

For complete details and to arrange a demonstration, call us now at (408) 292-4000.

We'll show you how to do in a minute what used to take ten.

QUBIX
1255 Parkmoor Ave.
San Jose, CA 95126
(408) 292-4000

Stretched-surface-recording boasts attributes of floppies and Winchester

*SSR technology uses 'stretched' media,
flying heads to achieve high densities*

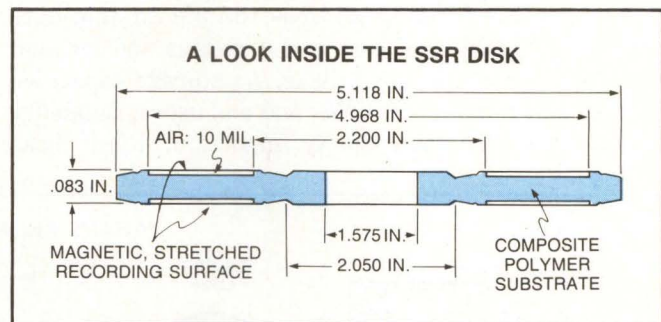
David L. Cross, 3M

Stretched-surface-recording (SSR) combines the performance characteristics of rigid disks with the low cost and environmental tolerances of flexible media. The media incorporates an injection-molded substrate with raised rims at the outer edge of the disk and around the center hole. A magnetic-coated film base is stretched and bonded to the rims, resulting in a compliant surface with a 10-mil gap between the substrate and the media.

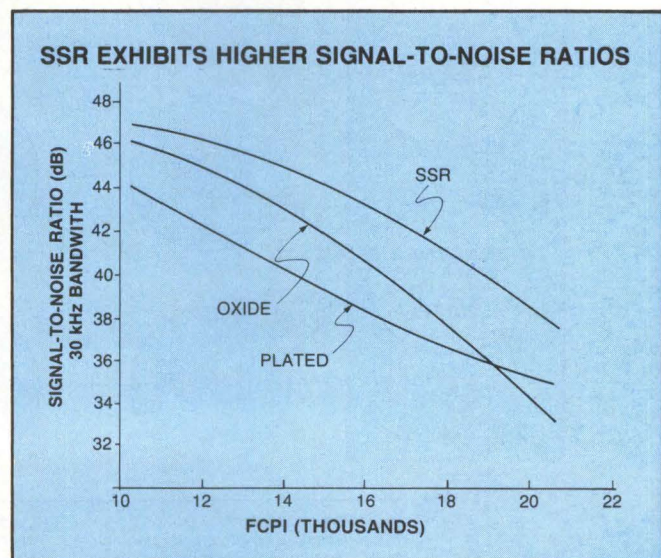
The substrate layer is a composite polymer, in contrast to aluminum substrates used in rigid oxide and rigid thin-film media. The magnetic layer of SSR disks is random particulate. Rigid oxide disks employ oriented-particulate magnetic layers, and rigid thin-film disks have plated or sputtered magnetic layers. The coercivity of SSR disks is 570 oersteds, compared to 330 oersteds for rigid-oxide media and 600 oersteds for rigid thin-film media.

Stretching and bonding the media to a support system reduces anisotropy to 1/10th that of a diskette. Anisotropy is the tendency of a material to expand more along one axis than the other because of heat or other forces. This reduction makes possible denser track spacing. Prototype SSR media support the 345-tpi (tracks per inch) density of stepper-positioned fixed-disk drives. In contrast, most diskettes have 48 or 96 tpi.

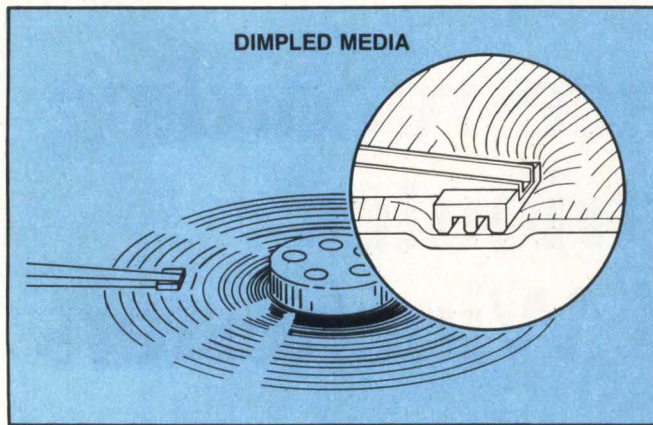
Because of the relatively high velocity of the disk (3,600 rpm), the read/write head flies above the surface of the media. (Most floppy disks operate at 360 or 600 rpm.) Although the head is flying, its force produces a small "dimple," or flexing on the media surface. This compliance between the flying head and the SSR sur-



A stretched-surface-recording disk consists of a composite polymer substrate layer and a film-coated, magnetic-recording surface.



Signal-to-noise ratio comparison between stretched-surface-recording (SSR), rigid oxide and rigid thin-film disks shows that as flux changes per inch (fci) increase, SSR disks consistently exhibit higher signal-to-noise ratios.



The media surface "dimples," or flexes, as the head flies above it.

SSR REQUIRES DRIVE MODIFICATIONS		
	ST412 drive with std. oxide disk	ST412 drive with 3M SSR disk
Head type	manganese-zinc monolithic	manganese-zinc monolithic with 3M contour
Track width (in.)	0.0022	0.0017
Data band (in.)		
outermost	2.34	2.212
innermost	1.46	1.328
Record current (ma)	36/40	35/50
Amplifier gain	1X	0.3X

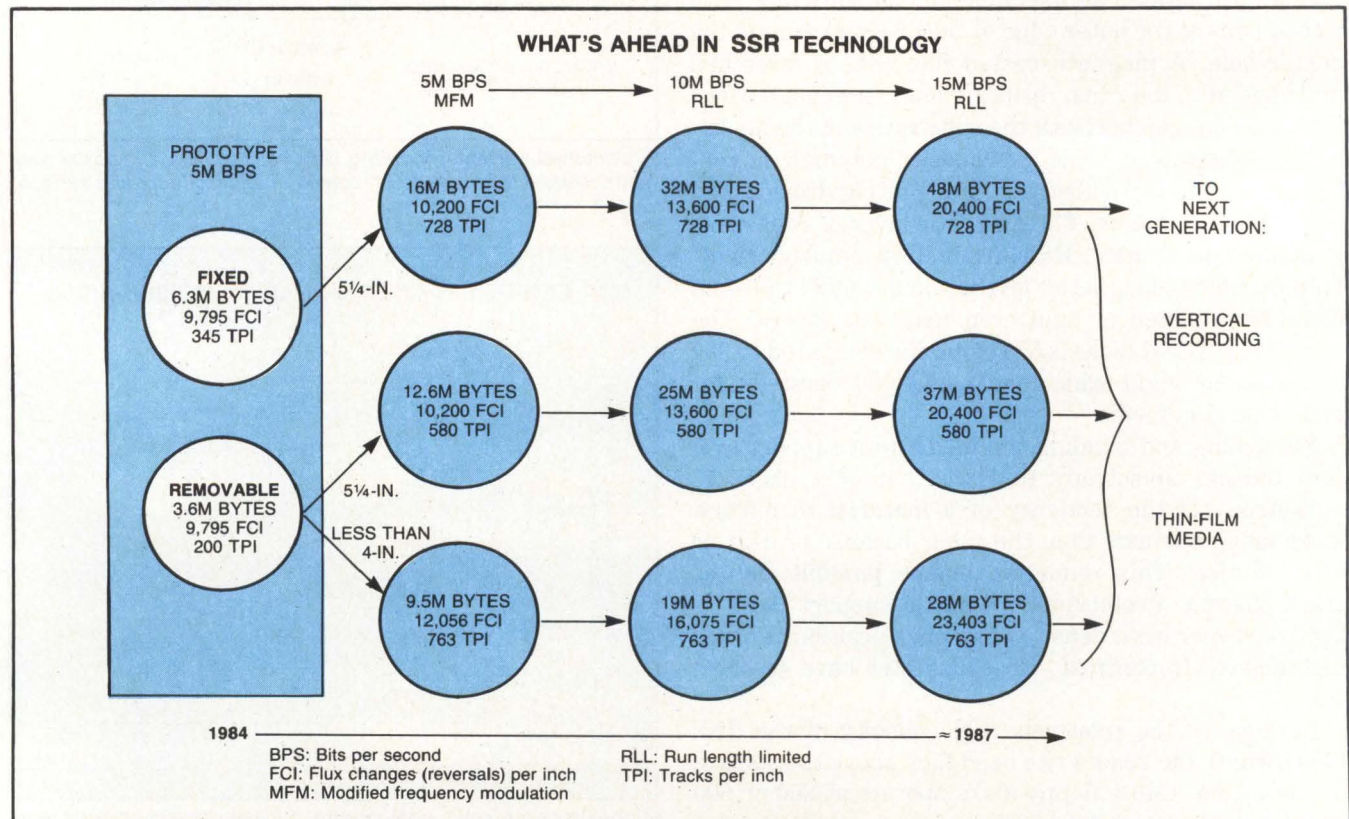
face is largely responsible for reduced head/disk interactions.

SSR fills storage gap

SSR media currently address the 3M to 12M-byte range falling between high-end diskettes and low-end fixed and removable rigid disks. As storage capacities fill the requirements of OEMs and end users, reliability and cost become increasingly important. Rigid disks

provide high performance and high capacity, but are relatively expensive. Diskettes are reliable and affordable in the less-than-one-megabyte range, but requirements for increased capacities are stretching the limits of diskette technology.

SSR technology bridges this gap by providing competitive capacities and performance. It also provides a lighter, more durable cartridge than that used with removable oxide or plated media, as well as minimized



The evolution of stretched-surface-recording disks will go from the current prototype version to 48M-byte disks using run-length-limited recording techniques, 20,400 fci and 728 tpi. Vertical record-

ing and thin-film media will further increase densities and transfer rates.



If you're a major league VAR, we want you on our team.

IBM is scouting for the most valuable of VARs: those with outstanding new ideas and a great batting average.

If you're one of them, you could become a Value Added Remarketer of IBM products. And what could that mean to you?

First, IBM can add clout to your marketing efforts. For example, we can help with product literature, direct mail and business show support. To add to your skills, IBM offers a wide range of professional classes for VARs.

Furthermore, thanks to the online referencing system used by our own sales force, we can direct prospects with special needs right to VARs with appropriate solutions.

And, as one of the finest of VARs, you'll be selling the finest equipment: some of IBM's most competitive products. Our VARs can apply for the IBM 4300 systems, System/36, Series/1, System/38, the IBM Personal Computer and the System 9000 family.

To find out more about the advantages of becoming an IBM VAR, simply send in the coupon below or call 1 800 IBM-VARS, Ext. 96.

If you think your company can qualify, now's the time to touch base.



Larry Humphreys
IBM Distribution Channels
P.O. Box 76477
Atlanta, GA 30358

96/10-84

Please send me your free booklet, "Looking for Leaders."

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Product Interest _____

shock problems due to reduced media mass.

Relative to diskettes, SSR offers increased ease of handling because it requires fewer loadings. It also provides cost-per-megabyte improvements. SSR manufacturer, 3M, estimates that 12M-byte SSR disks will cost less than \$10 per disk in OEM quantities once production levels are reached.

Laboratory and OEM beta-site testing has shown the SSR disk to have high data reliability. For example, soft error rates in laboratory tests are equivalent to those of sealed disks: less than 1 in 10¹⁰.

Future generations promise increased capacities

SSR prototype disks operate in a drive with open-loop positioning at 345 tpi with a capacity of 3M bytes per side (formatted) on a dual-sided disk. The next generation will use modified frequency modulation (MFM) recording with track-following servos. Fixed and removable capacities will be 16 and 12.6M bytes, respectively.

The succeeding generation will offer further capacity increases and higher data rates via higher linear recording densities using run-length-limited coding techniques. These disks could store 48M bytes on a 5¼-inch

HOW MAGNETIC-RECORDING MEDIA COMPARE

	SSR	Rigid oxide	Rigid thin film
Substrate material	composite polymer	aluminum	aluminum
Magnetic layer composition	random particulate	oriented particulate	plated or sputtered
Thickness (in.)	0.083	0.075	0.075
Coating thickness (µin.)	55	30	3
Diameter (in.)	5.118	5.118	5.118
Head type	manganese-zinc	nickel-zinc	manganese-zinc
Coercivity (oersteds)	570	330	600
Coefficient of thermal expansion (µin./in./°F)	12.2	13.3	13.3
Track stability (60°F - 135°F)	100 µin.*	stable	stable

* 1/10th that of a standard diskette; that is, a recorded track in a standard diskette can wander as much as 1 mil from perfect circularity.

disk with 728 tpi and 20,400 flux changes per inch (fci). Perpendicular recording and thin-film media will lead to the next generation of disks.

SSR disks are the same size as 5¼-inch rigid disks, which facilitates head/disk performance evaluation. OEMs can use standard 5¼-inch drives with minor modifications.

One required change is the contouring of the head profile. This provides stable flight characteristics with head/disk separation of approximately 5 µin.

Another required modification is that the OEM or drive manufacturer raise the record current from the 36/40 milliamper range to the 35/50 milliamper range to accommodate the high coercive force of the particulate material. In addition, the amplifier gain must be attenuated two to three times to compensate for high head output. SSR disks produce two to three times more signal output than do Winchester-based oxide disks.

Prototype versions of the media were introduced by 3M at the fall 1983 COMDEX. The 5¼-inch fixed-media prototype holds 6.3M bytes per disk with 9,795 fci and 345 tpi. Limited quantities will be available in the fourth quarter. □

David L. Cross is project manager for stretched-surface-recording products in the data recording products division of 3M, St. Paul, Minn.

Interest Quotient (Circle One)
High 816 Medium 817 Low 818



A Software Implementation within Your Product Hardware

If you manufacture a computer system or a computer based product, allow it to EMULATE/COMMUNICATE by installing one or more of Systems Strategies "C" Language based communication packages.

- 3270 SNA/SDLC Emulation
- 3270 BSC Emulation
- 2780/3780/HASP Emulation
- X.25 Levels 1, 2, 3 Communication

You can purchase these "C" Language packages with source code and license to distribute in your hardware product. Each package is available either "Port it Yourself" with instruction manual and training or ported to your hardware by Systems Strategies' communications staff.

**Systems Strategies/Advanced Technology Division
Specialists in Data Communications Software**



Systems Strategies Inc.
225 West 34th Street
New York, New York 10001
(212) 279-8400

CIRCLE NO. 83 ON INQUIRY CARD

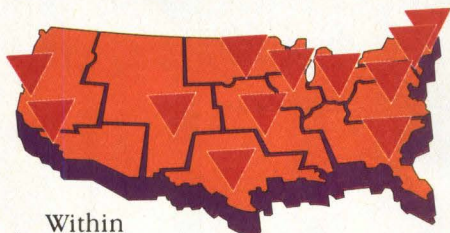
Write your own success story with Epson®



You've had the idea for years. Or maybe you just got it. But no matter what application you have in mind, Epson has the hardware to make it work. And the sales and technical support to make it a success.

Whether you want a portable, like the HX-20, or a desktop, like the QX-10. Or printers and other peripherals. When you build your system around Epson hardware, you get more than just machines. You get the support of a \$3 billion company, one of the world-wide leaders in the computer industry, and the number-one manufacturer of printers in the world. A company that has committed the human and technical resources you need. One that will be in business, and maintain our commitment to yours, over the long term.

WE'VE ALREADY INVESTED IN YOUR SUCCESS.



Within Epson, we've formed a nationwide program to support VAR marketers. Your initial inquiry will immediately be directed to one of our 12 regional VAR support centers. Then to one of our representatives who will contact you for further details. Each of our VAR representatives is well-versed in the hardware and software aspects

▼ V.A.R. SUPPORT CENTERS

of Epson machines. There's no runaround, just answers.

OTHER SUCCESS STORIES ARE ALREADY BEING WRITTEN.

The Epson HX-20 has been used in many applications that would have been impossible without it.

A major overnight delivery service uses it in their trucks, to input airbill data for tracing packages. It's also been developed into an on-site estimating system for everything from insurance to interior decorating.

How about the pilot who uses the HX-20 as his electronic co-pilot?

The QX-10 has seen duty as a medical/dental accounting system and on-line commodity quoter with high-
Epson is registered trademark of Epson America.



resolution graphics.

Of course these are only a sample. But if you're interested, Epson has an up-to-date directory of VAR applications using our machines. Just another way we can help you develop your own successful system.

WE'LL TREAT YOU LIKE A PARTNER.

Epson has put together a complete development kit for each of our machines. The kit includes all the detailed technical specifications you need to develop your software around our directory. Our VAR rep will continue to work closely with you and your programmers until the job is done. If necessary, he has ready access to a VAR technical group back at Epson headquarters.

No matter what application you have in mind, Epson has a machine to make it real.

To put Epson's VAR support to work for you, just mail this coupon to Epson today. Send it to Epson America, VAR Program, 3415 Kashiwa St., Torrance, CA 90505. Or call us at (800) 421-5426 (in Calif., call 213-539-9140).

Start writing here:

MM-10/84

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

PHONE NO. _____

TYPE OF COMPANY: VAR/SYSTEMS HOUSE END-USER CONSULTANT

YOUR APPLICATION _____

EPSON

V.A.R. PROGRAM, EPSON AMERICA • 3415 Kashiwa St., Torrance, CA 90505

Zilog now gives users of the System 8000 the kind of choice the big three cereal companies have given breakfast eaters for years.



Zilog Systems Division now gives you a choice in software for the System 8000 supermicros similar to the kind you've had for breakfast from the big three cereal companies since the early 1960's. You get to select the software you need when you need it. It's an easy and practical way to satisfy individual tastes.

We give you a choice of the best software you can buy. All from a single source.

We give you a choice of the best software applications packages you can buy. All from a single source. It's efficient, convenient and it saves you money. While satisfying the individual needs of

customers and users alike.

The software selections you have from Zilog are all industry standard packages. Your customers will recognize them instantly. What's more, Zilog provides complete software support. So you don't waste energy seeking vendors for help if and when you need it.

Get a taste of what it's like to run the most satisfying menu of software on the best high-performance UNIX* multi-user supermicros ever built—the System 8000. Call Zilog Systems Division at (800) 841-2255. Or write: Zilog Systems Division, Corporate

Publications, 1315 Dell Avenue, MS C2-6, Campbell, CA 95008.

*UNIX is a trademark of AT&T Bell Laboratories. Zilog is licensed by AT&T Technologies, Inc.



Systems Division
Zilog
 an affiliate of EXON Corporation

UNIX-based software introduces Telex to office automation

With SofGram, users can transmit and receive Telex communications over different computers

Michael J. Heffler and Betsy Longendorfer
SofTest Inc.

Telex, a communications method long used in international business, has entered automated offices with the help of SofGram, a UNIX-based software package that has recently been ported to MS-DOS. SofGram sends and receives Telex and TWX messages via the Telex, TWX and Direct Distance Dialing (DDD) networks and stores them in computerized filing systems. It can retrieve messages created by a word processor, or create them with its own screen editor. Users can create, transmit and receive messages on Telex and TWX between different computers and between operations on the same computer. The interface is user friendly and its operation hides communication protocols from the end user.

The alternatives are either a room full of Telex and TWX terminals to receive and send messages or a message switch, which requires a dedicated computer and customized software. SofGram is general-purpose, not customized for a particular application, and runs on low-cost computers.

For users communicating over public networks, getting on the networks and organizing their messages is difficult. SofGram solves the problem through its line handling, menus, forms, message formatting and database services. It lets the computer handle drudge work and organize data. More important, it enables a UNIX computer to replace Telex machines.

Communications abound in the office

In a typical office, people mail out orders, send and receive messages, leave notes on co-workers' desks,

Telex, TWX, DDD—what do they mean?

Telex is a worldwide, highly reliable communication network which has been in existence for over 45 years. There are over 200,000 Telex subscribers in North America and over 1.5 million worldwide. Telex communicates reliably with hard-copy (paper) output and verifies that messages are received. Telex runs at 50 baud (approximately six characters per second), using the baudot character set. International Record Carriers (IRCs) include Western Union, IT&T, RCA and several smaller companies.

TWX (Telex II) is a communications

network available throughout the continental United States. It is the second generation of Telex technology. It runs at 110 baud, approximately 11 characters per second, and uses the full ASCII character set. The delimiting sequences used within a message are ASCII control sequences, as opposed to the character sequences used in Telex.

DDD (Direct Distance Dialing) is the communications acronym for the telephone network. There are many ways to communicate between computers over a phone network, such as X.25

and its derivatives, packet switching networks, X.75 and the like. There are also several database services available that can be accessed through a phone network, such as Dow Jones, CompuServe and many others. When a computer tries to communicate with another computer, there must be a protocol set up between the two, plus knowledge of what to expect on each end of the communication line. For example, when a computer user dials up another computer, the modems and computer exchange handshaking protocols to log on in several levels.

miss telephone calls, and receive memos and inter-office mail. Much of the automated communications pass through Telex or TWX networks. And use of computer communications systems with on-line databases providing news and stock market information is increasing.

Consider a scenario in which all messages sent are created on a word processor, automatically time-stamped and stored in a special, computerized filing system. At the same time, messages received are stored in the filing system, making each one easy to peruse at the user's choosing.

If these functions are handled by Telex, TWX, inter-computer and intra-computer mail, they probably require an expensive corporate message switch. But message switches run on either mainframes or large minicomputer systems that cost \$250,000 or more.

Corporate message switches are usually manned by a specialized staff. Existing and future offices need to have communication capacity for everyone. So an office workstation user-interface must hide the computer's command language and the communication networks' protocols and commands. SofGram handles all these communication functions. It encourages and simplifies the use of existing data communication networks and their databases. Often, the complicated procedures necessary to access the communication network or

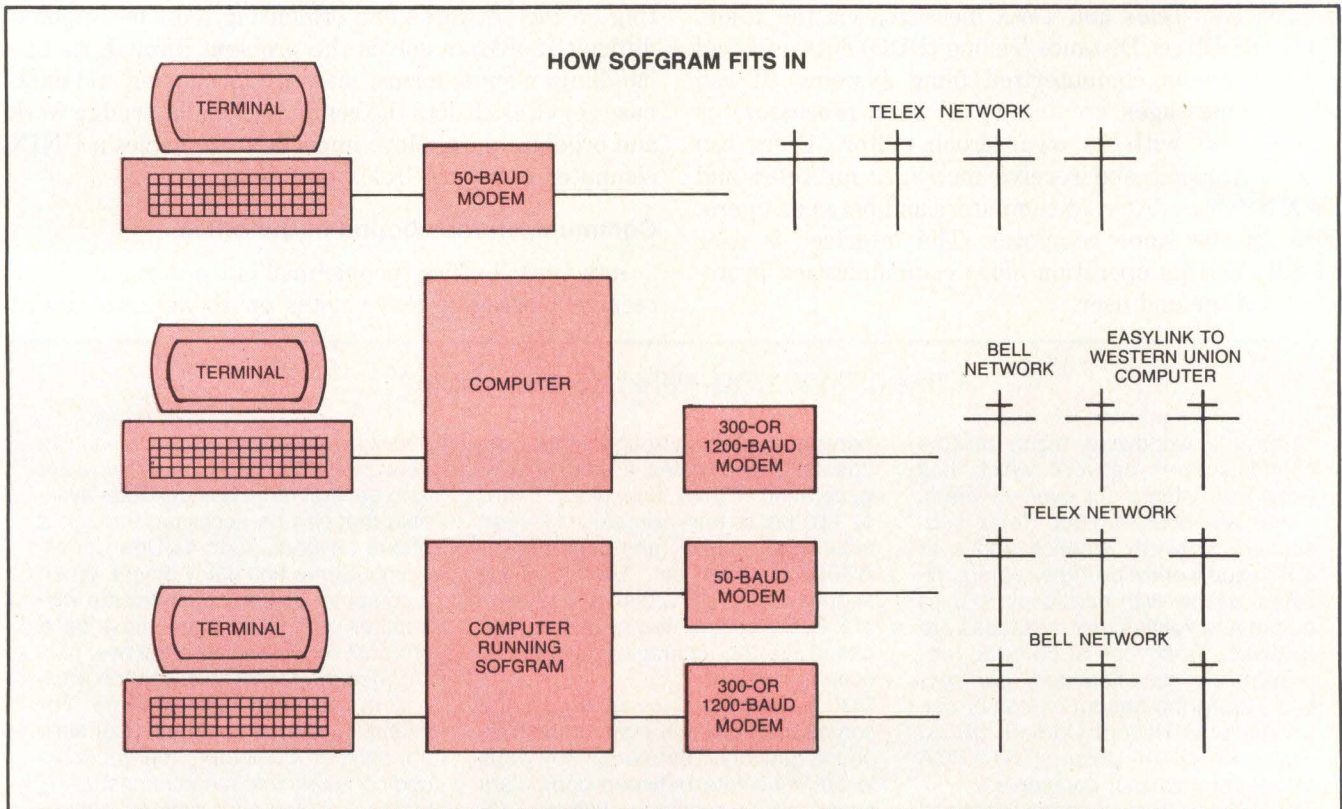
database—dialing, redialing, formatting messages to conform to strict network standards—discourage use of these services. But with SofGram, office workers can interact easily with computerized menus and forms and thus concentrate on obtaining or distributing information, with fewer details to handle.

Package customizes the user-friendly interface

Easy use is essential for software packages. SofGram allows users to make a single numeric choice from a displayed menu to initiate an action. The menu then gives way to a form the user fills in with all the information needed to send a message. Reverse-screen video supports this feature, and a cursor prompts the user for data. Once address information is entered, it is automatically retrieved the next time the information is requested.

The menus and forms provided are stored as ASCII text within the system and can be modified or extended. This allows users to customize the interface to a particular specification and makes it easy to add new features.

An integrated, easy-to-use screen editor permits users to create messages more readily. The editor permits data entry, moves the cursor around the screen and inserts and deletes lines and characters. It can also retrieve computer system files, such as letters created

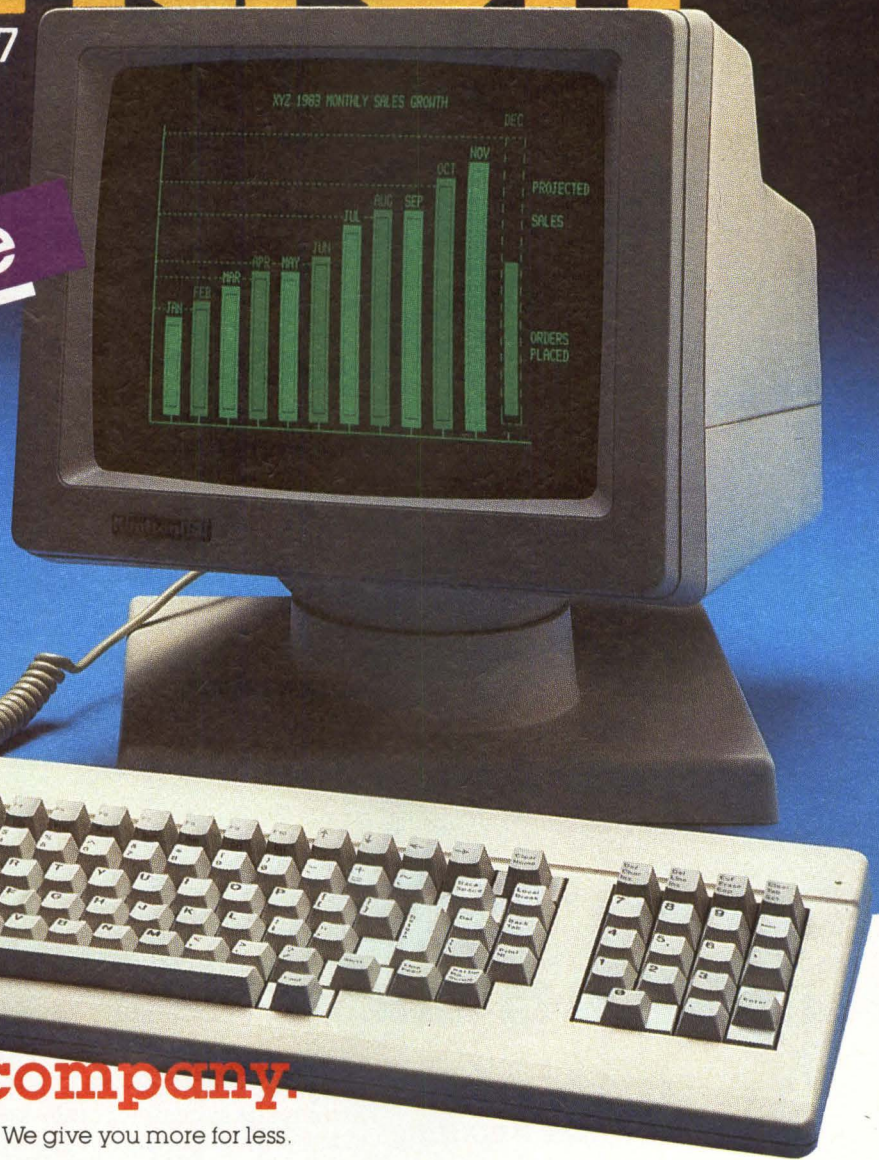


Transmitting and receiving Telex messages over users' computers is possible through both the Telex and Bell Networks.

Kimtron

The KT-7

Perfect
Performance



**We're building
the #1 terminal company.**

Kimtron delivers terminals that are not only pretty and smart, but so reliable they seldom fail. Kimtron technology enables many useful features to be available at no extra cost like user selectable Hidden/Embedded attributes, so you're not limited to Embedded attributes as you are with the others. Plus, we make the only low-cost terminals to take true Ergonomic standards that extra step - to provide adjustable display height in addition to swivel and tilt. Kimtron terminals are designed to be flexible and compatible to systems like IBM PC/XT/AT, DEC, DG, and many more to avoid obsolescence.

COMPARE - We give you more for less.

Kimtron KT-7	Wyse 50	Qume 102	TeleVideo 925/925E	Features
Yes	No	No	No	IBM PC Emulation Option
Yes	No	No	No	DEC VT-100/ANSI X3.64 Option
Yes	No	No	Yes	TeleVideo 925 Emulation
Yes	No	No	No	DG D100/200 Emulation Option
Yes	Yes	Yes	No	14 inch screen available
Yes	No	No	No	Amber option at no extra cost
Yes	No	No	No	Selectible Hidden/Embedded Attributes
Yes	Part	No	No	Programmable Function Keys in NVM
Yes	No	No	Yes	Bi-Directional Aux Port
Yes	No	No	No	96 Business Graphics Characters
Yes	No	No	No	4 Page Memory Option
Yes	No	No	No	Height Adjust, Tilt & Swivel
\$595	\$695	\$695	\$995/\$795	Suggested Retail Price

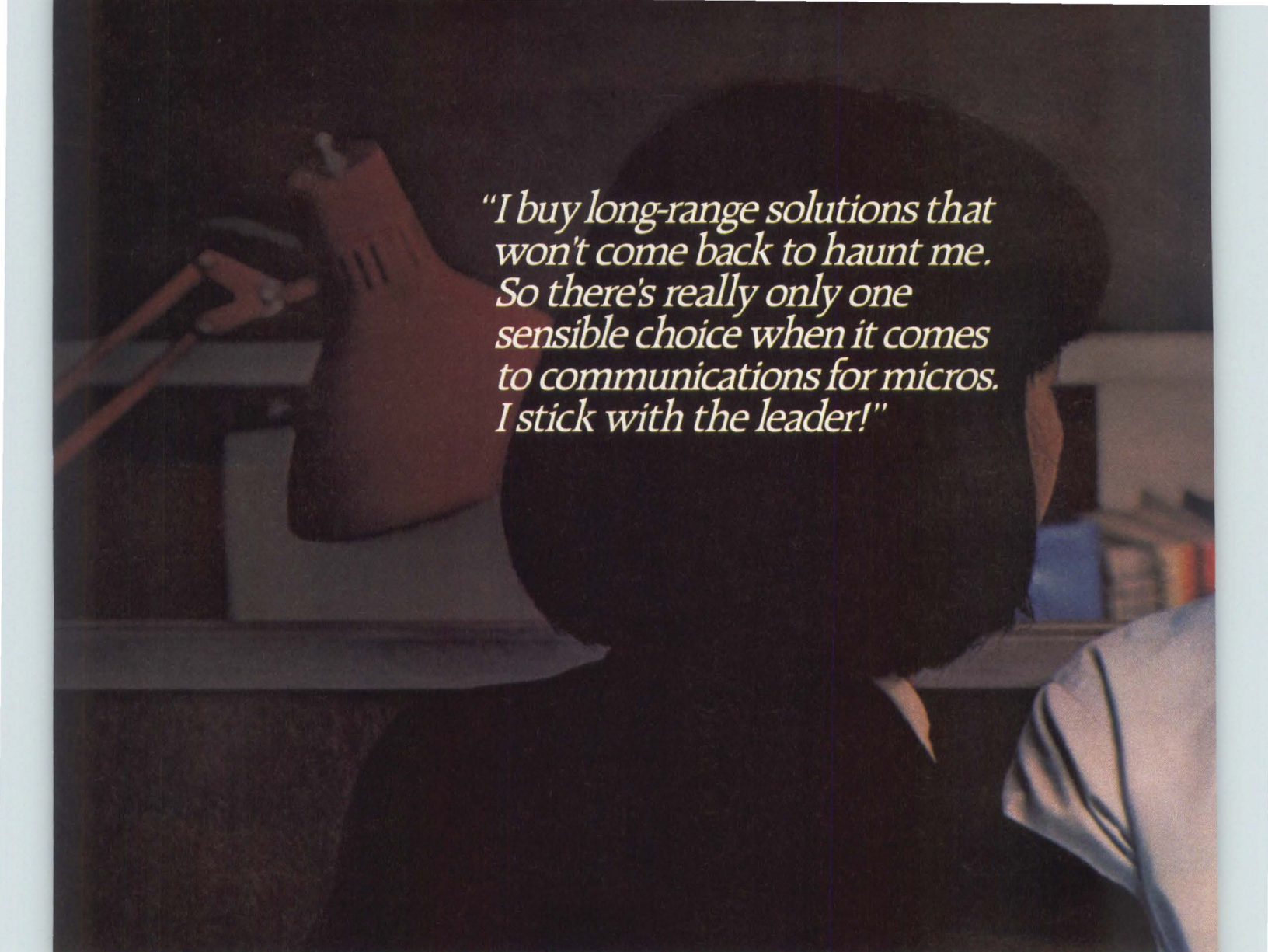
CIRCLE NO. 86 ON INQUIRY CARD

Kimtron, a 5-year technology leader - we're going places and want you to join the Kimtron family of satisfied users. For more information about our KT-7 or KT-10, call the Kimtron Corporation. (408) 727-1510

NOTE: The above comparison is based on information available at the time of preparation and is subject to change without prior notice. IBM, DEC, TeleVideo, DG, Wyse and Qume are trademarks of IBM Corp., Digital Equipment Corporation, TeleVideo Systems, Inc., Data General Corporation, Wyse Technology, and Qume Corporation.

2225 - I Martin Avenue
Santa Clara, CA 95050
408-727-1510 TWX. 910-338-0237





"I buy long-range solutions that won't come back to haunt me. So there's really only one sensible choice when it comes to communications for micros. I stick with the leader!"

Hayes. Leading the way with quality telecomputing systems for the personal computers that businesses use most.

If you're in the business of configuring computer systems for businesses, you know the importance of quality and reliability.

That's one good reason to trust the telecomputing leader. Hayes Smartmodems (300, 1200 and the 1200B board modem for the IBM® PC and compatibles) have an unsurpassed record of reliability. And when Smartmodem is combined with Hayes Smartcom II® software, you have the most complete and dependable telecomputing system available!

Smartcom II is flexible. Use it as is or customize it for particular applications. Smartcom II makes telecomputing simple for beginners, with sophisticated programming options for you.

Now Smartcom II does even more to streamline business communications.

More connection capabilities. Our new Smartcom II is available for more

than 16 personal computers (with more to come). Now the DEC Rainbow in purchasing can swap data with the HP 150 in accounting. While the IBM PC in sales gets updates from the TI in the southeastern office. Quickly and easily. Smartcom to Smartcom. And with no handholding from you.

XMODEM protocol. In addition to the Hayes Verification protocol, Smartcom II includes the XMODEM protocol, for error-free transmission to even more micros, as well as to mainframes at the information services.

Terminal emulation. Smartcom II emulates the DEC VT100 and VT52 terminals, opening the door to a vast installed base of DEC minicomputers.

Voice to data communications. With Smartcom II, users can easily switch from voice to data transmission (and back again), all in the same



phone call. This saves the user time and the company money.

Unattended operation. Smartcom II can increase the efficiency of corporate communications, by receiving and sending data unattended. It can receive messages on disk or hard copy. And Smartcom II also lets users "batch" up to 25 communication sequences, and will automatically transmit them later. This convenient feature can cut long-distance costs considerably, since data can be sent when phone rates are lowest.

Follow the leader! If you're involved with linking micros or setting standards for configurations, let Hayes provide the definitive connection. With our feature-rich, direct-connect modems. Easy-to-use, menu-driven software. Concise documentation. And a customer service organization that is second to none!

Smartcom II

Available for: IBM PC and compatibles, plus HP 150, DEC Rainbow 100, Texas Instruments Professional and Portable Computers and Wang Professional.*

- Hayes Verification and XMODEM protocols
- Records and executes up to 25 communication sequences for unattended transmission
- Emulates DEC VT100 and VT52 terminals
- Prints data while recording on disk
- Stores telephone numbers and communication parameters
- Defines and stores log-on sequences and 25 remote system commands
- 128K memory
- Voice/data communications.

Smartmodem

- Smartmodem 300™ (300 bps), Smartmodem 1200™ (up to 1200 bps) and Smartmodem 1200B™ (plug-in board modem for the IBM PC)
- Direct connect
- Auto answer, dial and disconnect
- Full or half duplex
- Automatic speed selection (1200 modem)
- Built-in speaker
- Two-year limited warranty.

For additional information see your Hayes authorized dealer or call us direct.
Hayes Microcomputer Products, Inc.
 5923 Peachtree Industrial Blvd.,
 Norcross, Georgia 30092. 404/441-1617.



Hayes

Smartcom II is a registered trademark and Smartmodem 300, Smartmodem 1200 and Smartmodem 1200B are trademarks of Hayes Microcomputer Products, Inc. *Trademarks of International Business Machines Corp., Digital Equipment Corporation, Hewlett-Packard, Texas Instruments and Wang Laboratories, Inc. ©1984 Hayes Microcomputer Products, Inc.

CIRCLE NO. 87 ON INQUIRY CARD

OEMs have the right questions

SMS has the right
answers

Introducing the SMS 1000 Model 40 DEC-Compatible Microcomputer System

SMS has been listening: You want microcomputer systems that can meet your current needs and can be expanded to handle future requirements. Our new SMS 1000 Model 40 is designed to do just that!

Foundation Module

We knew what the end product had to do before we started, so we designed it based upon an integrated foundation architecture that optimizes performance and flexibility. The foundation module interfaces to Winchester, floppy and tape peripherals; serial communication ports; and the Q-bus backplane. It also includes a sophisticated Support Monitor Subsystem which makes the system easy to use and maintain. And we put it all on one board that doesn't require any backplane space!

Compatibility

The SMS 1000 Model 40 contains a Q-bus backplane and emulates the DU handler/device driver. All LSI-11 software will operate with no modifications.

Flexibility

This system provides you with the widest choice of peripherals available in any microcomputer on the market. The options include 8 or 5¼ inch floppy drives, up to 140 Mb of 5¼ inch Winchester and a soon-to-be-released streaming tape drive. All this in one 5¼ inch rack mount or floor stand enclosure.

Performance

The Model 40 allows non-interleaved disk transfers using an enhanced version of DEC's* MSCP storage architecture. It is offered with fast access Winchester disk drives and either LSI-11/23 or LSI-11/73 processors. So you can optimize your application software performance whether it runs on RT-11, RSX-11M*, RSX-11M-PLUS, RSTS/E*, or TSX-PLUS*.

Reliability

High reliability is essential to your business. The SMS 1000 Model 40 is designed to provide your users the uptime both you and they dream about. And if things go wrong, the Support Monitor Subsystem is there to help you or your end users get back on the line quickly. The system was designed to minimize parts count and maximize access to all components. This allows replacement of any failed component in less than 5 minutes!

Family of products

The SMS 1000 Model 40 is really a family of products, available in over 150 different configurations—today—with more to come in the near future.

If these are the answers to the questions you are asking, please contact us immediately for more information.

SMS Scientific Micro Systems, Inc.

777 East Middlefield Road
Mountain View, CA 94043
(415)964-5700
TWX: 910-379-6577

CIRCLE NO. 88 ON INQUIRY CARD



SMS SALES OFFICES: Seattle, WA (206)883-8303; Boston, MA (617)246-2540; Atlanta, GA (404)296-2029; Morton Grove, IL (312)966-2711; Melrose Park, IL (312)345-5320; Arlington, TX (817)429-8527; Laguna Hills, CA (714)643-8046. AUTHORIZED SMS DISTRIBUTORS FOR DEC PRODUCTS: Midwest—First Computer Corporation (312)920-1050; Western—Pnambic Systems, Inc. (206)282-0199; Quebec Province, Canada—Logicon, Inc. (514)430-5960.

*DEC, RSX and RSTS are trademarks of Digital Equipment Corporation. *TSX-PLUS is a trademark of S&H Computer.

by a word processor, and send them as messages.

Eases the communications interface

The Telex system requires special, noisy and costly terminals that run at a slow 50 baud, or approximately six characters per second (cps). Most dial-up terminals transmit at 1200 baud, or approximately 120 cps. Worse, all Telex messages must be typed in, or fed in through a paper-tape reader when transmitted. For each message sent, the Telex machine operator per-

forms a special sequence of actions: pushing buttons, waiting for responses, dialing and more waiting.

SofGram's line-handling function identifies the network it is accessing and automatically logs into that network. It uses scripts for accessing and logging into each network and database service. These ASCII-text scripts are provided with the software, and contain information used by SofGram to send and receive messages over the different communications networks. The scripts also include commands for redialing, error handling, validation of network handshakes and other responses. Should one of the International Record Carriers (IRCs) change their access protocol, the scripts can be modified by the user.

SofGram can also be directed to periodically log into these networks to receive or transmit data without further operator intervention. This capability allows users to send messages during low-rate periods or to periodically send and resend a message automatically. If a message can't get through to a destination when first transmitted, the software keeps on trying until completion.

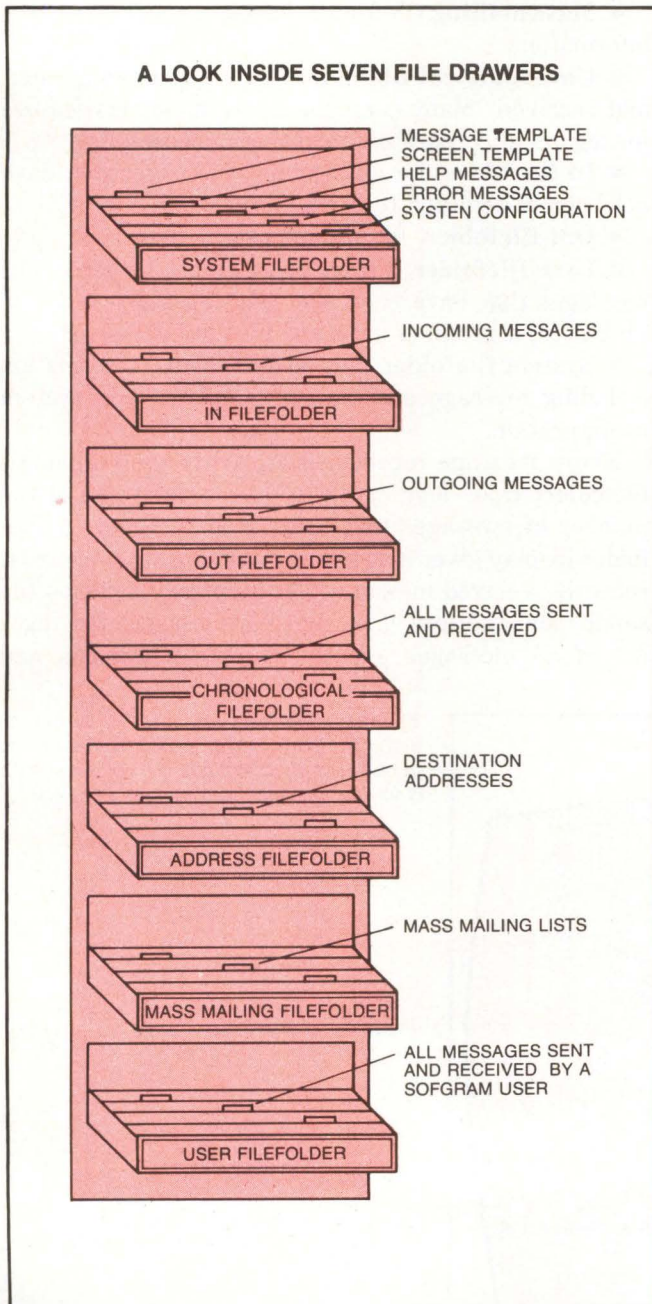
Telex messages must conform to a particular format in order to be transmitted. This format is usually that of the International Air Transportation Association (IATA) or some variation of it because the airline industry was one of the first to use the Telex network. Unfortunately, the IATA format is highly structured and syntactically inflexible. A facsimile of a message formatted to the IATA standard is as shown.

```
ZCZC 0100
NJNJ
.SFSF (Soft)
DEAR MR. RODERICKS
THIS IS A MESSAGE TO TELL YOU ABOUT SOFGRAM. IT
TAKES THE DIALING, WAITING, AND FORMATTING OUT
OF TELEX.
YOURS TRULY,
BOB
NNNN
```

Its complex structure suits interpretation by a computer but is unforgiving of human errors. In addition, each IRC uses a different variation of the IATA standard, and each service offered by each IRC uses a slightly different format.

Unfortunately, accessing different networks usually involves using different formats. SofGram's scripts handle these variations. Like its line-handling scripts, the message-format scripts are in ASCII text and are user-modifiable. They ease the transition should an IRC change its standard message format.

You can access the Telex network by two methods. The first is to buy or rent a Telex machine and hook it up to the Telex network through a line running to the user's site. However, the Telex terminal must be turned on at all times to receive messages. Alternative-



SofGram filefolders, which are Indexed Sequential Access Method (ISAM) UNIX files, are analogous to drawers in a file cabinet.

ly, you can connect to the Telex or TWX network by renting an electronic "mailbox" from an IRC and accessing it through the DDD network. Examples of such a service are Western Union's EasyLink, IT&T's Time Tran and RCA's Telextra. This mailbox is stored on the IRC's central computer and can be accessed by dialing a number, provided by the IRC, on the telephone network. The user can then access the contents of the mailbox or send messages over the phone-line connection to the IRC. Thus, a Telex machine is unnecessary. Message formats, as always, are strictly enforced.

SofGram can connect to the Telex/TWX network in either way. A computer can be connected directly to an existing Telex line using commercially-available modems. However, connecting directly to the Telex line limits transmission speed to its sluggish 50 baud. By renting a mailbox from an IRC, users can connect a common modem to a computer and transmit at 1200 baud. In either case, SofGram handles the receiving, transmitting and formatting of messages, and the accessing of different network services. Renting a mailbox is the fastest, least expensive and most convenient choice.

C language eases portability

SofGram is written in the widely used C language, making it generally easy to port to new systems that also support C. The code is modularly written so that the operation-specific system calls are localized.

SofGram stores all messages and system-related information in filefolders—UNIX files with certain special attributes. Filefolders are sequentially indexed.

Inputs and outputs to filefolders take place through a virtual memory package. The virtual memory package ensures that the most recently accessed information remains in primary memory for as long as possible so it can be quickly re-accessed. This cuts down on disk reads and writes, and speeds user response time. Filefolders maintained at all times are:

- **Address filefolder**, for information on people who have been sent messages including their addresses, the networks they use and other information relevant to communications.
- **Mass mailing filefolder**, for mass mailing lists and information.
- **Chronological filefolder**, for every message sent and received. Many companies rely upon this feature for legal and corporate-accounting purposes.
- **In filefolder**, for all incoming messages that have not been distributed to users.
- **Out filefolder**, for all outgoing messages.
- **User filefolder**, for all messages to be sent, plus messages that have been sent and messages received by a user, a group of users, or by subject matter.
- **System filefolder**, for system-related information including message and screen templates and system configuration.

Every message received is stored in the recipient's filefolder. Upon logging on, a user is informed of the number of messages that have been received. A filefolder display gives a summary, starting with the most recently received message. The summary includes the sender and the first line from the message. Having a list of all messages greatly simplifies perusing and

FORMS MAKE IT EASY

ENTER PF1 FOR HELP PF2 TO EXIT

To:	Via:
Company: ABC Corp. _____	— TWX #: 012-345-6789 _____
Street: _____	Answerback: ABC ANYTOWN _____
City: _____	x Telex #: 012345 _____
State: _____ Zip: _____	Answerback: ABC ANYTOWN _____
Attention: Mary, Purchasing Dept.	— Phone #: 201-555-1234 _____
	— Mailgram _____
	— Telegram _____
	— Computer mail _____
	Owner of TLX/TWX if not WU:
	— ITT — RCA _____

Signature: Richard Nelson _____

Send: ASAP Overnight Hold Periodically

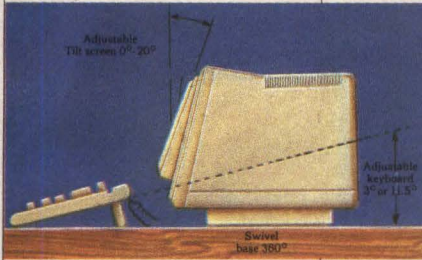
Your order will be shipped immediately via overnight express. Invoice to follow. Terms net 30 days.

The message form appears on the top of a split screen, making it easy for the user to get all the signals straight. The bottom portion is for the message and may be scrolled.

More and more. For less and less.

Hewlett-Packard introduces the HP 2392A.

When you get this new HP display terminal, suddenly you'll be running applications



with less effort. In less space. For less money. And with more confidence, having HP's reliability and quality to count on.

Less effort.

The first thing that will impress you is how easily everything fits into place. Integral tilt and swivel make screen and keyboard adjustments easier. Power and brightness controls are right up front, at your fingertips.

Working becomes more pleasant, thanks to the non-glare, high-resolution screen and well defined, smooth scrolling characters. Up to four pages can be stored in display memory, with up to four more pages available as an option.

And all that happens on a 12-inch display that only takes up about one square foot of your desk.

More helpful.

With eight non-volatile, programmable function keys, it will take you less time to enter complex or repetitive commands. A handy terminal status line tells you what mode you're working in. And

national language keyboards are available to make work easier for everybody, just about everywhere.

You get more speed, too. You'll communicate

with your computer at up to 19,200 bps in block, line or character mode. So your information will get around in less time. It's also easy for you to get hard copy, since our terminal has an optional printer port you can install yourself.

If you're an ANSI user, you've also got more going for you. The HP 2392A has ANSI capabilities making it an ideal terminal for your DEC system.

More reliable.

HP engineered the HP 2392A using state-of-the-art VLSI



technology to minimize component count and increase reliability.

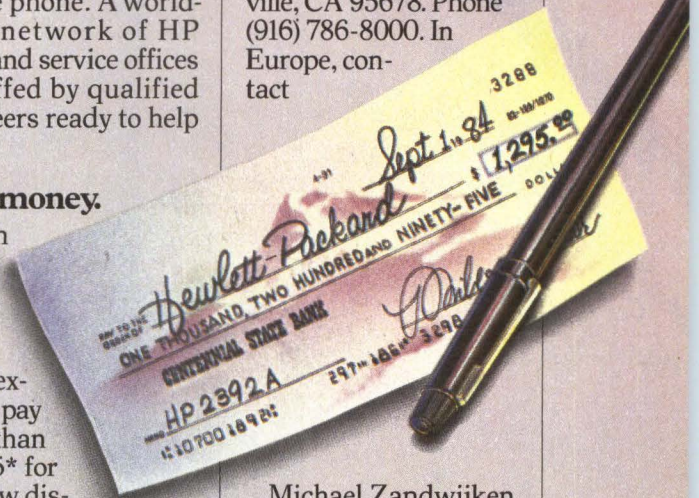
But, if you do need support services, just pick up the phone. A worldwide network of HP sales and service offices is staffed by qualified engineers ready to help you.

Less money.

With all these features, you'd expect to pay more than \$1,295* for our new display terminal. But that's all we're asking. So why settle for less?

To get more information, call your local HP sales office listed in the white pages. Or get in touch with Terry East-

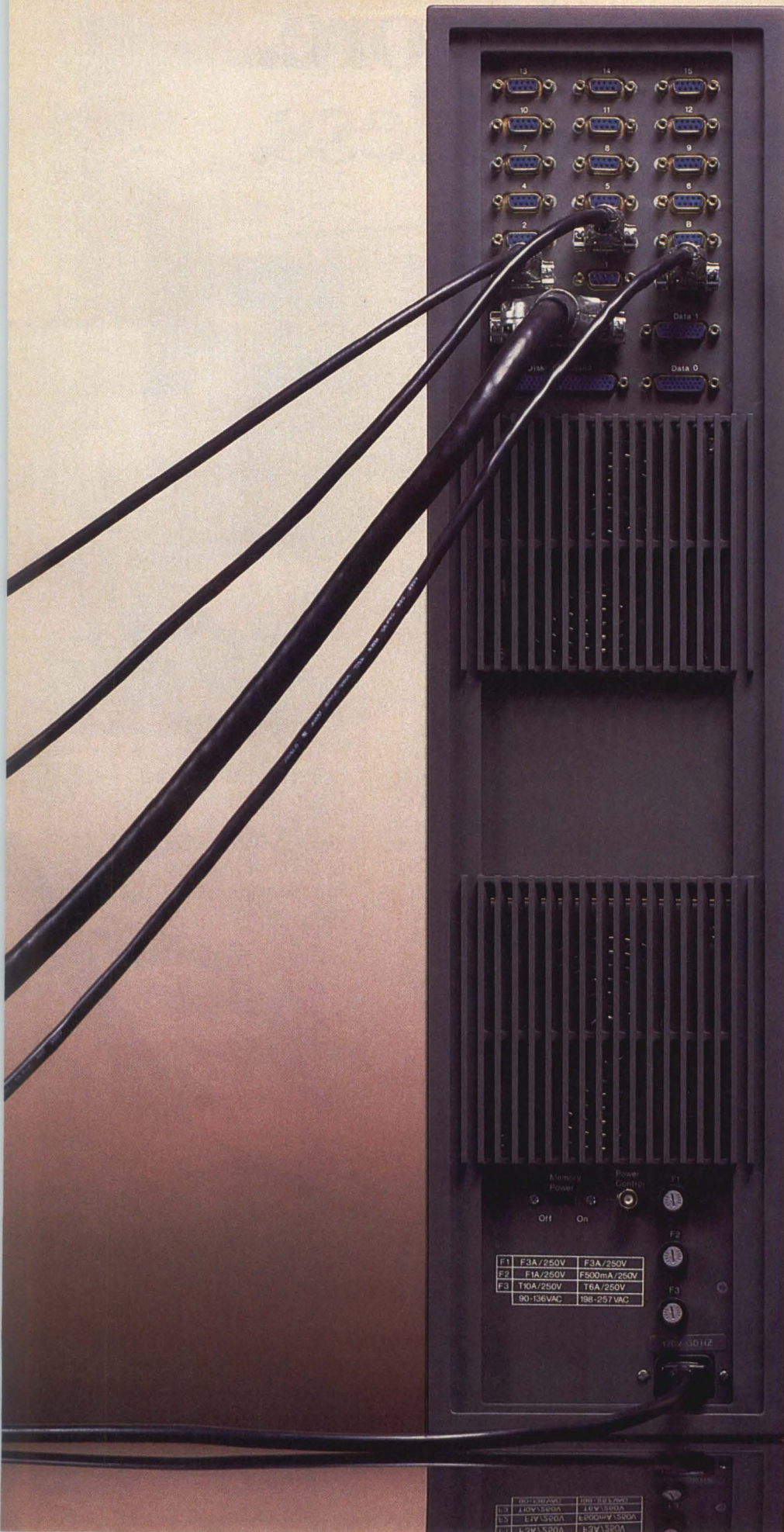
ham, Hewlett-Packard, Dept. 008199, 8020 Foothills Blvd., Roseville, CA 95678. Phone (916) 786-8000. In Europe, contact



Michael Zandwijken, Hewlett-Packard, Dept. 008199, P.O. Box 529, 1180 AM Amstelveen, The Netherlands.

Productivity. Not promises.





F1	F3A/250V	F3A/250V
F2	F1A/250V	F500mA/250V
F3	T10A/250V	T6A/250V
	90-136VAC	198-257VAC

F1	F3A/250V	F3A/250V
F2	F1A/250V	F500mA/250V
F3	T10A/250V	T6A/250V
	90-136VAC	198-257VAC

TOWER 1632. YOU CAN REALLY GROW ATTACHED TO IT.

Tower™ 1632's nonproprietary peripheral connection flexibility is simply unsurpassed by any mini. Or micro.

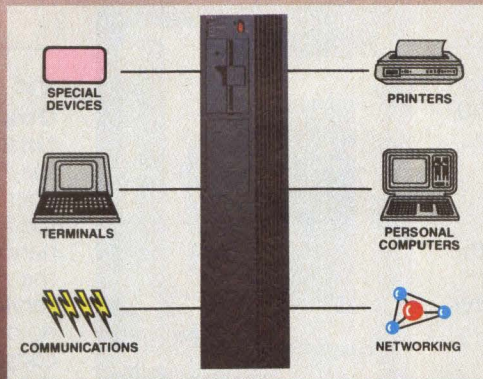
Of course we offer an industry-standard bus, Multibus* IEEE-796. Of course we offer SA400, ST506, SMD and QIC II, so you can attach additional mass storage devices. And of course we support RS232C communications. ASCII TTY. And Bisync (2780/3780). Allowing Tower 1632 to connect and communicate with terminals, printers, mainframes, minis, personal computers and numerous special devices, from optical character and code readers to data tablet digitizers.

But our planning really pays off for you in our networking capabilities. Whatever standard you choose we can handle. From our UNET** peer network to SDLC/SNA, X.21/X.25, or Ethernet.***

Of course, we have a very good reason for offering all this flexibility. It's part of our commitment to providing OEMs with the prime requisite for success. A system built expressly for systems builders.

That's what we deliver. And that's the reason we tower over our competition.

Call us toll free at 1-800-222-1235 to learn more.



BUILT FOR SYSTEMS BUILDERS.
TOWER 1632.

NCR
OEM Marketing Division

NCR Corporation, World Headquarters, OEM Marketing Division, Dayton, OH 45479. Nationwide (800) 222-1235. In Ohio (513) 445-2380. In Canada (800) 268-3966.
*Multibus is a trademark of Intel Corporation. **UNET is a trademark of 3 Com Corporation. ***Ethernet is a trademark of Xerox Corporation.

CIRCLE NO. 90 ON INQUIRY CARD

TELEX®

Telex Shamrock 9250 has everything you want in a GCR tape subsystem. Right down to your favorite color.



It's the color of the money you stand to save with the new Telex Shamrock 9250. The most affordable GCR subsystem in its class.

Telex engineers have been making advancements in GCR technology for over a decade. The Shamrock 9250 is the biggest breakthrough yet. It gives you the faster access and throughput, greater storage efficiency and higher data reliability you look for in a full performance GCR subsystem. And it does so with the kind of cost efficiency other tape drives just cannot match.

The savings start right up front. The unit price of the Telex Shamrock 9250 is half that of previous GCR subsystems. Its compact design frees up valuable space. And with the assistance of Telex Engineering experts, your interface development will be fast




and efficient.

Down the road, the savings continue to add up. Cost of ownership of the Telex Shamrock is truly attractive. There are no planned service calls because the 9250 requires no preventive maintenance. Self-calibrating capability eliminates the need for scheduled adjustments. When service is required, the resident diagnostics hold costs to a minimum. Lower power consumption (typically 100 milliwatt) of the 9250 gate arrays increases reliability and keeps energy costs in line.

There are more reasons why the Shamrock 9250 is today's best value in full GCR performance. For the rest of the story, call your nearest Telex OEM Sales Office or our OEM Marketing Department at 918-627-1111. And let us show you how good you'll look in Telex Shamrock green.

CIRCLE NO. 91 ON INQUIRY CARD

TELEX® SHAMROCK  The innovation continues . . .

Telex Computer Products, Inc., Terminals/Peripherals/OEM Products
6422 East 41st Street, Tulsa, OK 74135 (918) 627-1111 Regional Offices: Amherst, NH (603) 673-9272/Garden Grove, CA (714) 898-9833/Houston, TX (713) 497-6770 International: (214) 931-8511/telex: 730612 TLXINTL ADDI

Spec summary

- **Manufacturer:** SofTest Inc., 555 Goffle Road, Ridgewood, N.J. 07450, (201) 447-3901
- **Product:** SofGram communications software
- **Compatibility:** systems supporting all UNIX versions and MS-DOS
- **Suggested end-user price:** \$2,500 for minicomputer systems, \$750 for multiuser microprocessor-based systems, \$500 for single-user systems
- **Communications hardware required:** Hayes Smartmodem-compatible modem for DDD communications (Hayes Microcomputer Products Inc., Norcross, Ga.) or TelexPlug (by Teleface Inc.) for Telex communications
- **Memory required:** 256K bytes
- **Disk storage required:** 2M bytes

maintaining the information. Messages that have not been read or acknowledged are specially marked by SofGram to distinguish them from messages that have been read. The user can call up the full text of a message, make copies, distribute them, print messages, print copies of summaries and perform additional housekeeping tasks.

Finally, a terminal or computer need not be solely dedicated to SofGram use. SofGram can operate in the background while the terminal is used for other activities.

Michael J. Heffler is a product manager for SofGram and executive vice president of SofTest Inc., a Ridgewood, N.J., company specializing in UNIX-based software packages. He holds a master's degree in computer science from the University of Massachusetts (Amherst) and previously worked for Bell Telephone Laboratories, Holmdel, N.J.

Betsy Longendorfer is a senior programmer with SofTest. She holds a master's degree in electrical engineering from Rensselaer Polytechnic Institute and previously worked for Western Electric Co.




Interest Quotient (Circle One)
High 819 Medium 820 Low 821

NEXT MONTH IN MMS

The Integrator section of Mini-Micro Systems will profile a computer-aided publishing system that allows professional quality typesetting, graphic arts and paste-up to be achieved in house. The system integrates a 32-bit microcomputer with high-resolution graphics, multiple-font text-processing and business-graphics software.

TERMINALS FROM TRANSNET

PURCHASE PLAN • 12-24 MONTH FULL OWNERSHIP PLAN • 36 MONTH LEASE PLAN

Authorized Distributors — Carry the COMPLETE lines of:			MONTHLY RATES			OR Purchase
			FULL Ownership 12 mo.	24 mo.	Lease 36 mo.	
DEC 	LA50	Personal Printer	\$ 62.	\$ 35.	N/A	CALL FOR DETAILS
	LA120KSR	DECwriter III	220.	122.	83.	
	VT101	CRT Terminal	115.	64.	43.	
	VT102	CRT Terminal	137.	76.	51.	
	VT220	CRT Terminal	115.	65.	45.	
	VT240	CRT Terminal	130.	75.	50.	
TI 	TI707	Portable Terminal	62.	35.	N/A	
	TI820KSR	Terminal Pkg.	211.	117.	80.	
	TI850	Printer w/Tractor	57.	32.	N/A	
	TI855	Dual Mode Printer	86.	48.	32.	
TELE-VIDEO 	TV914	Tilt/Swivel CRT	62.	35.	N/A	
	TV950	CRT Terminal	103.	57.	39.	
	TV970	Tilt CRT Terminal	115.	67.	43.	
NORTHERN TELECOM	NT6K00	Displayphone	124.	69.	47.	
	NT6K55	Modem 212/A	47.	26.	N/A	
C. ITOH	CIT101	VideoTerminal	105.	58.	39.	
	CIT414A	Graphics Terminal	134.	74.	50.	
	CIT500	W/P Terminal	191.	106.	72.	
	CIT600	Line Printer	537.	298.	201.	

ON-SITE TECHNICAL SUPPORT & SERVICE

PERSONAL COMPUTER SYSTEMS
Visit our computer stores in Union and Ocean, NJ
AUTHORIZED RETAIL DEALER

APPLE® IIe, IIc, MAC, III and LISA — DEC RAINBOW — TI PROFESSIONAL

SUPPLIES — FREE CATALOG — CALL

DEC is a registered trademark of the Digital Equipment Corporation

APPLE is a registered trademark of Apple Computer Inc.



TRANSNET CORPORATION

1945 ROUTE 22 — UNION, NJ 07083

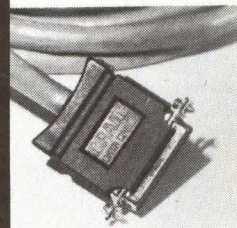
In NJ (201) 688-7800 • (800) 526-4965 • TWX 710-985-5485

CIRCLE NO. 92 ON INQUIRY CARD

**SUPER
LOW
PRICES!**

**HIGH QUALITY
LOW COST CABLES
WITHIN 24 HOURS**

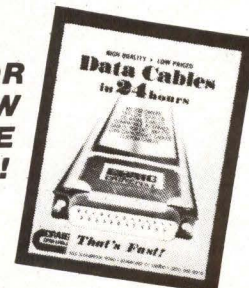
**CALL TOLL FREE 800-243-5760
in CT 203-356-9315**



**EXTENDED DISTANCE
DATA CABLES**

- EDC04 \$11 both ends + 20¢ per ft. or 1000 ft. reels \$93
- EDC08 \$12 both ends + 30¢ per ft. or 1000 ft. reels \$149
- EDC12 \$12 both ends + 40¢ per ft. or 1000 ft. reels \$215
- EDC25 \$16 both ends + 60¢ per ft. or 1000 ft. reels \$384

**ASK FOR
OUR NEW
20-PAGE
CATALOG!**



CRAIG DATA CABLE CO.
652 GLENBROOK ROAD
STAMFORD, CT 06906

CIRCLE NO. 93 ON INQUIRY CARD



INTRODUCING THE ONLY FAST PATH THROUGH PORT SELECTION TRAFFIC JAMS—METAPATH.

Metapath introduces the CPS 080, a centralized port selector data PABX that gives you up to 64 serial and 16 parallel ports to link dissimilar mainframe, mini, and personal computers as well as terminals and peripherals. Now you can say goodbye to port selection traffic jams with their resulting slower throughput, network entry speed and increased degradation.

This next generation data PABX offers new dimensions in network value by linking serial devices and parallel devices over 1 mile using a single coaxial cable. The system expands to network up to 900 serial ports and 225 parallel ports. Up to 200 of these net-

works can be on line at any given time connecting up to 225,000 devices in a single network. In addition, the CPS 080 provides port contention queuing, flow control and speed matching.

The CPS 080 is housed in a 19" x 23" x 16" unit and may contain up to 16 modules, each with 4 RS-232C ports and a parallel port. There is no central point of failure. If a module fails, it can be replaced in seconds without tools and without shutting down the rest of the system. Next generation benefits again are evident in the CPS 080's ability to allow immediate printer sharing and modem pooling as well as mainframe computer interconnection

for both synchronous and asynchronous systems. System reliability is ensured through dual power supplies and network interfaces.

Don't make an interconnect decision until you examine Metapath's new technology—the leading edge in network performance and value. For more information, call Heather Paul at (800) 445-0200. In California call (800) 445-0201. Or write Metapath, Inc., 737 Lincoln Centre Drive, Foster City, California 94404.

METAPATHTM_{INC.}
The Data Communications Pathfinders.

CIRCLE NO. 94 ON INQUIRY CARD

Graphics boards rejuvenate microcomputer displays

Windowing and integrated software packages boost the capability of microcomputer displays. And improved add-in graphics boards contribute further enhancements

Carl Warren, Western Editor

Personal-computer makers are incorporating more graphics capability into their machines, and board vendors are offering more sophisticated add-in graphics-adaptor boards. For one thing, improved application programs with integrated functions are forcing hardware makers to add even more display capability. For another, users are asking for presentation graphics in both monochrome and color.

Thomas Dodge, president of the Irvine, Calif.-based distribution company, Premier Source, notes the growing call for graphics. "We have found that a system without graphics just isn't wanted. We carry systems such as the Zenith line of microcomputers that do have graphics, and our dealers are asking for add-in boards for the IBM [Corp.] PC and compatibles," says Dodge. "It's a growing market and we see a great deal of support not only from the hardware vendors, but also from the software people as well."

Andrew Czernek, director of marketing for Zenith Data Systems, adds, "The emphasis [on graphics] is definitely there. The number of color monitors sold is rapidly increasing. We estimate that only 18 percent to 20 percent of the IBM-type systems were being bought with a color monitor and a graphics adapter a year ago. Now, it exceeds 24 percent. And no one knows the real number of systems that are being upgraded with graphics capability."

IBM sets the pace

The IBM PC sparked an accelerated interest in graphics functions on microcomputers. The basic IBM system is designed for a monochrome monitor and for handling alphanumeric outputs. However, because the

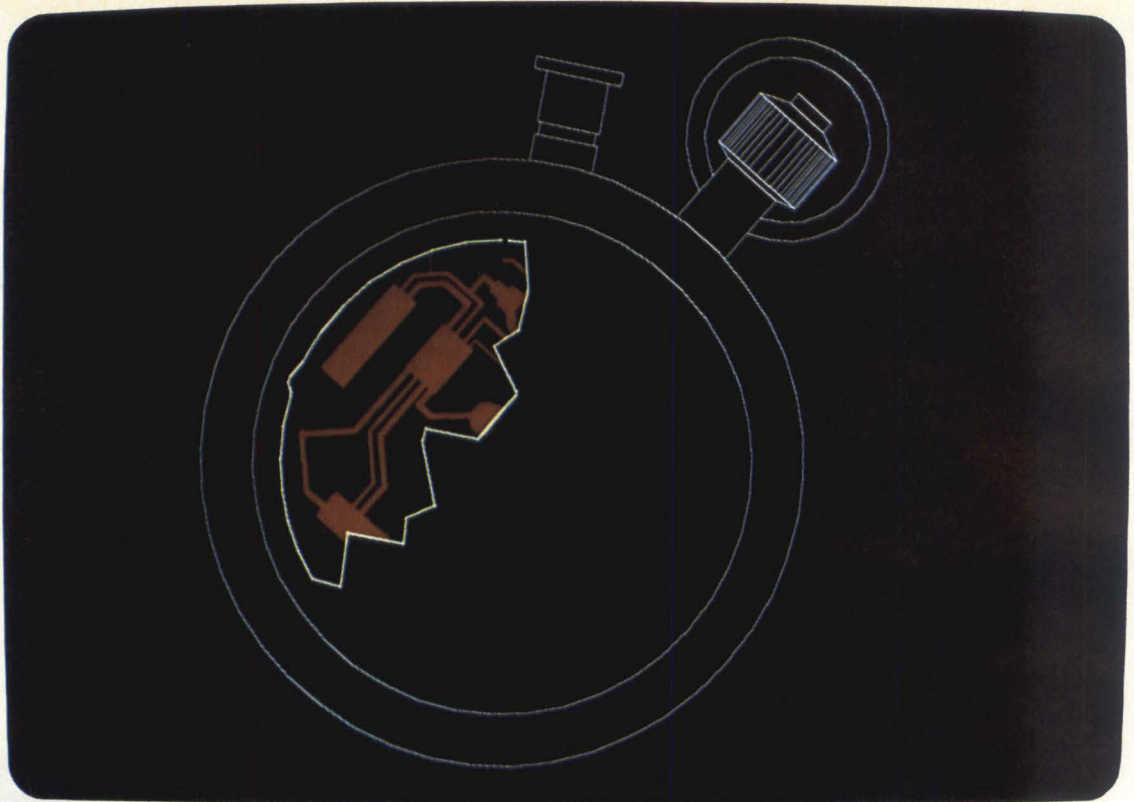


Matching the IBM PC, Zenith Data Systems' Z-150 comes with built-in monochrome and color capability, and can dynamically switch from 320-by-400 to 640-by-425-dot resolution depending on the application requirements.

success of software that provide graphics capability—e.g., Lotus Development Corp.'s Lotus 1-2-3—and the explosion of windowing software on microcomputer CRT screens, the IBM PC is quickly becoming populated with sophisticated color and monochrome add-in graphics boards.

To extend the PC, IBM offers a color graphics board adapter that also provides black and white resolution as high as 640 dots by 200 dots. This resolution allows some of the more sophisticated programs, such as Open Access from Software Products International (SPI), to operate at maximum efficiency in various text type modes. However, for graphics such as a rotating 3-D type, a resolution of 320 dots by 200 dots permits the simultaneous display of three colors and a choice of one of eight background colors.

An average terminal gets this far in 1.4 seconds. You'll twiddle your thumbs for 14 seconds before it's finished.



New HiSCAN terminals complete the entire drawing in just over one second.



Graphics terminals with ten times the drawing speed. \$2,195 Monochrome, \$2,995 Color.

"One, one thousand...

Our new graphics co-processor technology gives you a faster draw than anything under \$10,000. It's ten times as fast as others in its price range. A hundred times as fast as the slowest terminals.

You get superior resolution, too: 800 x 600 monochrome, 800 x 300 color. The monochrome terminal displays four gray levels. The color terminal displays 16 colors (out of 64 choices). Plus fifteen programmable,

non-volatile function keys. Simple menus. Superior ergonomics.

You don't sacrifice a thing for superior graphics. The alphanumeric quality equals the best text terminals. The display is not interlaced (not running at half speed), so there's no smearing or ghosting when you scroll. You can even choose an 80- and 132-column display to get a full spreadsheet on the screen.

HiSCAN™ graphics terminals have full DEC VT220 and TEK® 4010/4014 compatibility. Plus your choice of DEC ReGIS, TEK 4027 or TEK 4105 compatibility at no extra cost. They're cable-ready for light pens, mice, digitizing tablets and inkjet printers.

They're designed to help you be more productive and creative. Because they work almost as fast as you think. So now you can play "what-if" with graphics.

You have to get your hands on a HiSCAN graphics terminal to believe it. And that's easy. We'll even arrange a 30-day trial at no risk. Just send the coupon.

done!"



**New
HiSCAN Terminals**
From the people
who brought you Retro-Graphics®

MMS 10/84

- Send complete information
 I want a 30-day trial with no

risk. Call me about my compatibility requirements.

NAME _____ TITLE _____

COMPANY _____ PHONE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Mail to: Digital Engineering, 630 Bercut Drive, Sacramento, CA 95814

**DIGITAL
ENGINEERING**

630 Bercut Drive, Sacramento, CA 95814
Phone (916) 447-7600 Telex 910-367-2009

CIRCLE NO. 95 ON INQUIRY CARD

The IBM graphics board allows more display functionality, but most users prefer improved display characteristics, especially for text. Therefore, a variety of approaches have emerged to improve the graphic and textual display. For example, the IBM PC Portable comes with a graphics display adapter.

Graphics play a key role

Zenith is one of several manufacturers aggressively pursuing the graphics market. The Zenith microcomputers, including the Z-100 and IBM-compatible Z-150, come with graphics capability. The Z-100, for example, always resides in graphics mode and provides a full bit-mapped display, even for alphanumeric characters.

The Z-150 is, however, conceptually closer to the IBM PC and thus offers similar attributes in order to take advantage of the growing base of software written for the PC. It handles both monochrome and color outputs and can support an interlace mode as well, thus improving its display characteristics.

For graphics design packages supporting CAD/CAM applications, a Z-150 software switch selects a pixel resolution of 320 dots by 400 dots or of 640 dots by 425 dots. Moreover, the carefully matched board output

With more color hard-copy available, personal computer users will demand more sophisticated color graphics capability in their displays.

ensures that text material can be handled correctly, overcoming character ballooning (the fuzziness characteristic of the IBM-card display).

Another system manufacturer taking graphics demand seriously is Pronto Computers Inc., Torrance, Calif. Although the Pronto system runs much of the PC-DOS software, this wasn't a design goal, company president Henry Gasbarro says. "We created a professional product to solve various business needs. We didn't aim at being PC-compatible, but we do get some of the fallout."

And like IBM and Zenith, Pronto realizes that graphics are important in business computer systems. Thus, the company provides a graphics adapter card that generates graphics with a resolution of 640 dots by 480 dots. Moreover, the card implements three full-bit planes that permit either eight levels of gray scale or eight colors chosen from a 16-color palette.

The sophisticated Pronto graphics adapter uses the NEC 7220 graphics display controller. "This chip . . . gives us some classy capabilities," notes vice president of engineering Skip Hansen. Among these capabilities



The Pronto Computer graphics adapter has three bit planes, a resolution of 640 dots by 480 dots and up to eight levels of gray scale or eight colors chosen from a 16-color palette.

are the ability to have a 13.3-MHz video-dot rate, thus providing speed in drawing lines. The use of three-bit-plane display-storage-areas and RAM-based look-up tables combines color and screen attributes in virtually any manner. Thus, the system is well suited for specialized applications.

Observers expect that, to solve immediate needs, many systems will include one monitor for text and another for graphics. Although a capable color monitor costs about 10 percent more than for monochrome, it accommodates extra bandwidth and thus offers more benefit per dollar. In the long-term, users will require single monitors supporting color.

Many users avoid color graphics because of the extra cost or because it often produces inferior graphics. And in many cases, color graphics are unnecessary. For example, database-management systems, spreadsheets and other packages work well without color. And word processing rarely requires color. More realistically, monochrome displays can be improved by use of sophisticated monochrome graphics boards.

Color is possible by coupling monochrome terminals to hard-copy devices, such as printers or plotters with color capability. With such devices just becoming available at low cost, personal computer owners will invariably be led to their use.

Systems get smarter

Most graphics adapter board enhancements are more powerful than those on the IBM PC adapter. Although many adapter boards are available, Kevin Jenkins, president of Hercules Computer Technology, Berkeley, Calif., talks of confusion surrounding graphics display adapters. "When this started, no standards existed. There was only the IBM way. Then, everyone improved on IBM, resulting in many ways of implementing a graphics display board." Jenkins continues, "It didn't make sense until Lotus brought out 1-2-3. That [software] required graphics capability, and the ideal was to be Lotus compatible." Jenkins says that while many

ADD TO AND TO



To add markets as well as profits to your business, add Zaisan to your system.

The ES.1 voice/data workstation offers single-key access to simultaneous voice, data or text. With the touch of a button, users can also access internal and external databases, PBX functions, and electronic mail.

The ES.1 is also upgradeable. So you can add application and communication software to tailor the ES.1 to the individual information needs of your users. Which can add sales to your business.

Another plus is the price. And the wide range of service options.

Add these all up and you'll see the formula for success is rather elementary. Add Zaisan.

13910 Champion Forest Drive. Houston, Texas 77069. 713.580.6191.

ZAISANTM

The new direction in business communications.

CIRCLE NO. 96 ON INQUIRY CARD

NOTHING REFLECTS THE CHANGING FACE OF THE COMPUTER INDUSTRY LIKE COMDEX

*Where the computer industry
comes to do business and
spot up-and-coming industry trends.*

COMDEX™/FALL'84

NOVEMBER 14-18, 1984 ■ LAS VEGAS, NEVADA

LAS VEGAS CONVENTION CENTER & WEST HALL

CAESARS PALACE ■ MGM GRAND HOTEL

RIVIERA HOTEL ■ LAS VEGAS HILTON

Don't miss it!

PRE-REGISTER TODAY

CALL (617) 449-6600

Presented by



**THE
INTERFACE
GROUP, Inc.**

World's leading producer of computer conferences and expositions including: COMDEX/Winter, COMDEX/Spring, COMDEX/Fall, COMDEX/Europe, COMDEX in JAPAN, FEDERAL DP EXPO & CONFERENCE, INTERFACE, The Nationwide COMPUTER SHOWCASE EXPOS, and THE BYTE COMPUTER SHOWS.

In U.S.: 300 First Avenue, Needham, Massachusetts, USA 02194 • (617) 449-6600 • TELEX-951176 • TWX-710-325-1888

In Europe: Rivierstaete, Amsteldijk 166, P.O. Box 7000, 1007 MA, Amsterdam, The Netherlands • Tel. 31-20-460201 • TELEX-12358NL

In Japan: Kashiwabara Bldg. 2F 1-3-3, Kyobashi, Chuo-Ku, Tokyo 104 • Tel. 03-271-0246 • FAC 03-271-0248 • TELEX 25845 SIMPLE

claims are made for boards, there is still not much software that takes advantage of their capabilities.

Hercules was one of the few companies to deliver a graphics adapter board that handles software like Lotus 1-2-3. Their 720-dot-by-348-dot resolution graphics card supports Lotus 1-2-3, Microsoft Corp.'s Word and other graphics packages. The \$499 card was designed to work in monochrome, notes Jenkins, because many systems come with monochrome monitors, and users want graphics capability without buying another CRT.

The Hercules card also supports alphanumeric, with up to 90 characters per line and 43 lines per screen. This attribute is especially useful when the board is used with Microsoft's multiple-window-featured Word.

AST Research Inc. of Irvine, Calif., maker of the MonoGraphPlus display adapter, still views the graphics market as fairly uncharted. According to Angela Rosak, product marketing manager, "Current studies show that graphics will be in greater use and that mainframe functions are quickly migrating to the PC. Consequently, it's important to have the proper mix of hardware and software to meet this new market." Moreover, AST sees the emerging CAD and business-graphics market demanding more from hardware. To meet those perceived demands, the AST board offers a bit-mapped video with 720-dot-by-348-dot resolution

and adds a serial and parallel port along with a clock/calendar.

Even with added board functions, AST sees the battle as one of cost versus market. Thus, for \$495, the MonoGraphicPlus provides high-resolution monochrome graphics without requiring extra CRTs. The company feels that the ideal situation is to have one CRT and one display adapter. The system must function in both text and graphics modes without either unit being degraded by poor performance. "Color isn't the issue. Rather, clarity of display for the lowest possible price is," says senior design engineer Ciro Cornejo.

Doubling scan lines enhances display

Another way to increase IBM PC display power at low cost is Princeton Graphic Systems' Scan Doubler. This \$249 add-on card runs Princeton's ST12, or other 31.5 kHz/30 MHz color monitors, from a standard IBM color card. When attached to an IBM color card, the

'Current studies show that graphics will be in greater use and that mainframe functions are quickly migrating to the PC.'



The Hercules graphic card displays up to 90 characters per line and 43 lines per screen on a monochrome monitor, in an enhanced, condensed-display mode.

board effectively doubles each horizontal scan line to produce a 640-dot-by-400-dot non-interlaced display. Although the software addresses only 200 lines, the lines are repeated, deepening the color display and improving the text clarity.

Another approach, Tecmar Inc.'s Graphic Master, brings high dot resolution (720 by 700) to the monochrome or color IBM display. The \$695 board's 128K bytes of display memory is usable as additional system RAM when the graphics functions are unused. And like the other boards mentioned, it can display graphics or text on any IBM monochrome monitor, NTSC (National Television System Committee) standard composite monitor or RGB (red, green, blue) color monitor that permits a 720-dot-by-480-dot, four-color display or a 640-dot-by-400-dot, 16-color output. The NTSC standard was the first monochrome-compatible, simultaneous color system used for public broadcasting.

Although the Tecmar board does offer a set of formidable features, including a light-pen connection and output to a video recorder, no existing package takes full advantage of the extra display characteristics.

Cards match IBM

For system implementations that must closely match IBM, the \$495 Graphix Plus from STB Systems Inc.'s (Richardson, Tex.) is like many previous cards: it offers

ATRON Announces A State-of- the-Art Software Debugging Tool



FOR THE MULTIBUS®

- **DEBUG 86/88/87 BASED BOARDS**
- **HARDWARE BREAK-POINTS**
 - finds problems like memory overwrites
- **REAL TIME TRACE**
 - answers the question "How did I get here"
- **SYMBOLIC DEBUGGING**
 - no more hex addresses
- **MEMORY MAPPING**
 - test code before blowing proms
- **COMPATIBLE WITH INTEL OBJECT MODULE FORMATS**
 - simplifies language compatibility
- **8 CHANNEL LOGIC ANALYZER**
 - trace and trap external signals
- **MACRO COMMANDS**
 - create your own commands
- **PERFORMANCE ANALYZER**
 - execution histograms
- **PROGRAM PATCHING**
 - on line symbolic assembler

If you're developing MULTIBUS® based systems you need MBUS PROBE 86/88. Call us today.

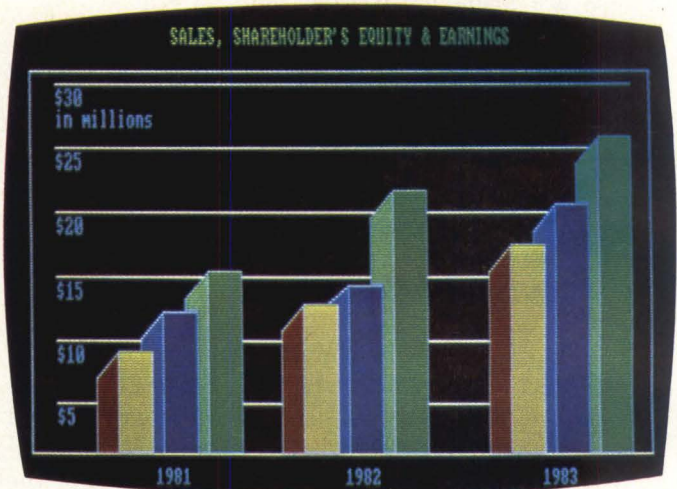
MULTIBUS is a registered trademark of Intel Corp.



THE DEBUGGER COMPANY
20665 FOURTH STREET
SARATOGA, CA 95070
(408) 741-5900

CIRCLE NO. 98 ON INQUIRY CARD

GRAPHICS



The Quadcolor II supports as many as 136 simultaneous colors with a resolution of 320 dots by 200 dots.

both composite monochrome and RGB color outputs. In addition, it has moderate output resolutions of 640 dots by 200 dots and 320 dots by 200 dots. "Our approach is simple," says company president Bill Ogle. "Offer the most workable and cost-effective product and be as compatible to the software world as we can. We don't want to provide more than is legitimately useful."

For system integrators wanting a monochrome adapter board to match the IBM card, and able to accept custom character sets, there is the \$295 Persyst monochrome display adapter. And for color-graphics capability, \$244 buys the color graphics adapter that provides a full set of characters and implements custom character sets as on the monochrome board. Like STB, Persyst plans a conservative approach to ensure software and system compatibility.

Quadram Corp. offers Quadcolor I and II boards. Quadcolor I with 32K bytes of onboard memory sells for \$275. Another \$295 converts it into the II model and adds another 32K bytes of memory, a game port and BASICQ, which modifies IBM's BASICA language with special graphics commands providing access to the board's enhanced features. With the Quadram boards, two colors in addition to black and white are available, and to enhance character sets, scan lines are increased from eight to 16. In addition, two character sets in ROM are software-selectable and user-definable for special applications. Besides supporting the more expensive monochrome and color displays, Quadram adapters have an RF modulator for television use. Screen mode provides 136 colors. Colors can be displayed simultaneously in various combinations with a resolution of 320 by 200 dots. □

Interest Quotient (Circle One)
High 822 Medium 823 Low 824

RamTape-PC.™

Because backups should do more than just take, take, take.



The trouble with conventional hard disk backups is that backing up is all they do. They take and store information—and can take a lot of time and effort doing it—but they don't help you use that information.

RamTape-PC is a complete data storage peripheral that does more than just take data from your PC; it gives you new and advanced capabilities.

It gives you: Electronic disk—a RamTape-PC exclusive. Load data into its 360 Kbyte RAM, without reducing user's memory. Breeze through file editing and spread sheets. With an access

time measured in nano-seconds, the electronic disk speeds every function.

It gives you: A floppy library capability—another RamTape exclusive. Store the contents of 32 double-sided floppies on one cartridge: it's more manageable, less expensive. And you access files up to 50 times faster.

It gives you: A choice of hard disk backup, either file or image oriented. A complete 10MB file by file backup requires less than 15 minutes, with no user intervention. Image backup is even faster. The file mode of backup allows great flexibility providing for backup and restoration of specific files

which meet selected criteria.

Even with its exclusive features, RamTape-PC costs no more than ordinary backups. So why settle for a system that only takes, when the RamTape-PC gives, gives, gives?

For details contact Qantex, 60 Plant Ave., Hauppauge, NY 11788. Call toll-free 800-645-5292; in NY State 516-582-6060.

CIRCLE NO. 99 ON INQUIRY CARD

 **north atlantic
Qantex**

IT TAKES A LOT OF DRIVE

In CAD/CAM. In seismic and transaction-based systems. Or PBX's. Or anywhere else you need a lot of data fast.

That's why we created the Ampex 825.

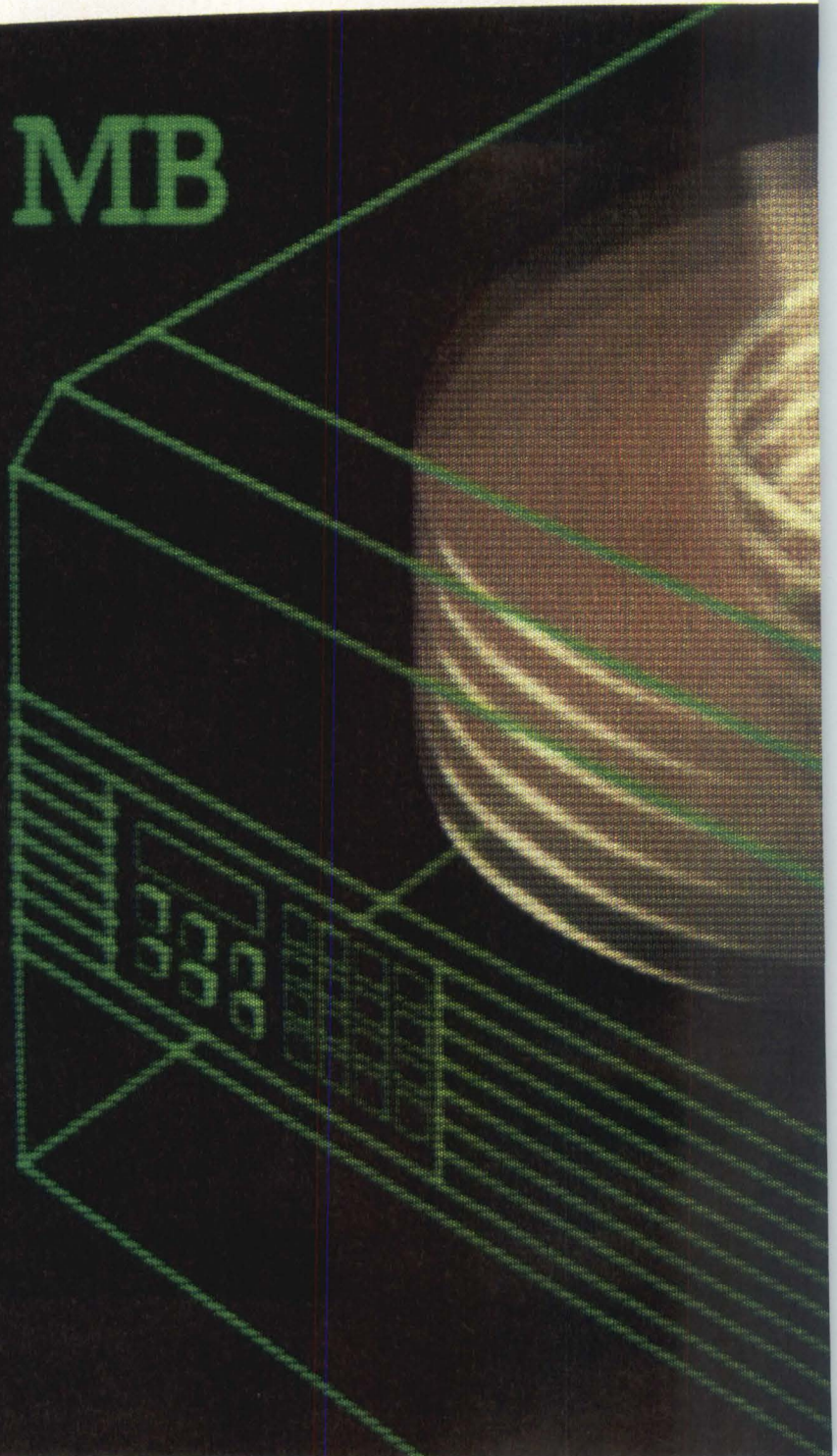
This 14" Winchester family delivers everything you need to take the lead in multi-user, multi-tasking applications: 825, 660 or 330 MB of unformatted capacity.

The new standard 1.859 megabyte per second data transfer rate.

Access times of 21 milliseconds. Plus the best price per megabyte on the market.

Fact is, we offer a better 825 MB price than any combination of small drives. And—thanks to a design that teams RLL encoding with proven, standard head and media technologies—better yields than other big drives. So you won't have to wait for us to get our act together in manufacturing.

825 MB



TO MAKE IT BIG IN PICTURES.

Or in QA. Or field service. Because we designed the Ampex 825 with features that keep it on the fast track. There's a unique control panel with an LED/keypad for push-button diagnostics and configuration. A modular head/disk assembly so you can upgrade capacity in minutes. A reliable, brushless DC motor; a universal power supply and a dual port option.

Plus something else no one else can

match: our vertical integration and 20 years of computer peripheral and offshore manufacturing expertise.

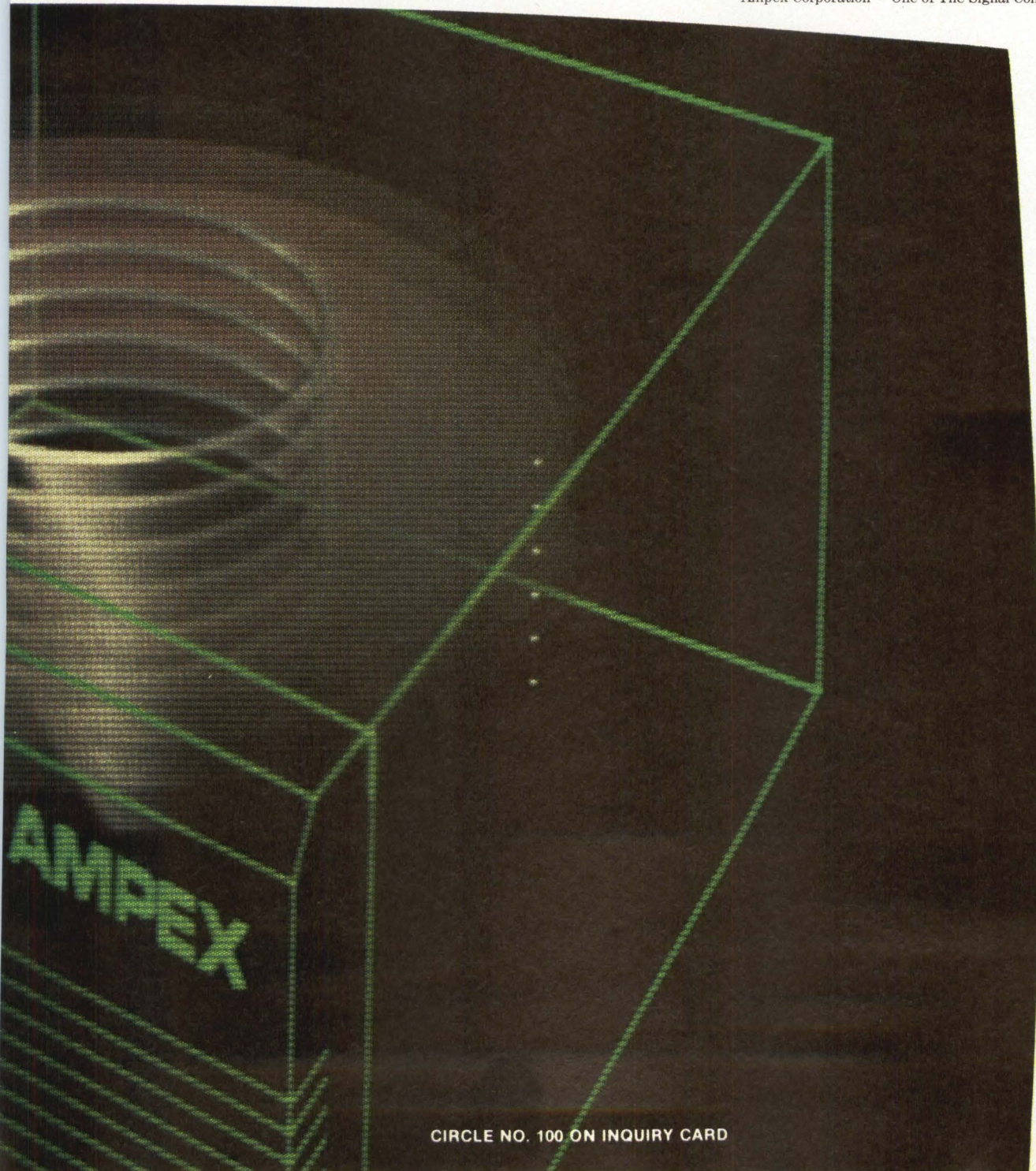
So if you're looking for someone with the drive it takes to play a supporting role in your next big release, contact Ampex.

Call us tollfree at 800 621-0292.

800 821-9473 in California. We'll be happy to set up an audition.


AMPEX

Ampex Corporation • One of The Signal Companies



CIRCLE NO. 100 ON INQUIRY CARD

UNIFY FINISHES FIRST.



In one independent competition after another, UNIFY has proved itself the fastest UNIX data base management system. No wonder it's been selected by more computer manufacturers than all other UNIX data bases combined.

UNIFY speeds you through development and expedites program execution with some of the fastest and most powerful utilities of all, including:

Fully menu-driven design.

Built-in optimizers that select the fastest of four data access methods.

Industry standard IBM SQL query language, fully integrated to our own powerful report writer, for easy access

by your end-users.

Ninety subroutines for advanced program development... the most complete package of its kind.

Horsepower for the long run.

Unlike other data bases, UNIFY won't slow down under the weight of additional data or multiple users. It won't fall behind in the future either, because it's built with the power to support new features as they come on-board.

Judge for yourself. Send for our 300-page tutorial and 500-page reference manual—yours for only \$95. Together they show you how to build virtually any application. To order, contact UNIFY, Dept. MMS-10, 9570 S.W. Barbur Blvd., Portland, Oregon 97219, 503-245-6585.

UNIFY®
THE PREFERRED UNIX DBMS.

CIRCLE NO. 101 ON INQUIRY CARD

Database management software accents flexibility

Word-oriented database package accepts varied data formats and simplifies data retrieval methods

Steve Magidson and Tom Sherrard, DayFlo Inc.

System integrators who use software in adding value to IBM Corp. PC/XT and PC/AT computer systems or their look-alikes can now offer a broad range of applications with a new concept in database management software. Called DayFlo, the software adds flexibility to database management in the personal computer environment.

Database design architectures were typically transplanted from mainframes and minicomputers and were not designed to maximize the capabilities of microcomputers in the personal and business environments. One had to choose between easy-to-use software with limited capabilities, or powerful-but-complex products that require detailed programming. In addition, because database systems available for microcomputers have been built around structured data, they employ rigid record formats that may make them efficient, but relatively inflexible. They do not support the way people work. Rigid record formats plague even the newer user-friendly packages.

Departs from past database technology

This database software represents a marked improvement in information management. By supporting any data format, it permits users to enter information spontaneously, without first translating it into rigid record formats. Similarly, users can retrieve information from the database via a range of criteria or "clues," without having to remember exactly how or where the

information is stored, as required by traditional database systems. Initiating tasks involves interactive menus that make task selection easy for the user, just like reaching for a file folder.

When DayFlo is employed in an "electronic desktop" environment, organized work resides in electronic stacks (the current stack and 19 side stacks), provides electronic files and offers a "trash" feature for purging no-longer-needed information. Switching between tasks takes four keystrokes. In traditional database environments, such switching is impossible or cumbersome, involving swapping diskettes and typing long sets of sign-on/sign-off control sequences. Speedy switching also does not interrupt the user's train of thought.

This approach to handling a database integrates word-processing with database-management functions to enhance flexibility, extending the capabilities of both functions. Dayflo's integral word-processing lets users perform powerful word-processing functions, such as search and replace or cut and paste, editing and modifying data records while staying within the database environment.

Adds value on two levels

The extended capabilities and flexibility of this database system mean system integrators can offer cost-effective applications at two functional levels. At the first level, integrators can create applications using standard DayFlo features. For example, they can create records that contain blank forms and templates,

such as for personnel records, expense reports, prospect files and stock portfolios. Blank forms and templates can be established for lists of public relations and editorial contacts.

A user preparing questionnaires for mailing lists may employ cross-referencing. Forms for sales prospects and listings would include such items as company, contact, title and potential sales amount. A daily calendar might include key tasks and deadlines. Expense report templates might include purpose, car mileage, tolls, meals, tips and the like. Personnel templates might include "last date changed," pay rate, shift, vacation time, remarks and notes.

Integrators can also use the standard features to provide enhancements, such as specific application-oriented databases. For example, to build systems for medical professionals, the system integrator could create a computer-based medical reference encyclopedia and make it a part of the software. The computerized database is superior to the same material in book form. The database can grow and change dynamically as medical knowledge advances. Furthermore, unlike a book, users can cross-reference information extensively, and group references together for easy access.

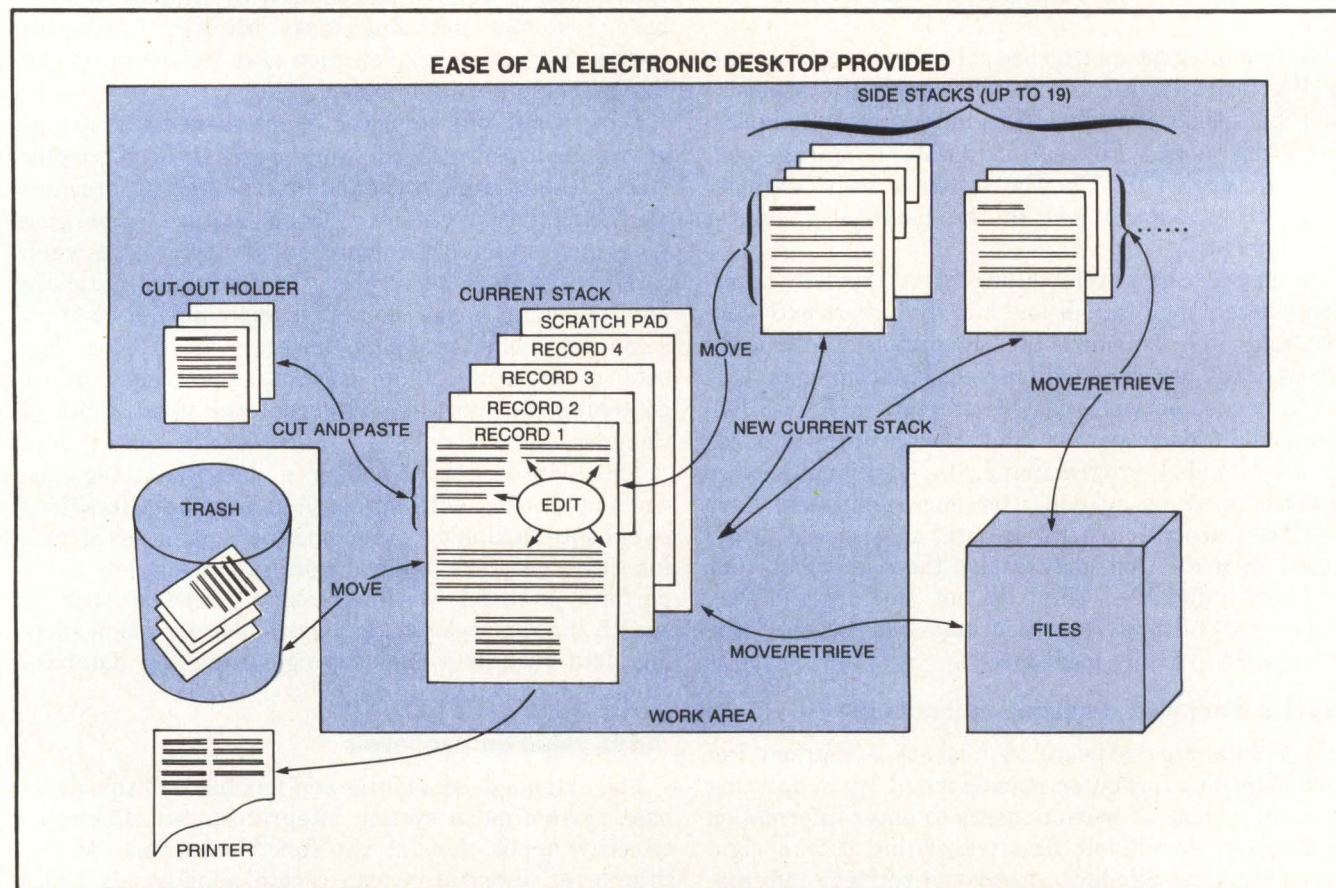
What's more, they can easily synthesize diverse information collected in the database and insert it in reports and papers by using cut-and-paste commands.

The command-log facility is another "built-in" feature with diverse possibilities. Command logs are database records; they contain command sequences required to execute certain specific functions. Command logs are created to perform such applications as automatically generating sales summaries for sales managers, creating investment summary reports for financial consultants or preparing tickler files for office workers.

Software applications are straightforward

At the second functional level, users can develop application software and interface it to the basic system. Here, also, the system has advantages for the integrator. DayFlo, developed under UNIX and written in C, benefits from that environment's inherent system-level portability.

Application implementations are developed in a straightforward manner. They also do not appear alien to the software's basic system of operation and menus. Instead, they are fully integrated and virtually transparent to users. Because of clearly-defined system-



The electronic desktop information flow portrays one current stack and 19 side stacks. Editing occurs on the current stack. Cutting and

pastings activities access temporary storage in the cut-out holder.

The first thing ISI International put on this new Multibus® card was 2 megabytes...

And that was just
the beginning.

Squeezing 2 megabytes of memory onto a single Multibus® card is quite an accomplishment in itself. But we believe it takes more than just memory to meet the increasing needs of today's systems. That's why our new MCB-2X Multibus card is designed with a number of significant special features. And why ISI International is truly a leader in Multibus memory products.

Superior Dynamic Memory Relocation.

The new MCB-2X can relocate up to eight 64K or 256K blocks independently — making it a very powerful tool for "RAM disk," graphics display or multiple table look-up applications.

Expanded Error Correction Logic.

All single bit errors are automatically scrubbed during refresh cycles without system interruption. And thanks to the automatic memory initialization feature, software doesn't have to be pre-conditioned.

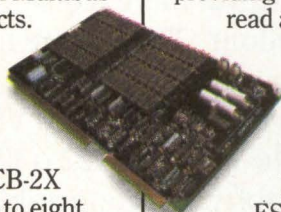
On-board ECC detects

all single and double bit errors, while providing 370ns read access

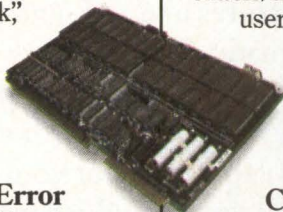
through standard 64K or 256K RAMs. Plus, the MCB-2X has CSR and ESR interrogation capability and software control of ECC enable/disable, allowing users to provide comprehensive system-level diagnostics.

Flexible Addressing Capabilities.

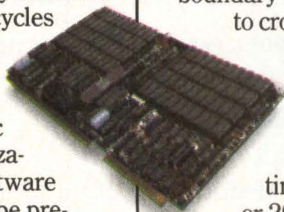
Board addresses starting on any 4K boundary can be mapped to cross 1 and 4 megabyte boundaries. The MCB-2X can also occupy a continuous 512K or 2048K memory space within its 16 megabyte range.



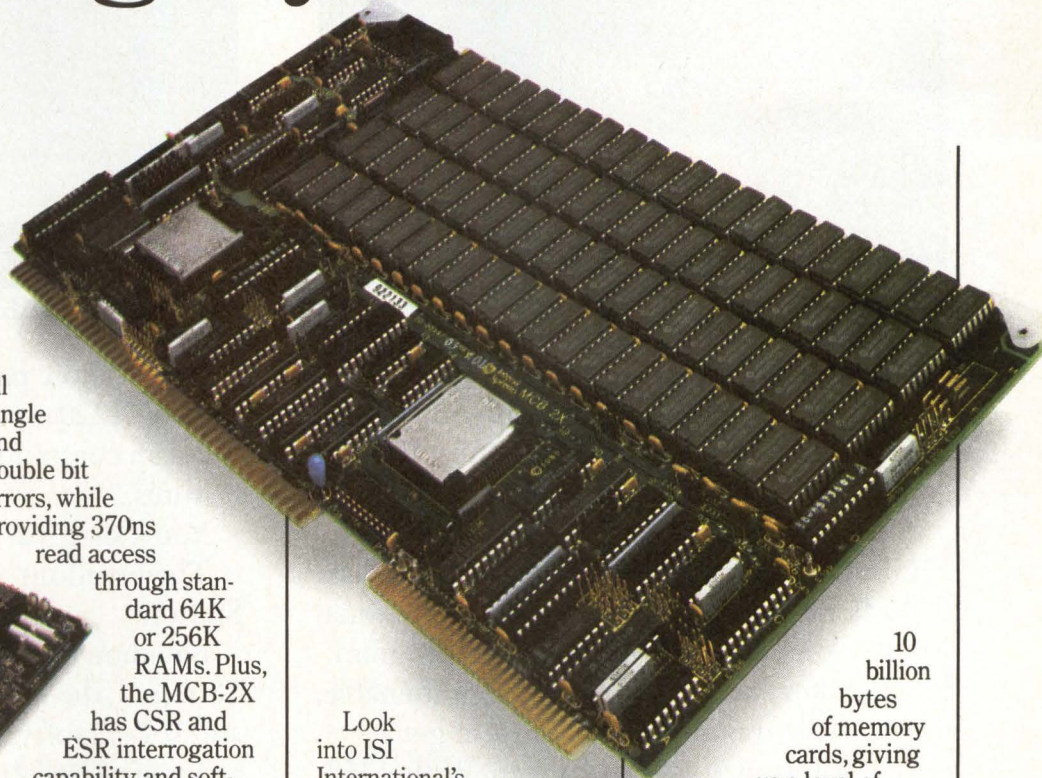
MCB-364



MCB-332



MCB-512



Look into ISI International's new MCB-2X. You'll find all the features you need... plus up to 2 megabytes of memory for the largest capacity available on a single card. Or, for non-volatile CMOS requirements, see our MCB-364 and MCB-332 modules. For simpler dynamic requirements, investigate our MCB-512.

Since 1970, ISI International has shipped over

10 billion bytes of memory cards, giving us a level of experience that's hard to match. Put it to work for you. For systems needs just call us in the West at (408) 743-4442, in the East (201) 272-3920, or in the Midwest call (513) 890-6450. For off-the-shelf products, contact your nearest ISI International distributor: Alliance, Anthem, Arrow, Future Electronics, R.A.E., Quality Components or Schweber.

*Multibus is a Trademark of Intel Corp.



INTERNATIONAL Formerly Intersil Systems

ISI International Corporation

1275 Hammerwood Avenue, Sunnyvale, CA 94089 • (408) 743-4443

CIRCLE NO. 102 ON INQUIRY CARD

Two New Freedoms for DEC.

Video Display



VT-220 compatible Freedom 220: \$795

Straight-out, the Freedom™ 220 Video Display Terminal gives you what you need in the DEC world: VT-220, VT-100 and VT-52 compatibility.

And then some.

Like room for a full-sized add-on PC board (OEMs, take note). A low-profile, professional 106-key keyboard that includes four program function keys as well as several programmable, non-volatile function keys. You also get a crisp resolution, non-glare screen. With +15° and -5° tilt. And 70° swivel. All in a 25-line by 80-column display with smooth scrolling. You also get panning for 25-line x 132-column applications. An amber screen is your option.

What isn't available is a down-loadable character set. Ours is fixed.

What you do get. And what you don't. Just \$795.

Voice/Data



VT-220 compatible Freedom 222: \$1395

List all those products available today that offer VT-220 compatible terminal capabilities, full data communications, and full telephony features.

You'll discover there is only one.

The Freedom™ 222 Remote Information Station.

Based on the Freedom 220 Video Display Terminal, the Freedom 222 is VT-220, VT-100 and VT-52 software-compatible and features an integral Bell 212A-compatible modem. You also get sophisticated, hardworking "smart" telephone features like a 25-entry directory and an automatic dialer.

The Freedom 222 is the only product available anywhere today with voice and VT-220 data capabilities for your DEC system. It's a powerful terminal. With powerful data communications. And powerful telephony features. At \$1395, that's a powerful lot.

See us at COMDEX/Fall, Booth #H7538, Hilton Hotel

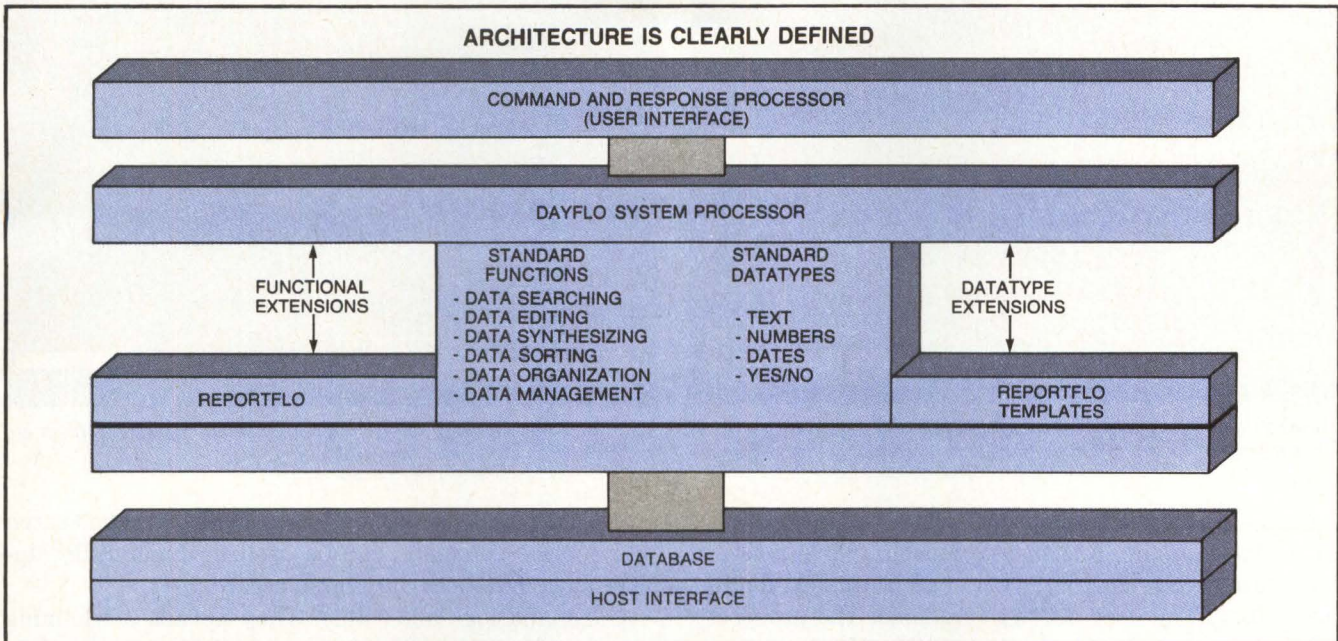
 **LIBERTY**

We make terminals.

Liberty Electronics, 625 Third Street
San Francisco, California 94107
Telephone (415) 543-7000. Telex 470 439

© 1984 Liberty Electronics

VT-52, VT-100, VT-220 and DEC are trademarks of Digital Equipment Corporation.



Systems architecture contains three levels. The host interface is at the bottom, the user interface at the top. The user gets into the system

through the command and response processor; the system processor performs data manipulation.

level interfaces, all developed applications look and operate like DayFlo. Application software will use the same interfaces and services. These include: a standardized database interface providing full record, field and index manipulation facilities; comprehensive command and response functions for parameter input and display of dynamic help screens; and executive services for screen, keyboard and peripheral input/output, virtual memory management and data translation and validation.

Flexibility unavailable in other database packages is possible because those packages' underlying architecture is fundamentally different from traditional database system architectures. In the traditional rigid record structure, each record type must be handled differently because each uses a different format. DayFlo provides an environment that manages both structured and unstructured records. Thus, it accommodates as many different types of records in its information base as the user wishes to create.

This approach to handling database information affects both the creation and manipulation of records. For example, records need not look alike. They may be of different lengths, contain different numbers of items and be changed dynamically. Because operating environment records are effectively equivalent, virtually the entire command set can operate on all types of records.

The key to handling records in such a unique manner lies in the system's structure. Flexibility is important

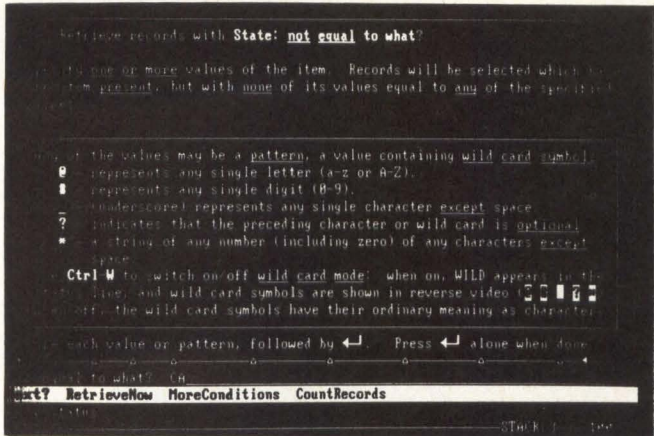
for people working in a personal-computer environment. For example, the retrieval software is relatively insensitive to grammar and punctuation. This insensitivity lets users recall records without remembering exactly how they were input.

Another key to flexibility in record handling is the way records are defined. Traditional systems separate the data structure from the data itself. Here each individual record carries with it all the information required to define its structure, using techniques that minimize both database storage and processing overhead. This freedom from global-structure constraints permits users to move—or even dynamically combine—individual data records to set up entirely new types of information from existing information.

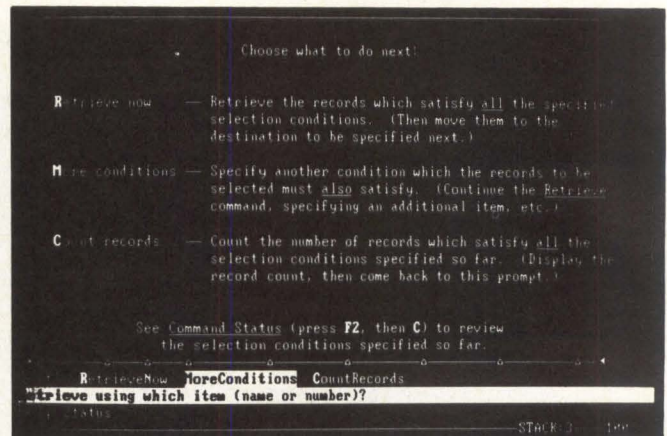
Further input flexibility lets the user enter data into the system in virtually any convenient format. And because the software accepts any record format, integrators can pick whichever format they find convenient to work with in creating applications. This reduces time and overhead costs in developing new applications and getting them to market.

Retrieval method eases task-switching

Associative retrieval makes switching between tasks easy. Operators get information out of the database easily using many options. Unlike traditional databases that require data-retrieval queries constructed with Boolean algebra, these retrieval queries are in English. Finding data is more direct. The system's "contains"



These English-language menus are direct, and data-retrieval queries are self-explanatory. Other database systems' retrieval queries



use traditional Boolean query languages, which users complain are cryptic, error-prone and user-unfriendly.

function illustrates how powerful data retrieval can be. Take, for example, a user who must retrieve a record for a prospective customer who had last called months previously. The user doesn't remember the prospect's whole name—only that it was “Mr. Richards”, or maybe “Richard”, or “Dick”—something. Constructing a satisfactory retrieval query for this situation with traditional database Boolean language is difficult at best. But the “contains” function does it with dispatch.

Certain functions that do not exist in traditional database systems are possible and meaningful. One is the ability to retrieve information from a record on the basis of a certain field. For example, a user could easily retrieve only those customer records that include a home-address field despite the fact that the system allows for customer records with or without a home-address field. It would be impossible to use this command in a traditional database system where all customer records must be the same. Either all the records would contain a home-address field or they would not. Another data-retrieval function gives users the ability to gather many different types of records with a single query such as the one previously described.

Integrating word processing with the database system extends the power of both functions. Word processing works directly with database records and keeps both functions simultaneously available to the user. Word processing capabilities are enhanced through managing, sorting and manipulating text files with database power. A record change is performed as a word-processing function. For example, adding a home-address field to a customer record is as simple as addressing the record: you insert the number of blank lines required and type in the address.

Other word-processing functions allow other powerful operations on database records. For example, the search function can move through whole sets of records, finding all records (regardless of type) that contain a

particular character string in any field. And the search and replace command can be used to dynamically update large numbers of diverse records.

Command logs add value. They permit predefining complex functions by putting commands together in a record and giving that record a meaningful name and optional description. Then it is only necessary to access and execute the appropriate command log. Command logs reduce the time and effort users normally need to create powerful functions and utilities. System integrators can provide these functions in application-specific command logs. The procedure for translating data from a popular database program into DayFlo records can be built into a command log that the user can access with just a few keystrokes. The command log contains the instructions necessary to perform an associative retrieval of data from the information base. □

Thomas H. Sherrard, principal member of the technical staff at DayFlo, has worked in software, hardware and systems design on mainframes, minicomputers and microcomputers for 21 years. He has worked for the University of Chicago, Bunker-Ramo Information Systems, General Automation Inc. and others, in positions ranging from system programmer to vice president of marketing.

Steven R. Magidson, also principal member of DayFlo's technical staff, has 14 years experience in software design, implementation, quality assurance and human interface subsystems. He has worked for General Automation, Inc., Downey Savings & Loan and the European American Bank. Magidson has a B.A. degree from Rutgers University and a masters degree in computer science from West Coast University.

Interest Quotient (Circle One)
High 825 Medium 826 Low 827



A DEFENSE THAT HANGS TOUGH
PLAY AFTER PLAY AFTER PLAY.

THAT'S WHAT KEEPS ALL THE POINTS
ON YOUR SIDE.

All about defense. And winning. Designing information systems to compete for different business needs is a lot like putting together a winning sports team.

Each component has to offer you the maximum number of offensive and defensive advantages to assure success. Take computer printers.

The key advantage for the defense is reliability. Will the printers that have all the offensive capability going for them be able to hang tough inside your system?

How Okidata stacks up for you. Defensively, Okidata keeps piling up

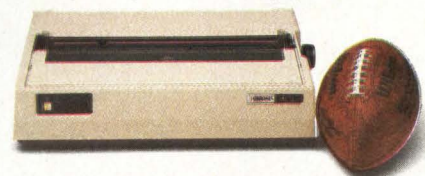
the points on your side of the board. Their tank tough bodies can take the most punishing hits.

Their MTBF stats score up to 4,000 hours. Their printheads always go the distance, up to 200,000,000 characters. Their MTTR's are down to an impressive 15 minutes. There are no duty cycle limitations.

And their warranty claim rate record book says 99 1/2 out of every 100 Okidata printers are always in the game for you.

We'll help you win. In OEM system building, just like in Super Bowls, reliability is the name of the game.

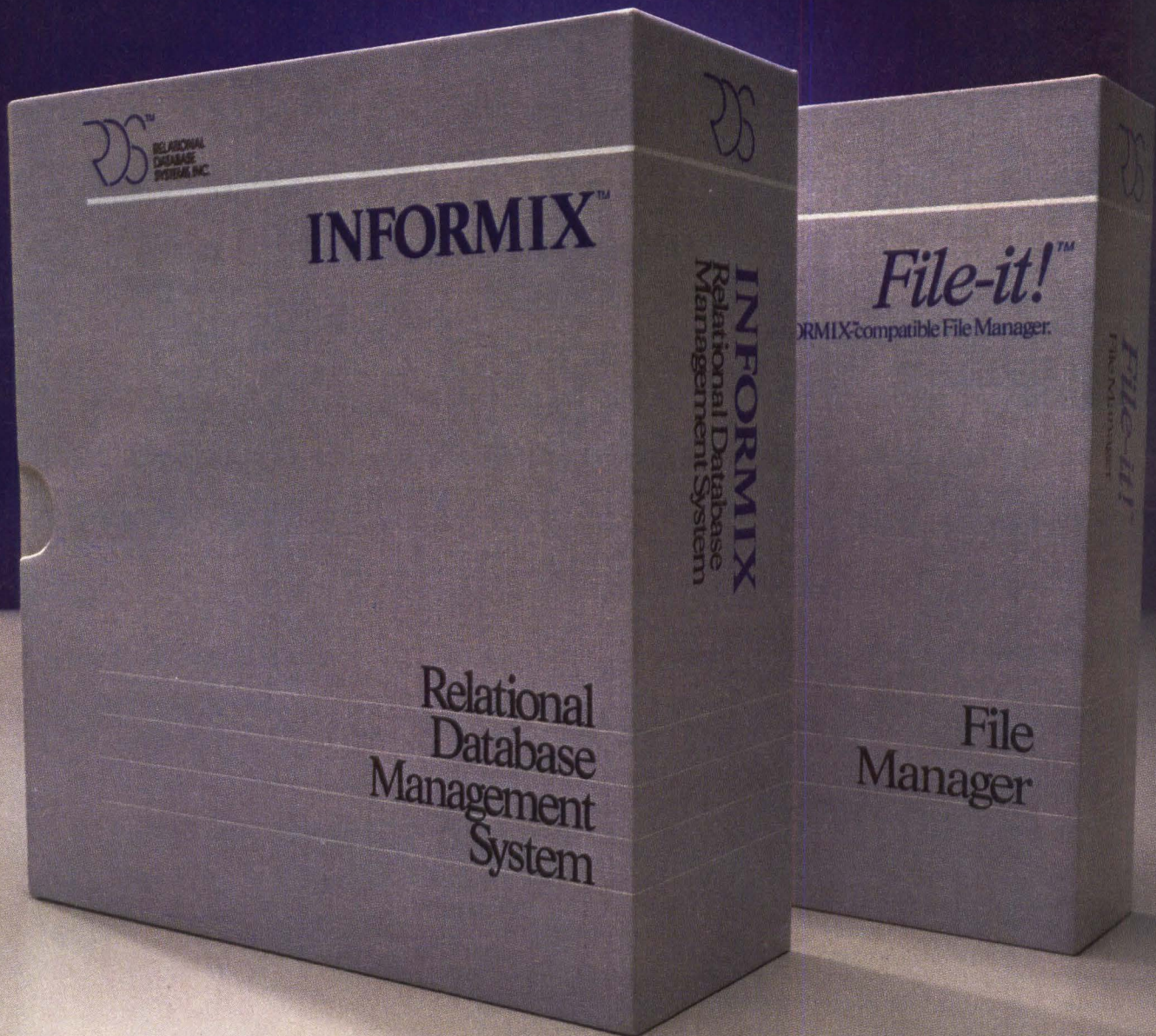
If you're putting together a components team where defense counts, call us at 1-800-OKIDATA (609-235-2600 in NJ). Or write OKIDATA, Mt. Laurel, NJ 08054. We'd be more than happy to suit up for you. And help you win.



OKIDATA
an OKI AMERICA company

INFORMIX AND File-it!

THE FIRST DATABASE SOFTWARE FAMILY
FOR UNIX AND MS-DOS.



Now OEMs and systems integrators can sleep better at night. Because one company has taken the worry out of buying the right software.

RDS.

The company that produces a family of database software designed to take on the future.

Incompatibility is a thing of the past.

INFORMIX[®] and File-it![™] are compatible with UNIX,[™] MS[™]-DOS, PC-DOS,[™] and PC/IX systems (over 60 micros and minis* at last count).

INFORMIX is a true relational database system designed to take full advantage of the power of UNIX. It includes the most widely used report writer on the market.

Then there's File-it! The first easy-to-use UNIX file manager. Together, they have the flexibility to accommodate novices and experts alike.

INFORMIX and File-it! are fully integrated. Users can upgrade from File-it! to INFORMIX or access data from one program or the other without re-entering data, retraining employees or reprogramming.

Applications can also be moved from MS-DOS to UNIX and vice versa without having to rewrite the application.

Simplify program development.

RDS offers C-ISAM,[™] the de facto standard ISAM for UNIX. It's a library of C subroutines with a B⁺-Tree based access method that stores, retrieves and modifies data from indexed files. It's embedded in INFORMIX and File-it! Or is available as a standalone product.

Software good enough for AT&T.

AT&T, inventor of UNIX, has co-labeled INFORMIX, File-it! and C-ISAM to run on their full AT&T 3B Computer line (from micros to minis).

Hewlett-Packard, Altos, Zilog, Siemens, Cromemco, Perkin-Elmer, Sydis and General Automation have selected RDS as well.

In fact, INFORMIX has an installed base of over 6,000 copies. And RDS has sold over 35,000 licenses for all their products to date.

But before you make up your mind, check the facts one more time.

There's only one database software family that's UNIX-, PC-DOS-, MS-DOS- and PC/IX-based. It runs on more than 60 systems. And it's ideal for both novice and expert.

Now it doesn't matter where the future's headed. You're already there.

*RDS products are available for the following systems:

Altos 586, 986, 8600, 68000	Hewlett Packard 150, 9000
Apollo DN300	Series 200, 9000 Series 500
AT&T 3B2, 3B5, 3B20,	IBM PC, PC-AT, PC-XT
AT&T Personal Computer	Intel System 86/330, 286/310
BBN C machine (all models)	Masscomp NC 500
Bunker Ramo Aladdin 20	Momentum Hawk 32
Charles River Data Systems	NCR Tower
Universe 68	Oryx C8002, C8002A
Convergent Technologies	Pacific Micro Systems PM200
Miniframe and Megaframe	Perkin-Elmer 32 Series, 7350
Corvus Systems Uniplex	Pixel 100/AP, 80 Supermicro
Cromenco System 1	Plexus P/25, P/35, P/40, P/60
DEC 11/23, 11/34, 11/44,	Pyramid Technologies 90X
11/60, 11/70, VAX 11/730,	Radio Shack Model 16
11/750, 11/780	SCI Systems IN/ix
Dual Systems System 83	Silicon Graphics IRIS 1400
Fortune 32:16	Visual Technology 2000
Forward Technology 320	Wicat Systems
General Automation Zebra	Zilog System 8000
(all models)	(all models)

Demos of INFORMIX and File-it! are available. Demonstration software and complete manuals included.

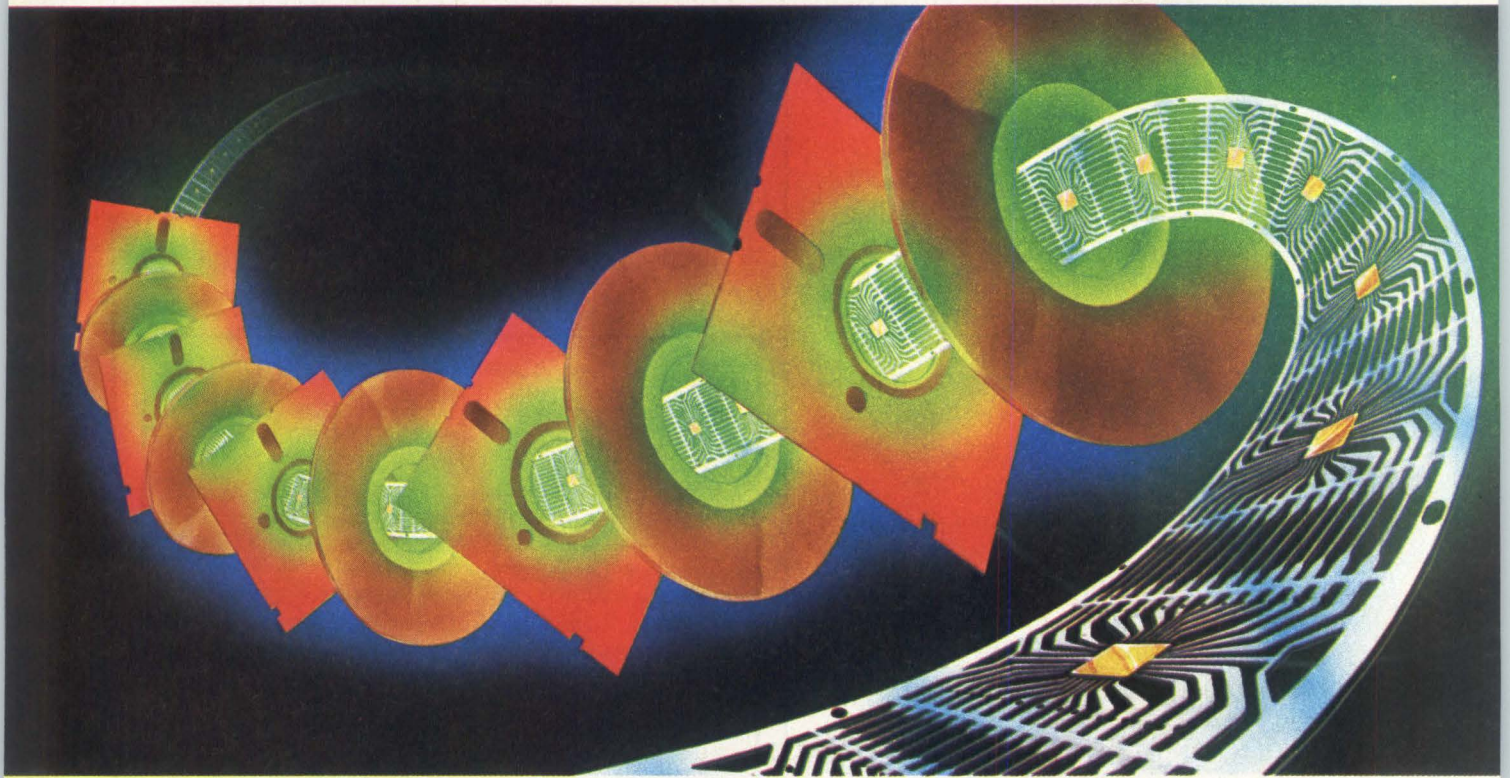


2471 East Bayshore Road, Suite 600, Palo Alto, California 94303
(415) 424-1300 TELEX 467687

INFORMIX is a registered trademark of Relational Database Systems, Inc. RDS, File-it! and C-ISAM are trademarks of Relational Database Systems, Inc. UNIX is a trademark of AT&T Bell Laboratories. MS is a trademark of Microsoft and PC-DOS is a trademark of International Business Machines.

See us at UNIX Expo, Oct. 16-18, New York, Booth #123

SSI-INNOVATORS IN DISK DRIVE INTEGRATION



We've delivered more read/write IC's than everyone else combined, but we're not satisfied.

Everyone knows that Silicon Systems dominates the market with read/write IC's for 14", 8", 5-1/4", and smaller Winchester disk drives. What they may not know is that we're not satisfied to stop there. Although our present line of rotating memory circuits includes much more than read/write IC's, we won't be satisfied until we completely integrate Winchester disk drive electronics. And we are continuing to expand the industry's most complete line of "Applications Specific" IC's for Winchesters, Floppies, and Tape Drives.

We're also the leading innovators in custom IC's for use with mass storage systems.

In addition to our broad line of standard circuits, we have developed a host of innovative custom IC's for use with a variety of mass storage systems. We have produced custom IC's for read/write electronics, spindle motor control, analog data processing, digital bus interface, and servo control functions.

For rigid and floppy disk drives, or tape back-up systems—if the circuit you want isn't in our standard line, we have the capability to produce it for you. We have

the analog and digital design capability, the Bipolar and CMOS process technology, and the rotating memory IC experience to make the exact custom chip your system needs.

For more information on our standard products and custom capabilities, send for our "Rotating Memory Integrated Circuits" brochure.



Silicon Systems incorporated,
14351 Myford Rd., Tustin, CA 92680
(714) 731-7110, Ext. 575.

silicon systems
INNOVATORS IN INTEGRATION

Microcomputer COBOL aids mainframe links

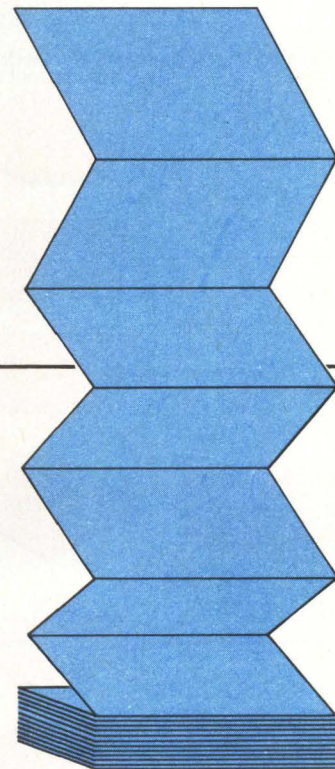
*A full COBOL compiler, a debugging package
and source-code generators let interactive microcomputers serve as
cost-effective, mainframe application development
and maintenance stations*

Dan Fineberg, Micro Focus Inc.

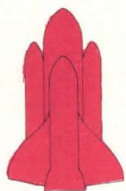
The use of microcomputers to develop COBOL (common business-oriented language) applications for mainframes has come of age. Programmers and system integrators can no longer regard microcomputers as machines incapable of effective interactions with mainframes. COBOL has outgrown its reputation as a batch-oriented, slow, verbose and memory-intensive language—a reputation that may have discouraged microcomputer-application vendors from taking advantage of COBOL's benefits. Today's interactive COBOL running on powerful multiuser 16- and 32-bit microcomputers with large storage capacities, allows them to effectively develop and maintain a host of mainframe-level business applications.

Microcomputers no longer function as mere stand-alone systems. They can serve as both mainframe program development stations and as delivery vehicles

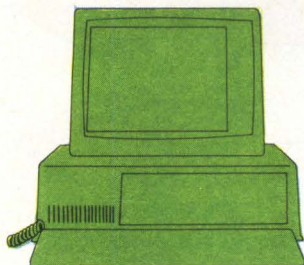
for distributed processing. Software shared between microcomputers and mainframes allows uploading and downloading of application programs between the two types of computers. Powerful microcomputers in large organizations linked to central mainframe computers provide two important benefits. They remove a significant programming workload from corporate mainframe computers, freeing valuable CPU time for execution of



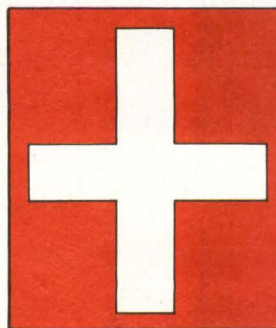
WORLDWIDE INVESTMENT IN COBOL LEAVES SPACE SHUTTLE FAR BEHIND



\$9 BILLION
SPACE
SHUTTLE
COST



\$27 BILLION
IBM'S
SALES



\$36 BILLION
GROSS NATIONAL
PRODUCT OF
SWITZERLAND



\$100 BILLION
WORLDWIDE
COBOL
INVESTMENT

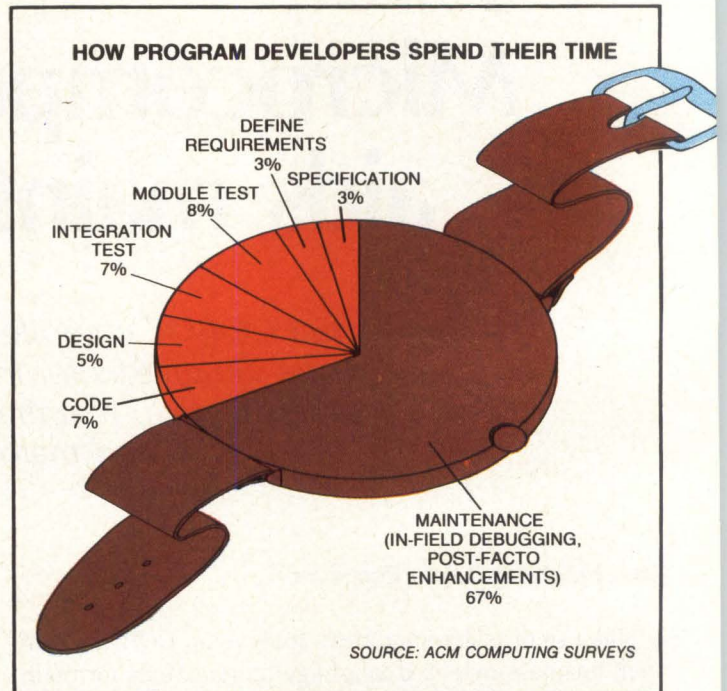
SOURCE: MICRO FOCUS INC.

data-processing applications. And they permit end-users to more easily access information and information-processing resources.

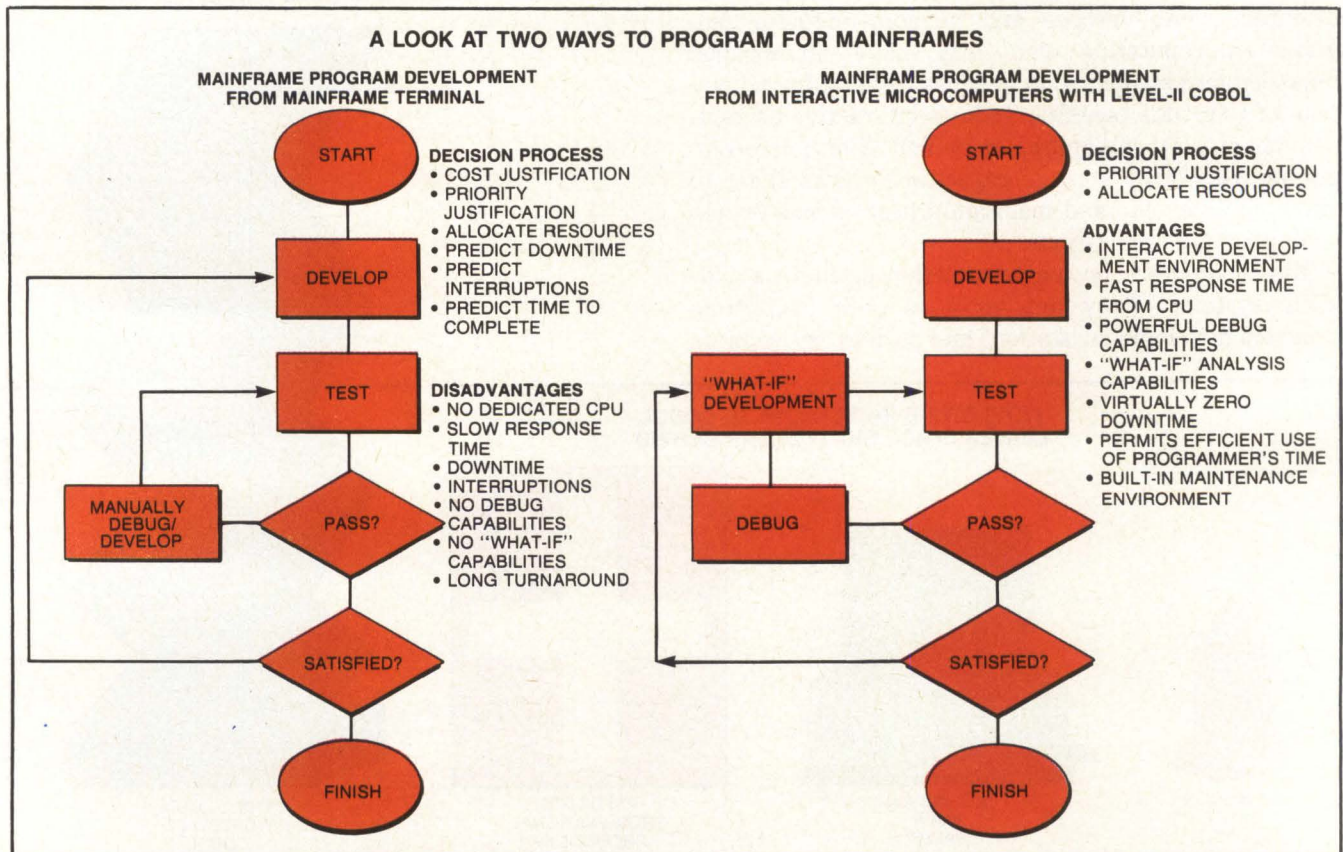
Increases programmer productivity

Optimizing computer resources in this manner also increases programmers' productivity. With their own microcomputers readily available, programmers can download from the mainframe to standalone systems for application testing and maintenance. They can also develop new mainframe applications on the standalone system without the interruptions that often occur when they use the central mainframe resource during peak hours: 1 p.m. to 5 p.m. During this period, response time often degrades to as long as two minutes from the normal 3 to 5 seconds.

Running standard COBOL on both a mainframe and microcomputers enables end users to collect and process central data on the microcomputer and store locally processed information on the mainframe. This capability allows end users to be more productive by freeing them from data-processing department schedules and constraints. However, it does not interfere with the DP manager's efforts to control the security of sensitive information.



The maintenance of application software takes up a disproportionate amount of program-development time. Microcomputer-based programming tools can decrease the time and effort required to debug mainframe application programs.



Mainframe program development from microcomputers using interactive COBOL offers advantages not found in the mainframe environment, speeding the decision and software-development processes.

The new Canon TX-50 desktop computer.

It fits any customer's business as well as his desk.



No matter how specialized your customers' business needs, Canon's new compact desktop computer is uniquely designed to accommodate them.

Because the TX-50 is a self-contained computer that can be customized for a wide range of specific business applications.

Its all-in-one design includes:

- A high-performance 16-bit microprocessor with MS-DOS[†] operating system. Standard 128KB memory is expandable to 256KB.
- Seven-inch high-resolution monochrome CRT display.
- Fifty-function LED keyboard plus separate ten-key calculator pad and cursor control keys.
- Three-inch compact floppy disk drive with 150 K-bytes memory capacity per side.
- Optional RS-232C serial interface and Centronics-type parallel interface available.
- Wire dot impact printer that gives a

sharp 5X7 dot matrix and has a maximum 30 characters per line. One original plus two copies can be made on plain paper in either black or red.

With such impressive, self-contained flexibility, the TX-50 is ideal in areas such as customer operations and counter service. Especially since the TX-50 provides such a huge range of varied functions, yet takes up so little space.

Businesses such as gasoline stations, banks, mail rooms, real estate brokers and numerous others will find the TX-50 particularly useful for sales, credit, loan or general customer calculations.

So if you're dealing with business, whether large or small, and you feel they need a rather special computer, consider the new Canon® TX-50 desktop computer.

There isn't a desk it won't fit.

For more information:

Call 1-800-323-1717, Ext. 302.

(In Illinois call 1-800-942-8881, Ext. 302.)

Or write Canon U.S.A., Inc.

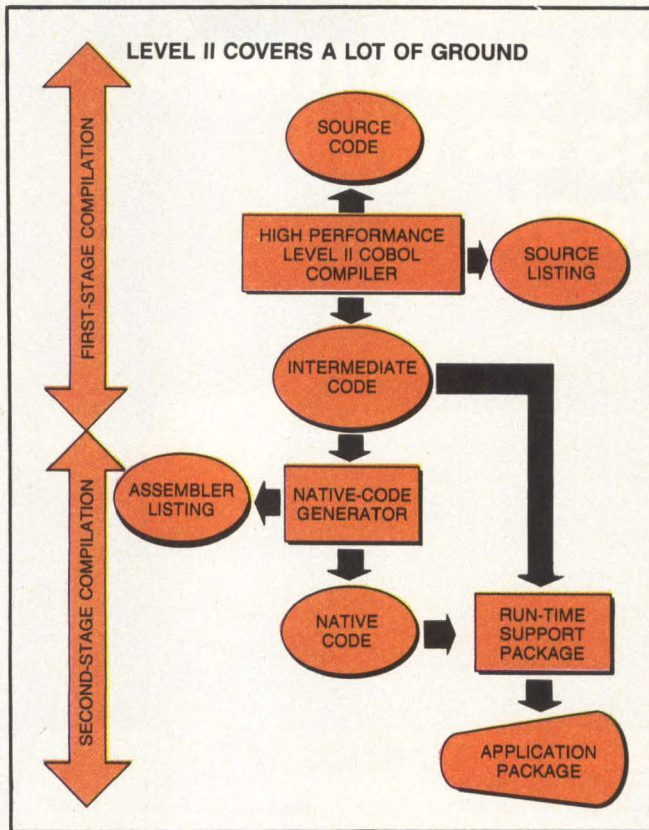
Systems Division/TX-Series

P.O. Box CN 11250, Trenton, N.J. 08650

Canon Systems Division

© 1984 Canon U.S.A., Inc.
†MS-DOS is a trademark of MICRO SOFT.

CIRCLE NO. 107 ON INQUIRY CARD



The increasing availability of 32-bit compilers on microcomputers will overcome several drawbacks of today's machines: First, 16-bit addressing often prevents the downloading of mainframe applications. Second, 16-bit compilers with data spaces of less than 64K sometimes cannot handle the large, unmodified mainframe applications. Having 32-bit addressing on a microcomputer also permits end users to read in multiple files and build up large databases.

Packages implement debugging, screen creation

Four packages from Micro Focus Inc. provide an effective bridge between microcomputer and mainframe business software-development environments. LEVEL II COBOL combines features of mainframe COBOL with interactive extensions to take full advantage of 8-bit to 32-bit microprocessor-based development workstations. The ANIMATOR debugging and maintenance package allows programmers to interact and control executing programs, check data values and

In the first stage of the application-development process, the high-performance LEVEL II COBOL compiler produces intermediate code that conforms to an abstract COBOL machine. In the second stage, the intermediate code is interpreted by the Run-Time Support Package for UNIX-, CP/M- and MS-DOS-based microcomputers. Alternatively, native code generators can compile intermediate object code to the target machine's native code.

On-going standardization efforts keep COBOL up to date

COBOL has evolved along standardized lines to keep pace with the development of computer hardware. In the late 1950s, when business and government first began using computers, software programs could be developed only by software engineers, and software applications were not readily transportable across different machines. To overcome these problems, a group of computer manufacturers, compiler writers, end-users and government officials met in Washington, D.C., in May of 1959 at the Pentagon to design a common business-oriented language (COBOL), "independent of any make or model of computer, open-ended and stated both in English and narrative form."

Led by a U.S. Navy Commodore, Grace Hopper, known as the "mother" of COBOL, the group grew into the COBOL Committee of the Committee on Data Systems Languages (CODASYL), the governing body that guides the language's evolution. The committee produced an initial version

of COBOL in January, 1960. Since then, more than \$100 billion has been invested in COBOL applications worldwide. The COBOL Committee has continued its work, proposing standards for adoption by the American National Standards Institute (ANSI) and enforced by the government's General Services Administration (GSA) at the Federal Compiler Testing Center. As a result, COBOL is the most strictly standardized business programming language in the world. Standardization offers many benefits, including the ability to maintain an investment in existing software as new hardware is implemented.

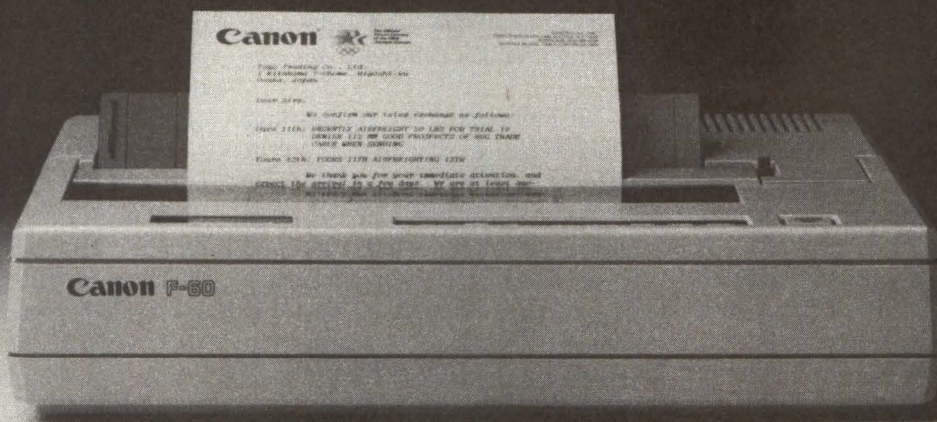
The 23-member COBOL Committee meets six times a year to discuss specifications of the language. It produces the COBOL Journal of Development (JOD), a regularly updated publication that defines proposed changes to the language.

ANSI, through its COBOL committee (XJ34), periodically generates a new industry COBOL standard. First

published in 1968, the standard is based solely on the current CODASYL version published in the JOD.

Based upon ANSI COBOL, Federal Standard COBOL meets U.S. government requirements with four levels of implementation: Low, Low-Intermediate, High-Intermediate and High. The GSA's Federal Compiler Testing Center tests each COBOL compiler for compliance with the Federal COBOL standard, using a suite of programs comprising 225,000 lines and 5,500 individual tests. A compiler is tested at the implementor's claimed level, then placed on the Certified Compiler List either "with errors" or "with zero errors." For example, Micro Focus Inc.'s LEVEL-II COBOL compilers are GSA certified at the High Level with "zero errors." Certification is valid for one year, after which each compiler must be retested. As a result of these standards, COBOL source code is portable across different machines, operating systems and various implementations of a standard COBOL compiler.

How does a new, letter-quality, thermal transfer printer made by Canon sound? Very quiet.



Canon's advanced non-impact printing technology heralds yet another achievement—The F-60: a flexible, high-quality thermal transfer printer with Graphic Image capability.

Its letter-quality printing is good enough to use with a word processor, yet quiet enough to be seen and not heard. The F-60 operates at a dramatically low 45db, so it's perfect for even the most noise-conscious office.

Extreme flexibility gives access to three attractive printing modes. Printing speeds range from Graphic Image at a rapid 80cps, through Draft and Near-Letter-Quality to Letter-Quality at a smooth 20cps and an impressive high-resolution 36X24 dot matrix.

But its flexibility doesn't stop there. A simple system of interchangeable typestyle cartridges gives an incredible choice of eight different fonts.

© 1984 Canon U.S.A., Inc.

The F-60 is also highly versatile. It handles not only thermal paper and overhead projection film, but also plain paper in single sheets, rolls or fan folded. Its self loading mechanism automatically inserts and advances the paper. It's even compatible with most leading personal computers.

Plus it prints in a choice of four bold colors.

And it does it very quietly, and at a very competitive price.

For upgraded performance, optional accessories include pin feed, tractors, roll paper holders and a serial interface card.

The new F-60 thermal transfer printer from Canon. You have to admit it sounds very good.

For more information:
Call 1-800-323-1717, Ext. 300.
(In Illinois call 1-800-942-8881, Ext. 300.)
Or write Canon U.S.A., Inc.,
Printer Division, P.O. Box CN 11250,
Trenton, N.J. 08650

Canon Printer Division

CIRCLE NO. 108 ON INQUIRY CARD

set up "what-if" situations—capabilities generally not available on mainframes. The FORMS-2 and SOURCEWRITER source-code generators speed the development of COBOL applications by automatically producing error-free source code.

Using these packages on a microcomputer reduces the time required to develop and debug a mainframe program. Working directly on a mainframe, a highly productive programmer might require 10 working days to write, debug and test 600 lines of code (one module). With LEVEL II COBOL on a microcomputer, the programmer could complete the task at least one-third faster. For example, if it takes nine months to develop a purchase-order system on a mainframe, the same task requires less than six months to complete on the microcomputer.

Nearly 70 percent of all investment in applications software goes toward maintenance. The ANIMATOR tool solves COBOL maintenance debugging problems in a flexible manner, permitting a programmer to watch the program's source code execute on the screen and automatically trace the effects of an error through a COBOL program's logic and data structure. ANIMATOR also lets programmers select parts of a program, choose the data to demonstrate the code being checked and control the speed at which the code runs.

The FORMS-2 source code generator automates the

An integral part of the applications-development environment, the ANIMATOR debugging and maintenance package allows direct statement-by-statement observation and control of program execution at the source-code level (A). The top part of the screen shows different parts of the software's working storage section, defining variable size and type, of a COBOL implementation of the "Sieve of

laborious task of creating interactive screen displays for COBOL programs. Menu-driven and easy to use, this tool allows programmers to directly "paint" displays on the screen using a keyboard. It also automatically generates the COBOL source code required to make the interactive screen functional.

After the package generates a COBOL source file, software developers can use the COBOL copy verb to incorporate the program into an application program. Simple editing commands manipulate text on the screen. Using FORMS-2 can save an estimated eight to 10 man hours for each interactive form generated. The SOURCEWRITER package, a system-building, data dictionary-based generator, can similarly cut the time required to produce source code for complex applications requiring interlinked files and thousands of lines of code.

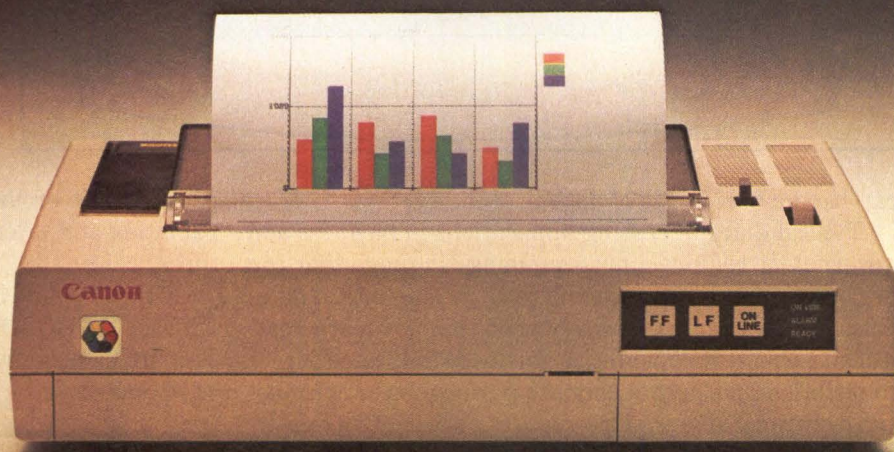
To meet the burgeoning needs of the personal computer market, Micro Focus developed PERSONAL COBOL, a fully integrated program development system for IBM Corp.'s PC, PC/XT and 3270 PC. The package provides a powerful full-screen text editor, source code generator for forms, index program generator, syntax checker, automatic file handler and an interactive source-code-level debugging facility. PERSONAL COBOL supports all IBM PC color/monochrome display attributes and graphics characters, and

Eratosthenes" benchmark program. As the program executes on the bottom half of the screen, the cursor moves from statement to statement. Interactive debugging and analysis commands (B) implement modification of data values, alteration of the control flow, "what-if" analysis and other capabilities.

(A)	THE ANIMATOR'S SPLIT-SCREEN DEBUGGER	(B)		
000090	OS COUNTER	PIC 9(4) COMP-3.	B(BREAKPOINT)	Controls use of breakpoints
000100	OS TOTAL-PRIME-COUNT	PIC 9(4) COMP-3.	D(DISPLAY)	Permits display/amendment of data item
000110	OS FLAG-END	PIC X VALUE " "	E(EXECUTE)	Controls program execution
000120	01 TABLE.		F(IND)	Finds specified string of characters
000130	OS FLAGS	PIC X OCCURS 500 TIMES.	L(LEVEL)	Controls perform threshold on nested performs
000140	01 VALS.		M(MONITOR)	Allows continuous display of data item as it changes during execution
000150	OS DISP-PRIME	PIC ZZ9.	P(ROGRAM COUNTER)	Controls program statement counter
000160	OS DISP-MSG1	PIC X(30) VALUE "is a prime".	Q(QUERY)	Allows display/amendment of data at cursor
<hr/>			S(CREEN)	Moves the display window
000470	COMPUTE COUNTER = INTEGER + PRIME.		U(SER)	Displays screen seen by end user
000480	FIRST1.			
000490	IF COUNTER > 499 GO TO NEXT1.			
000500	MOVE "x" TO FLAGS (COUNTER + 1).			
000510	COMPUTE COUNTER = PRIME + COUNTER.			
000520	GO TO FIRST1.			
000530	NEXT1.			
000540	ADD 1 TO TOTAL-PRIME-COUNT.			
000550	MOVE PRIME TO DISP-PRIME.			
000560	DISPLAY VALS.			
000570	IF PRIME > 500 MOVE "x" TO FLAG-END.			
000580	DETAIL-COMPARE-EXIT.			

What's more incredible about Canon's color ink-jet printer?

The quality... or the price?



Take a look at the beautiful clarity of the Canon®PJ-1080A's color ink-jet printing. Then discover that Canon's color printer actually costs well under a thousand dollars. You'll be hard-pressed to decide which is more amazing.

What makes the quality so incredible? Features like:

- The advanced drop-on-demand printing system. Canon's patented ink-jet technology gives a sharp 640 dot-per-line scan mode, for dazzling high-resolution color and exceptionally clean, crisp printouts.
- Whisper-quiet operation of less than 50dB and an impressive speed of 37 c.p.s.
- A choice of seven bold colors for bright, imaginative graphics.
- A special dual-ink cartridge system that gives cleaner

resolution on blacks and saves you money, because when black is used up only the black cartridge need be replaced.

- The ability to print high-fidelity characters and images on transparencies for overhead projection.

- Compatibility with most computers you can buy. And how much does all this cost? Far less than a thousand dollars.

So what's more incredible about the PJ-1080A color ink-jet printer? There's only one way you'll really be able to find out.

And that's to buy one and decide for yourself.

For more information:
Call 1-800-323-1717, Ext. 300.
(In Illinois call 1-800-942-8881, Ext. 300.)
Or Write Canon U.S.A., Inc.,
Printer Division, P.O. Box CN 11250,
Trenton, N.J. 08638.

© 1984 Canon U.S.A., Inc.

CIRCLE NO. 109 ON INQUIRY CARD

Canon Printer Division

'PAINTING' A FORM FOR END USERS

CLIENT PROFILE

Last Name	[XXXXXXXXXXXXXXXXXXXXX]	Current Salary	[ZZ.ZZ9.99]
First Name	[XXXXXXXXXXXXXXXXXXXXX]	Previous Salary	[ZZ.ZZ9.99]
Middle Initial	[X]	Required Salary	[ZZ.ZZ9.99]

Address	[XXXXXXXXXXXXXXXXXXXXX]
City	[XXXXXXXXXXXXXXXXXXXXX]
State	[XXXXXXXXXXXXXXXXXXXXX]
Zip	[XXXXXXXXXX]

Telephone:

HOME (999) 999-XXXX	Work (999) 999-XXXX
---------------------	---------------------

Speeding the creation of interactive screen-handling programs, the FORMS-2 VISUAL PROGRAMMING tool enables a COBOL program developer to "paint" a form directly on the screen exactly as it will appear to the end user. After the variable data in the screen shown left is defined (represented, for example, by Xs, Zs or numbers within the brackets), the package automatically generates the source code necessary to implement the final screen display.

can handle 60K bytes of data in memory.

Typical data-processing applications in business and government require a programming language that can organize, handle and manipulate large amounts of data. Business programmers rarely need complex mathematical and scientific capabilities. Instead, they need access to facilities that permit them to perform basic arithmetic operations and produce reports and printouts easily and efficiently.

COBOL offers strengths in these areas. Approximately half the language is dedicated to file-handling capabilities, and a sort module permits the reorganization of data files according to complex user-defined parameters. Other languages require programmers to write additional lines of code to accomplish similar tasks.

COBOL versus the alternatives

New software alternatives, such as fourth-generation languages, are not compatible with the \$100 billion, worldwide established base of COBOL applications and lack the flexibility of high-level programming languages. COBOL has maintained standardization and compatibility with its installed base.

In comparing COBOL with C, PL/I, and other popular languages, system integrators and programmers should consider the extent of standardization along with software investment and optimal design for business-application development.

C, for example, is a system implementation language useful for writing operating systems, other languages, database-management systems and word-processing

packages. It provides powerful assembly code-like capabilities and offers portability among many architectures.

COBOL and C are complementary languages. LEVEL II COBOL, for instance, contains a run-time support package written in C that allows it to operate on UNIX-based systems. As an application program-

LEVEL II COBOL combines features of mainframe COBOL with interactive extensions to take full advantage of microprocessor-based development workstations.

ming language, however, C lacks the strengths of COBOL for file handling. Moreover, no large scale investment in C applications exists.

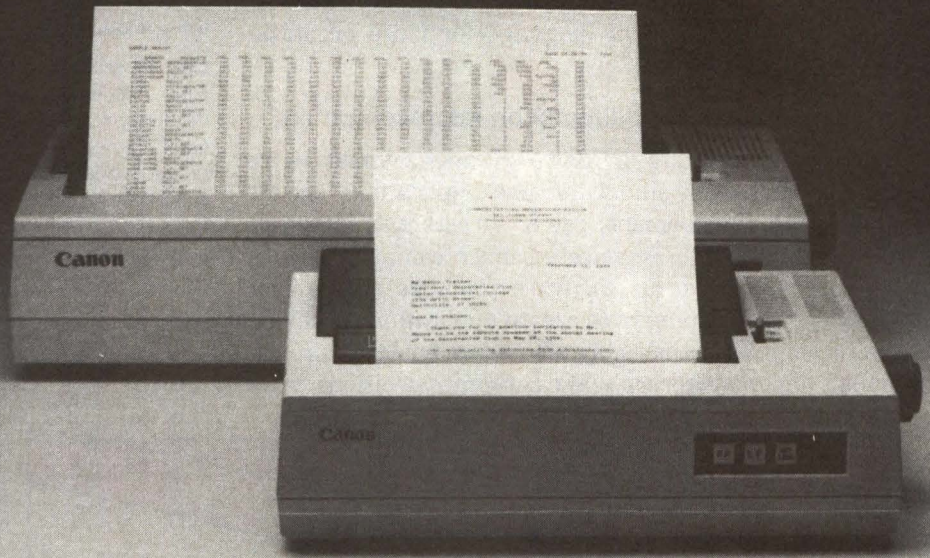
PL/I, developed by IBM Corp. as an application programming language for mainframes, is essentially a combination of COBOL and FORTRAN. Many companies have an investment in the language, and PL/I possesses strengths similar to COBOL for file handling. However, it lacks an associated set of comparable programming tools that allow programmers to interact with an executing program at the source code level and perform "what-if" analysis—valuable facilities for program development and maintenance.

An excellent systems implementation language, Pascal also suits writing word-processing packages and

FOR

**Now you don't have
to sacrifice print
quality for speed.**

The Canon® Impact Matrix Series Printers.



High speed and high quality in one functional, compact unit. That's what Canon's Impact Matrix Printers offer you.

They print hard copy at a rapid 160 characters per second. While in the double pass mode you get an impressive, high-density 23 X18 dot matrix that gives near letter quality printing suitable for word processing.

Canon's unique technology has also dramatically reduced bothersome clatter down to a muted noise level of less than 60dB. Even at high speed.

And that, unlike many other impact matrix printers, makes them a pleasure to work with.

Plus there's limitless flexibility with the optional down-loading function that lets you print

whatever character fonts your host computer can create. As well as a choice of four different character styles (all printable on the same line) that you can enlarge or condense.

The Impact Matrix Series Printers give you a convenient choice of special paper widths—the PW-1080A for 80-character column printout and the PW-1156A for 156-character column.

Exceptional quality and high speed.

The Canon® Impact Matrix Series Printers give you the best of both worlds.

For more information:
Call 1-800-323-1717, Ext. 300.
(In Illinois call 1-800-942-8881, Ext. 300.)
Or Write Canon U.S.A., Inc.,
Printer Division, P.O. Box CN 11250,
Trenton, N.J. 08638.

© 1984 Canon U.S.A., Inc.

Canon Printer Division

CIRCLE NO. 110 ON INQUIRY CARD

similar applications. But it was developed to help college students learn how to use computers, and lacks COBOL's facilities for manipulating data and handling files in an elegant manner. In addition, Pascal does not represent as large a mainframe-based application software investment as COBOL.

BASIC was developed at Dartmouth College as a beginner's instructional language. It was not designed specifically as a data-processing tool, although it is a useful language for personal computers. Furthermore, BASIC's lack of standardization and sophistication generally prevent its consideration as a serious business-application development language for large organizations.

Implement decisions directly on microcomputers

In short, running COBOL on microcomputers to develop and maintain mainframe applications speeds application development, reduces costs and increases the capabilities of connected microcomputers with added capabilities. As software products evolve that allow non-programmers to create applications easily on microcomputers, they may also allow business professionals and managers to make corporate decisions with-

out interfacing directly with the corporate mainframe.

Today, when a manager in a large company decides to implement a complex procedure, usually more than two years pass before the DP department can complete the application. Using COBOL on both microcomputers and mainframes allows non-programmers to design an application based on collected data using standard COBOL procedures. Users can then transmit the program to the DP department for integration into the corporate management information system, freeing DP professionals to perform other tasks. □

Dan Fineberg, business unit manager at Micro Focus Inc., Palo Alto, Calif., controls the company's joint marketing and development efforts with Digital Research Inc., Pacific Grove, Calif. Previously, he headed Micro Focus's marketing communication operation and was an account manager at Franson & Associates. He holds a master of management degree from the George Atkinson Graduate School of Management, Willamette University.

Interest Quotient (Circle One)
High 828 Medium 829 Low 830

IF POWER FAILS, DATASAV[®] TAKES OVER!

PROTECTION - saves data during power failures.
- saves hardware from overvoltage transients.

PORTABILITY - allows mobile or extended holdup time using auxiliary 12 volt battery.

FEATURES - internal battery provides 5 min. + operating time - AC line conditioning
- audible and visual alarms, interrupt signal - compact, desktop styling
- no installation required.

200 WATT - \$495 / 90 WATT - \$350
For special applications and product information, call 805-541-4160.

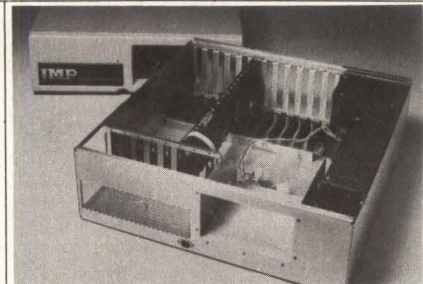
Instant power order line
805-541-4161

CUESTA SYSTEMS, INC.
3440 Roberto Court, San Luis Obispo, California 93401

INSTANT AC POWER



CIRCLE NO. 111 ON INQUIRY CARD



ROLL YOUR OWN PC OR XT CLONE FOR JUST \$662

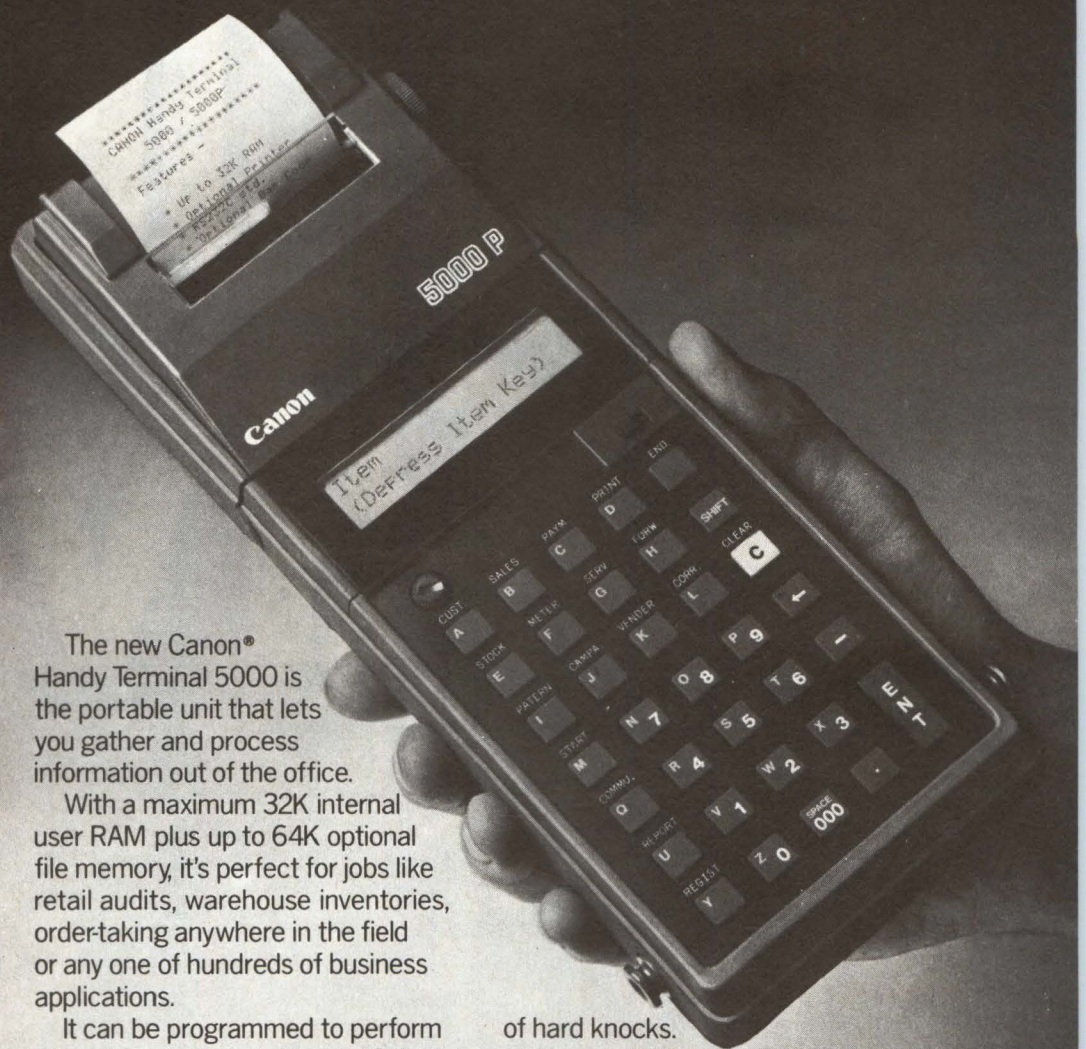
STARTER SYSTEM INCLUDES CHASSIS, COVER, 12-SLOT BACKPLANE, 125W POWER SUPPLY, 8088 CPU CARD; IN QUANTITIES OF 1000.

- 18-SLOT OPTION
- 100% SOFT/HARDWARE COMPATIBLE
- SELECT FROM INDUSTRY OR OUR ADD-ON CARDS INCLUDING: RAM, COMBI, COMBIRAM, FDC, QUAD232, DIGITAL I/O, ROM SIMULATOR
- LICENSING; PRIVATE LABELING
- IN STOCK FOR IMMEDIATE DELIVERY

Electro Design, Inc.

690 Rancheros Drive
San Marcos, CA 92069 (619) 471-0680
CIRCLE NO. 112 ON INQUIRY CARD

The new Canon[®] Handy Terminal makes any computer system go farther.



The new Canon[®] Handy Terminal 5000 is the portable unit that lets you gather and process information out of the office.

With a maximum 32K internal user RAM plus up to 64K optional file memory, it's perfect for jobs like retail audits, warehouse inventories, order-taking anywhere in the field or any one of hundreds of business applications.

It can be programmed to perform almost any task, adopting BASIC and Assembler languages.

And can even relay information to your computer via phone hookup.

Portability is also the key word of the 5000, because Canon's Handy Terminal was especially designed for traveling light.

At a weight of less than 2 lbs., it can operate on a rechargeable battery and can be carried by neck strap or in an attache case. Yet it's highly durable, water resistant and shock resistant. Which means it can take its fair share

of hard knocks.

Also available is the 5000P (shown above) which has a built-in thermal dot printer that can print one original and a copy.

And both terminals can incorporate an optional bar code reader.

So why not widen your computer horizons with Canon's new Handy Terminal. It lets you go as far as you like.

For more information:
Call 1-800-323-1717, Ext. 302.
(In Illinois call 1-800-942-8881, Ext. 302.)
Or Write Canon U.S.A., Inc.,
Systems Division/Handy Terminal,
P.O. Box CN 11250, Trenton, N.J. 08638.

Canon Systems Division

CIRCLE NO. 113 ON INQUIRY CARD

© 1984 Canon U.S.A., Inc.

Start/Stop And Stream.

INTRODUCING

DOUBLE DRIVE™



Series 50 Drive. High Performance. High Capacity.

If you've been pondering whether you need a streaming tape drive to back up your Winchester, or a start/stop tape drive, or maybe both, we have good news. You no longer have to decide.

Because now there's a drive with the capabilities of both. Rosscomp's Double Drive.

It saves you the agony of decision. And an incredible amount of money at the same time.

There Are Two Sides To Our Story

When our engineers set out to design the Double Drive, they too had a decision to make. Quarter-inch tape? Or half-inch tape? But then they found that, even by pushing quarter-inch technology to its absolute limit, they wouldn't be able to give us the capabilities we wanted.

So half-inch became the only choice. That also meant they could assure us of something else we demanded. Reliability. For instance, they could design-in the industry's highest quality read/write half-inch heads. Meanwhile, they could make the system stream at unbeatable speeds.

And do practically everything a large start/stop machine can do for a fraction of the cost.

Side One

One of the fruits of their labors is, you get a Winchester backup that does something no other can. It scoops 190 MBytes of data onto standard half-inch tape that's housed on our Back-Pac™ four inch self-threading reel. (Which costs less than a cartridge.)

That translates into the lowest cost per byte of any tape drive, anywhere.

And it streams at a blazing 90 ips standard.

In fact, the Double Drive's electronic speed and capacity are matched by only one thing we know of. Its mechanical reliability.

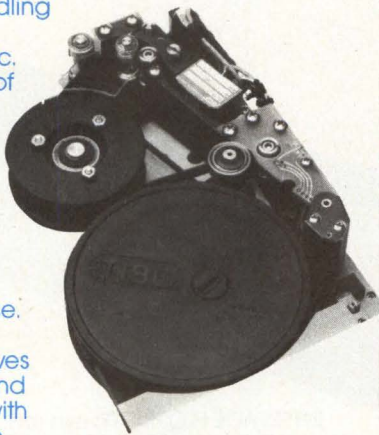
That comes from its having dependable tape-handling method yet devised.

Threading is automatic. The tape travels a path of proven design, kept on course by both spring-loaded and ball-bearing guides.



Spring loaded and ball bearing tape guides.

Tension control is equally precise. A single capstan motor drives both supply and takeup reels with one belt, while an advanced controlling device main-



Simple, dependable automatic tape threading.

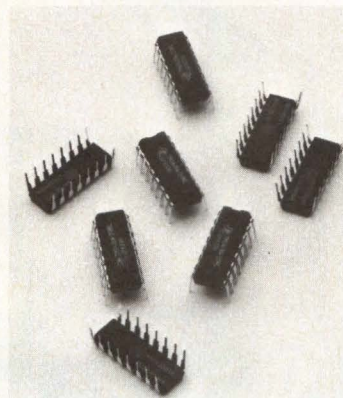
tains identical tension between them. So you experience very little ISV. As well as lower power dissipation. The motor uses less than 15W.



Single capstan motor.

The Back-Pac™ self-threading reel stores 190 MB on 1/2" tape. Costs less than 1/4" cartridges.

Side Two



64 KB cache memory in its interface makes it look like a start/stop drive.

For your selective file-search and backup jobs, the Double Drive acts as a start/stop unit. Because it has 64 KBytes of cache memory right in its interface.

That means no time loss. An optimized I/O. And apparent real-time operation for every user.

Plus more efficient use of your tape, covering a full 95% of it.

Online, it gives ample secondary storage for files during

restructuring and in hierarchical memory management schemes.

Now, if the Double Drive sounds like it might be just what you need, here's more good news. It will fit your system.

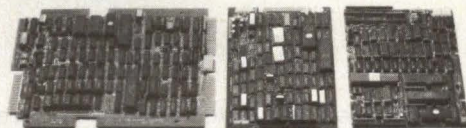
Or rather, one of our Double Drives will. Our Series 80 fits an 8" envelope, our Series 50 a 5 1/4" envelope.

They'll each hold 190 MBytes of data, stored on 24 serpentine tracks.

Both are available with standard industry interfaces. So one of them is right for you.

Which means there's no painful decision to make. Just put the Double Drive to work. Doing double duty.

Series 80 to right. Series 50 below.



Available formatters include QIC-02, SCSI and 9-track.

NASDAQ-RCOM

1695 MacArthur Blvd., Costa Mesa, California 92626 · Call (714) 540-9393

ROSSCOMP®

The way with tape.

WREN—SUPER-PERFORMING 5¼" WINCHESTERS IN 21 TO 86 MEGABYTE CAPACITIES.



**TOLL FREE
HOTLINE**
1-800-828-8000
EXT. 82
IN MINNESOTA
(612) 921-4400

HEADS never land on data areas. All WREN drives use a dedicated media zone for head take-off and landing. Even in the event of a total power loss to the system, the actuator will return the heads to the dedicated landing zone.

ROTARY VOICE COIL ACTUATOR provides 40 millisecond typical average access for the 21 and 36 MB capacities and a 30 millisecond average typically for the 48, 67 and 86 MB models (includes head settling).

DEDICATED CLOSE-LOOP SERVO SYSTEM for added positioning accuracy and maximum system performance.

INTERFACE FLEXIBILITY: Two industry standard interfaces ST506/412 and Enhanced Small Device Interface (ESDI). The ST506/412 interface is available in all capacity versions up to 86 MB. The ESDI is available in the 48, 67 and 86 MB models.

T H E W R E N™

High Technology from Control Data delivers a 5-1/4" Winchester with truly outstanding performance and reliability. Compare for yourself. Call our Information Hotline 1-800-828-8001 or write OEM Product Marketing, HQN08H, Control Data Corporation, P.O. Box 0, Minneapolis, MN 55440. Also available through your Arrow or Kierulff distributor.



CD CONTROL DATA

Versatile OEM module combines laser printing, image scanning and copying functions

Easily integrated into office automation systems, the M3071 uses a semiconductor diode laser, a CCD scanning system and halogen-lamp electrophotography to perform a host of office applications

Mark R. Bond, Fujitsu America Inc.

Today's automated offices contain a variety of one-function business machines lined up side by side. Such machines—printers, plotters, facsimile machines, optical character recognition readers and copiers—perform their functions well enough, but unifunctional office machines cannot match the efficiency of an integrated automated environment. Furthermore, they are expensive and take up valuable office space. Each unifunctional office system has its own set of host-computer interfacing rules, drivers, software-control codes, repair subassemblies and replacement parts.

Fujitsu America's M3071 integrated-printer module addresses these problems by combining printing, copying, image scanning and optical image overlay functions in one multifunctional machine that can serve a wide variety of automated-office applications.

The M3071 module performs high-resolution laser printing, halogen-lamp copying, digitized image scanning using a charge-coupled device (CCD) and optical image overlay combining printing and copying. Because system integrators add external controllers, the machine easily interfaces with end users' systems or machines to accommodate a variety of specialized applications, including optical character recognition (OCR) and the intelligent facsimile transfer of text and graphics. The M3071 prints 20 pages per minute (ppm) with a resolution of 240 dots per inch (dpi), and 16 ppm with 300 dpi resolution for business, scientific or word-processing printing applications.

Three technologies are combined in the M3071: a low-cost semiconductor laser, a compact electrophotographic copier and the CCD scanning system.



Exterior view of M3071 shows 250-sheet paper cassettes. The machine prints at 20 pages per minute with a resolution of 240 dots per inch.

Semiconductor lasers reduce cost of laser printers

Semiconductor diode lasers form the heart of the new generation of inexpensive laser printer modules. Compact and reliable, they are less expensive and have lower power and voltage requirements than gas lasers. A drive current that can be changed very rapidly to pulse on and off produces the semiconductor laser's light beam. In contrast, gas lasers use expensive and space-consuming external modulators rapidly blocking or deflecting the light beam.

Laser printing, (laser electrophotography), is performed by scanning a charged, revolving photoconductive drum with a narrowly focused light beam, modulated by video signals, that disperses the charge. The areas not exposed to the beam are left charged and attract oppositely charged toner that is transferred to the copy paper. Because laser printing uses some of the same components as photocopying, the M3071 module can combine printing and copying functions. Merging of these functions is cost-effective and efficient and permits additional office applications such as overlaying photocopied images with laser-printed data.

When comparing and evaluating different print technologies, OEMs and system integrators should consider several factors including print speed, resolution, diversity of applications and versatility. The use of semiconductor or gas laser systems, band, dot-matrix and ink-jet printers entails tradeoffs for certain applications.

Three principal factors, for example, determine laser printing speed: how fast the light beam turns on and off, print resolution measured in dpi and the drum's photoconductive sensitivity to laser wavelengths. The M3071's 4-mW laser pulses at 280 nsec for 240 dpi resolution. For 300-dpi resolution, it pulses at 219 nsec.

The printing speed compares favorably with other competitively priced systems, which operate at eight to 20 ppm.

Higher printing resolutions are available—some desktop laser printers produce 480 dpi—but these machines operate at slower speeds, (requiring twice as many scan lines per inch), and their higher resolution is difficult to perceive when compared with 300-dpi printing. In any case, 480 dpi appears to be the upper limit for laser-printing resolution. Higher resolution systems obey the law of diminishing returns; they do not result in observably better quality, only slower printing speeds.

The scanning mirror and drive-motor assembly provide critical support functions for fast laser printing. The laser beam scans the drum by reflecting off a multi-faceted, circular mirror assembly rotating at a high rpm level. Because each mirror face provides one drum scan, the number of scans per minute equals the number of mirror faces (facets) multiplied by the rpm. Fujitsu's mirror assembly has 10 mirrors and spins at 6,810 rpm.

Drum sensitivity is an extremely important factor affecting laser-printing resolution and speed. The faster the laser is able to switch power on and off, the more

How Fujitsu combines three document reproduction functions

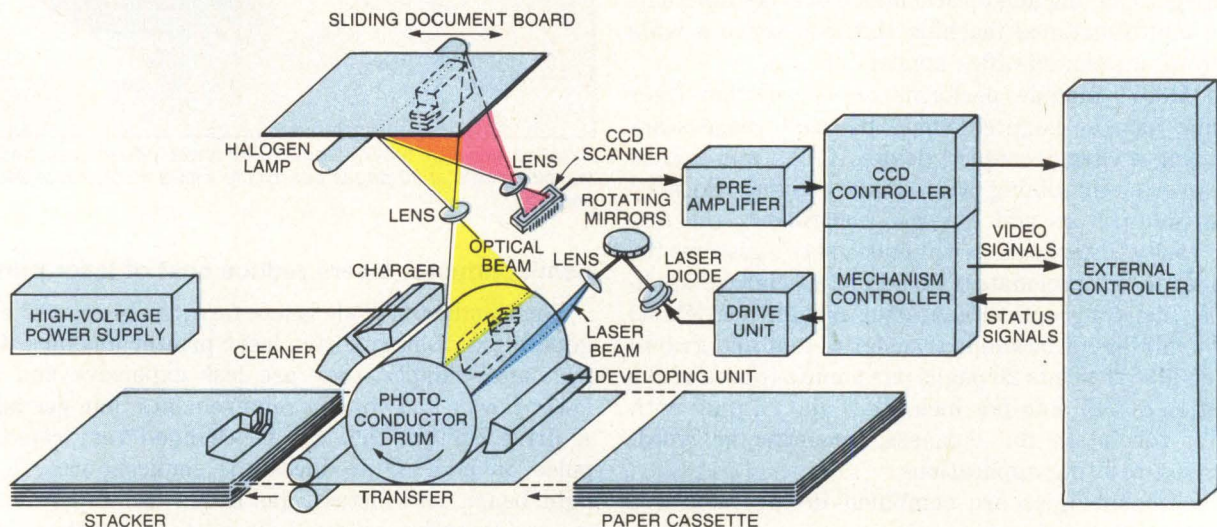
Laser printing and electrophotography functions use the same photoconductor drum.

In laser printing, the laser beam, modulated by video signals from the external controller, generates an image on the drum, which is transferred to paper and fixed by pressure.

The copying process uses a halogen lamp illuminating a document on the document board to produce the image.

For optical image scanning, the charge-coupled device (CCD) generates a digitized video signal from the original document that is sent to the host computer through the CCD and external controllers for further processing.

The copying process uses a halogen lamp illuminating a document on the document board to produce the image.



CalComp introduces the only plotter with .001" resolution, eight pens and 36" wide plots for under **\$8,500.**

The numbers on CalComp's new 1040 Series add up to one great buy. Even better, there are no hidden costs or extras because each 1040 plotter includes a built-in controller interface and host software.

So now every workstation can have its own full-size, full-featured, high-quality plotter.

The 1040 Series has advanced features that make it impressive at any price. For instance, there's a new interchangeable carriage-mounted 8-pen turret that eliminates tedious pen change delays. By using special sensors, it determines pen type, and sets optimal pen force and speed.

User-friendly features such as automatic media loading and sizing allow the user to

IBM and Apple are registered trademarks of, respectively, International Business Machines Corporation and Apple Computer, Inc.



get started quickly, producing A to E size plots. An intelligent control panel has local data manipulation capability and built-in self-diagnostics which further enhance overall productivity.

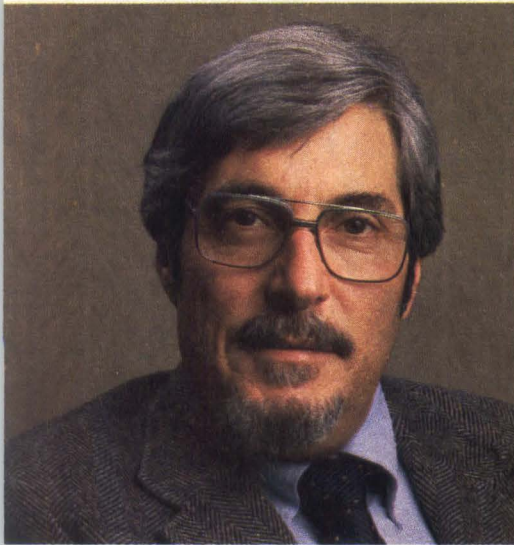
The 1040 Series family includes both cut-sheet operation for more immediate jobs and continuous roll capability for unattended operation. These flexible products are compatible with any CAD system, including those based on IBM® PC and Apple® computers.

Go by the numbers when you select plotters. For details, contact: CalComp, 2411 W. La Palma Ave., P.O. Box 3250, Anaheim, California 92803. Or call toll-free 1-800-CALCOMP, ext. 156.



CALCOMP
A Sanders Company

Choose Precision Visuals graphics software and you're in the best company.



"DI-3000® graphics software will meet the needs of a total enterprise."

Phil Goss
Honeywell

Precision Visuals' graphics software tools are today's standard for over 800 organizations, large and small. Here's why. Graphics programmers are saving hundreds of hours by using the appropriate Precision Visuals software tools for the project. They choose from our integrated family of graphics packages based on the commercially acclaimed DI-3000® subroutine library or the GKS implementation, GK-2000.™ With full support for most computers—IBM, DEC, CDC, PR1ME, Honeywell, Data General, Cray, Apollo, and many UNIX-based systems*—and over 80 popular graphics peripherals, their investment in our software is secure . . . today and tomorrow. Look into Precision Visuals and see why.

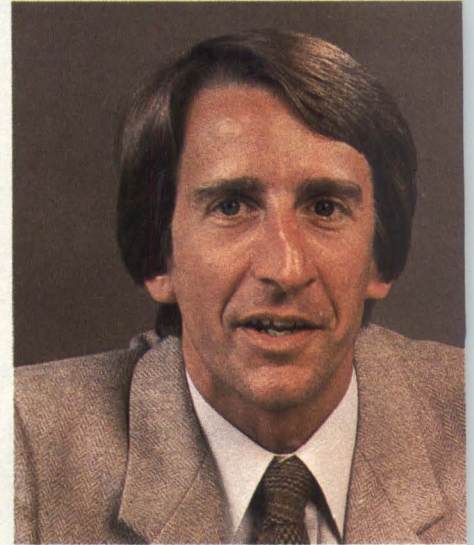


"Precision Visuals' documentation is a model for the industry."

Dr. James D. Foley, President
Computer Graphics Consultants, Inc.

Here's someone who knows how a good manual should look. Dr. Foley, Professor of Electrical Engineering and Computer Science at George Washington University, is co-author of *Fundamentals of Interactive Computer Graphics*. According to Dr. Foley, our DI-3000® manual is "ideal for people with little or no graphics experience." Our example-intensive documentation includes a quick reference guide for the experienced graphics programmer and step-by-step tutorials that quickly turn beginners into productive graphics programmers.

It's not surprising that many customers were sold on our graphics tools just by looking at our documentation. Ask to see a copy for yourself.



"It's not just the package that's important. It's the people behind it."

David Campbell
INCYTE, Fairchild/A Schlumberger Co.

What adds even more value to our versatile graphics tools is the support you get from our people at Precision Visuals. Graphics software specialists staff a Help Line for quick answers to keep you on schedule; national training programs, for the novice to the advanced graphics programmer, help get your applications operating on time and within budget; active international and regional user groups that exchange creative and productive ideas; plus thoroughly tested products and documentation designed to meet your needs today and in the future.

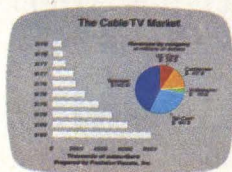
Don't you think it's time to choose Precision Visuals? Call us today at 303/530-9000.



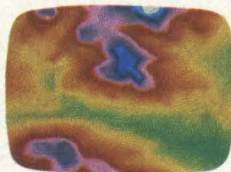
Precision Visuals

6260 Lookout Road / Boulder, Colorado 80301
303/530-9000
TELEX 45-0364 / TWX 910-940-2500

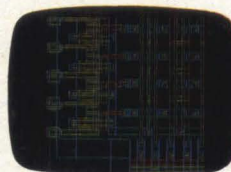
Presentation Graphics



Enhanced Contouring



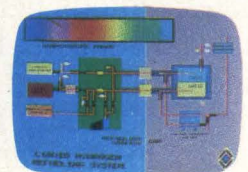
VLSI Design



Solids Modeling



Process Control



*UNIX is a trademark of BELL Laboratories, Inc.

CIRCLE NO. 116 ON INQUIRY CARD

dpi it can produce in a given time period. Unfortunately, a semiconductor laser's low infrared-light wavelength discharges a drum more slowly than high-wavelength blue or red in gas lasers. Using higher-wattage lasers to produce a stronger light output is one method by which manufacturers obtain faster printing speeds—but at accompanying higher costs. Fujitsu's and other semiconductor lasers, however, rely upon a new generation of photoconductive selenium drum coatings highly sensitive to infrared light to overcome the low-wavelength-light sensitivity problem.

Laser printing versus the competition

Operating at 300 to 2,000 lines per minute (lpm), band and drum printers offer the closest competition in price/performance ratios to laser printers. Low-cost laser units provide 500- to 1,300-lpm operation. Line printers perform certain jobs extremely well, such as continuous, unattended printing; printing on multi-part carbon-copy statements, and heavy-duty printing workloads of 200,000 or more sheets. These data-processing office workhorses have their limitations, though. For example, their print-band/fabric-ribbon combination and single font style cannot match the quality and multi-font flexibility of laser printing.

Ink jet printers operate at speeds to 150 characters per second (cps), providing stiff competition for high-end laser systems that operate at 10 ppm or less. Furnishing multi-font printing, long-life components, optional color output and whisper-quiet operations, these units have print quality resembling that of dot-matrix printers. High-quality, expensive smooth bond paper however, is typically required because resolutions of higher than 80 dpi invite ink bleed and print smearing.

Multi-mode dot-matrix printers are among the most versatile devices for office-printing applications. Models with high-resolution graphics, multiple fonts, variable pitch selection and letter-quality or draft-quality printing are available. Dot-matrix systems are less expensive, require less maintenance and are smaller in size than laser systems. They can also print carbon-copy packs—unlike non-contact laser printers—and can handle envelopes and other odd-sized stationery.

Laser technology, however, surpasses dot-matrix technology in general-performance speed and resolution specs. Some of the faster-performing dot-matrix models print at 600 cps (approximately 270 lpm), and several multi-head machines print at a rate of 150 lpm, for data-processing resolution of approximately 72 dpi. Laser printers, though, offer four times the resolution and three to five times the print speed of most dot-matrix units.

Plotting and graphics are also performed extremely



Finely detailed printing is no problem for the M3071 machine, as this example produced with 300-dots-per-inch resolution illustrates. A description of the sights of Paris, it was distributed at the 1984 Hanover Fair.

well by laser technology. Because the laser is already set for high resolution, quality business graphics, bit-mapped graphics and plots do not reduce printing speed. In contrast, pen plotters can spec very fine resolutions of 500 steps per inch and up to infinite resolutions for straight lines and defined geometric shapes, but for specialized plotting applications laser printers have the edge in speed.

Image scanning produces video output

In addition to laser printing, the M3071 module performs image scanning of any hard-copy document placed on its sliding-glass document board. The document is exposed to a halogen lamp, and the reflected light is focused by a lens onto the CCD. The CCD converts the light image into digital form and then into video signal outputs that can be sent through the CCD controller and external controller for further processing. The CCD can detect 16 shades of gray to provide accurate reproductions of the original document.

Two CCD packages are available: 240-dpi resolution (2,048 dots per line) or 300 dpi-resolution (4,096 dots

Go from port to port without ever leaving the terminal.



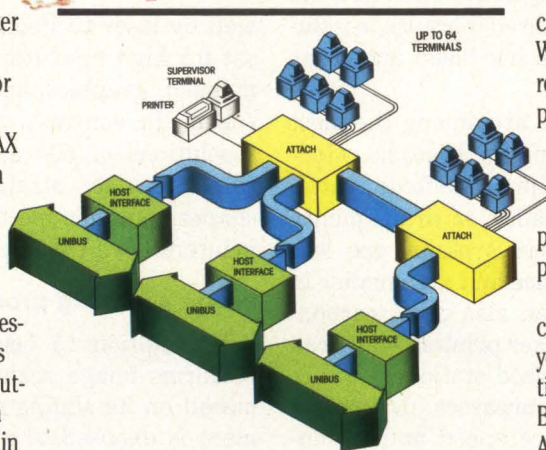
The ATTACH system from ABLE Computer helps the data processing manager avoid a mutiny among users by enhancing processor efficiency. A multi-host terminal network system, ATTACH supports DEC UNIBUS VAX and PDP computers... and with its Softswitch feature that supports port selection, makes for smooth sailing through your network.

Ports-Of-Call, The User's Choice

With ATTACH, users select their network destination. The data processing manager assigns user class definitions for various host computers. Then users can initiate switching between any VAX and PDP-11 UNIBUS computer ports in the system. Access to specific data files and applications in the appropriate host computer is readily available.

Navigate The Network Efficiently

With port selection, users match themselves to the application port required — no



more wasted user time, or wasted support resources. And no host computer is sitting idle while others are overloaded.

Secure A Safe Passage

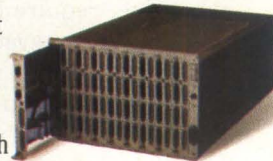
The ATTACH system assures the data pro-

cessing manager of security in the network. With user class definition the supervisor restricts access to any specified host computer, set of computers or subset — this safeguards critical data files. Plus, with

ATTACH, the supervisor is free to allocate a particular host computer to high priority users who demand instant access and processing time.

Chart the right course through your communications network. Book passage with ABLE's ATTACH.

Contact an ABLE representative near you, or call us toll free at 800-332-2253.



**ABLE
COMPUTER**

The Communications Specialists

ABLE Computer, 3080 Airway Avenue, Costa Mesa, California 92626. In the Costa Mesa area: (714) 979-7030. Or, TWX: 910-595-1729.

ATTACH is Patent Pending. DEC, PDP, UNIBUS and VAX are trademarks of Digital Equipment Corporation.

CIRCLE NO. 117 ON INQUIRY CARD

per line). The higher resolution module can actually produce 480-dpi output, but output bits are masked off to conform to the laser printer's 300-dpi resolution. The CCD system takes six seconds to scan documents up to 8½ by 14 inches. System integrators can loop a CCD-scanned image into the M3071 laser from the external controller's RAM memory, overlaying logos, signatures and photographs on data sent from the host computer. Overlaying a negative image-scanned master form in this manner, with print data sent from the host system, means that computer end users no longer have to store pre-printed forms.

Communications facilities can turn the printer module into an intelligent facsimile machine. System integrators can buffer the scanned image on-board (1M byte of RAM memory is required for full-page storage) or send the image to the host computer for buffering. With pattern-recognition logic, the M3071 can perform optical character reading or image reading for many different applications.

Optical overlay merges copied, computer images

Optical image overlay can also combine images generated by M3071's laser system with those produced by halogen lamp copying. Like image scanning, this process reduces the cost of business forms by merging a copied master form with data transferred from the host computer system. Other applications include merging drawings, business graphs and logos with word-processed text.

Although halogen lamp electrophotography is a well-known technology, the M3071 incorporates several unique features into its photocopier module to improve the quality of a copied or printed image and to provide longer maintenance-free performance.

Like other photocopier systems, Fujitsu's uses a 5-step process that charges a photoconductive drum, images it with a light source (a halogen lamp or laser), develops the image with toner, transfers the developed image to a charged sheet of paper, cleans the drum and bonds the toner to the paper. The copier's cleaning and bonding stations, however, are different from most other low-cost copier modules. Cleaning is performed in three stages to remove any toner on the drum not transferred to the paper. First, a fluorescent lamp discharges the drum's surface so that the toner is no longer attracted to it. Next, a magnetic roller brush attracts the loose toner particles, dropping them into a throw-away receptacle. Finally, a soft sponge roller wipes the drum surface clean of any remaining particles.

Most copiers use hot roll fusing to bond toner with paper. In this process, toner is melted under high temperature (375°F) and fused under light pressure. A

Spec summary

- **Manufacturer:** Fujitsu America Inc., 3055 Orchid Drive, San Jose Calif. 95134.
- **Product:** M3071 integrated printer module
- **Dimensions:** 17.6 by 48.6 by 22.1 inches with paper stacker and cassettes

Laser printing

- **Technology:** laser diode and electrophotography
- **Resolution:** 240 dots per inch (dpi), vertical and horizontal, with 280 nsec per dot video-signal input, or 300 dpi
- **Print speed:** faster than 20 pages per minute (ppm), with 240-dpi resolution and letter-size paper
- **Paper size:** letter and legal plus B4, A4, B5, A5

Copying

- **Technology:** halogen-lamp optics system and electrophotography
- **Copy speed:** faster than 12 ppm with letter-size paper

Image scanning

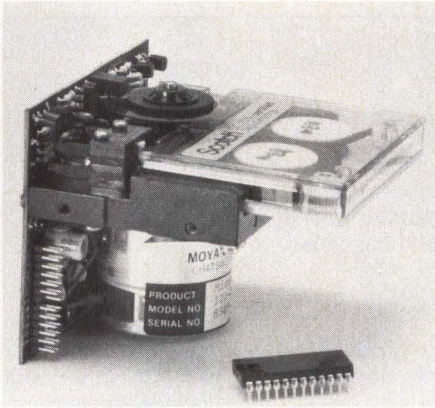
- **Technology:** flat-bed scanning by charge-coupled device
- **Scanning density:** 240 dpi, vertical and horizontal, or 300 dpi
- **Scanning speed:** less than 6 seconds per sheet
- **Interfaces:** printer, TTL 3.6M-bps serial video; image scanner, TTL serial video
- **Noise:** less than 60 dB
- **Price:** \$7,760 (OEM quantity) for M3071 module with copier and scanner options; \$8,285 (OEM quantity) for M3072 desktop printer with controller and power supply

newer technique, and one used by the M3071, employs cold press rolling that bonds the toner to the paper under relatively high pressure. Critics of cold pressing charge that it cannot achieve the quality of hot fusing. Fujitsu has overcome the quality problem through the development of a proprietary toner.

Cold pressing, in addition, offers certain distinct advantages over hot fusing. Because copiers using this technique are not subject to the accelerated wear and tear caused by high levels of heat, they will probably have fewer repair bills and maintenance problems. Cold press rolling also has faster initial start-up time. Copying is performed at the rate of 12 ppm with the first copy available in less than 17 seconds.

The M3071 module is available as a laser printer engine without copier and image-scanning components or as a desktop printer—the M3072—with controller and power supply. It operates at 16 ppm with 300 dpi

TAPE?



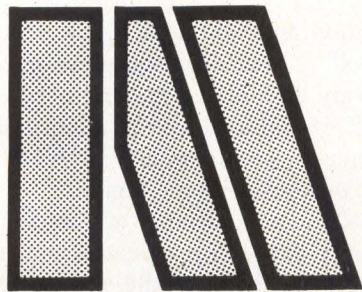
MicroDrive™/OEM

- Mechanism Only

- controller

- Minimum Electronics

- servo/data
- serdes
- processor



Moya Corporation

9001 Oso Avenue, Unit B
Chatsworth, Ca. 91311
(818) 700-1200

CIRCLE NO. 118 ON INQUIRY CARD

OFFICE PRODUCTS

resolution. Four plug-in cartridge slots accept ROM cartridges for font selection and/or RAM cartridges for downloadable character sets, data buffers, large-scale graphics and electronic forms image-overlay applications. A 256K-byte cartridge provides nearly 4 inches by 4 inches of large-scale graphics. An electronic forms feature overlays format data held in a forms overlay buffer with print data sent from the host computer. □

Mark R. Bond, is senior product engineer, peripheral products group, at Fujitsu America Inc., San Jose, Calif. He came to Fujitsu after 13½ years at Mannesmann-Tally Corp., Kent, Wash., where he was supervisor of field services, Western region.

Interest Quotient (Circle One)
High 831 Medium 832 Low 833

NEXT MONTH IN MMS

The November issue of Mini-Micro Systems focuses on terminals. MMS will present an overview on alphanumeric terminals, the key products and expected market trends.

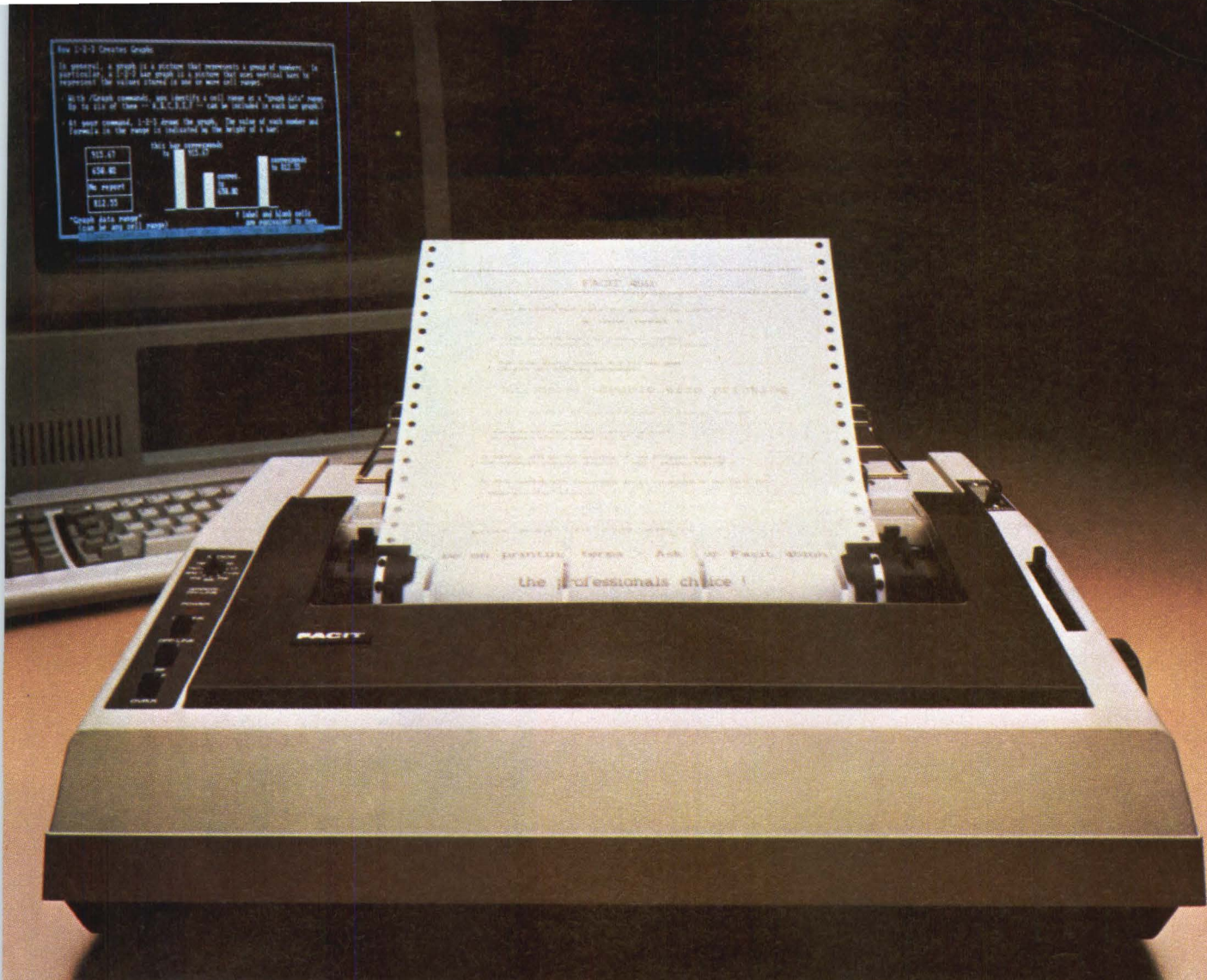
In a comprehensive software profile, MMS studies terminal emulation and control software. Through the use of this type of software, display terminals can emulate the features and performance of other, often superior terminals at a much lower cost. MMS will examine networking opportunities and software compatibility advantages of various product offerings.

The Integrator section of Mini-Micro Systems will profile a computer-aided publishing system that allows professional quality typesetting, graphic arts and paste-up to be achieved in house. The system integrates a 32-bit microcomputer with high-resolution graphics, multiple-font text-processing and business-graphics software.

Be sure to watch for your issue of Mini-Micro Systems' next Fall Peripherals Digest, coming November 15. This comprehensive reference guide will cover the following topics:

- disk drives (up to 5¼-inch)
- disk subsystems
- cartridge tape drives (up to ¼-inch)
- alphanumeric terminals
- serial printers

A directory of manufacturers will also be included.



YOUR IBM PC PERSONAL PRINTERS

What your IBM Personal Computer* commands, the new Facit 4511 and Facit 4512 Serial Matrix Printers will reproduce in quality letters and graphics.

All perfect, at a speed of 160 CPS. Twice as fast as the IBM PC printers.

The combination of high throughput with Facit quality and reliability in printing performance keep pace with professional PC developments.

Your printout possibilities are completed by:

- printing in 9×9 matrix
- 10 or 17 pitch printing
- fan-fold tractor feed, single sheet with friction feed
- 80 or 132 column paper width (4511 or 4512 versions)

Take pride in your printouts with Facit 4511 and Facit 4512.

At a price every PC-owner can afford.

*IBM PC is a trademark of International Business Machines Corporation.

FACIT

Head Office: P.O. Box 54, S-17222 Sundbyberg, Sweden. Phone: (8)282720.
 USA: Nine Executive Park Drive, P.O. Box 334, MERRIMACK, NH 03054.
 Phone: (603)424-8000.

CIRCLE NO. 119 ON INQUIRY CARD

EMULEX IMPROVES AND TAPE BACKUP BY

Emulex sets the pace with three great storage subsystems for the full range of DEC QBus and Unibus systems. Whether you need Winchester disk, cartridge disk, 1/4" streaming tape, or a combination unit, you'll be a step ahead with Emulex.

INTRODUCING VAULT.™

Emulex rises above the competition with the Vault.™ This 70-MByte tape subsystem is built around the CDC Sentinel 1/4" cartridge tape streamer and uses Emulex's own TC05 (QBus) or TC15 (Unibus) tape coupler to interface with your system. The Vault is totally software transparent to standard TS11 software. So this compact tape unit looks just like a big 1/2" TS11 subsystem to your operating system and diagnostics.

Vault comes complete with power supply in a single compact cabinet. It's the perfect backup unit for smaller QBus systems such as the MICRO/PDP-11 and MICRO/VAX.

PRESENTING SABRE.™

SABRE™ is a sharp solution for LSI users who need more storage and backup. It packs 31.2 MBytes of main storage onto a 5 1/4" Winchester and 10.4 MBytes of backup onto a removable 8" cartridge disk.



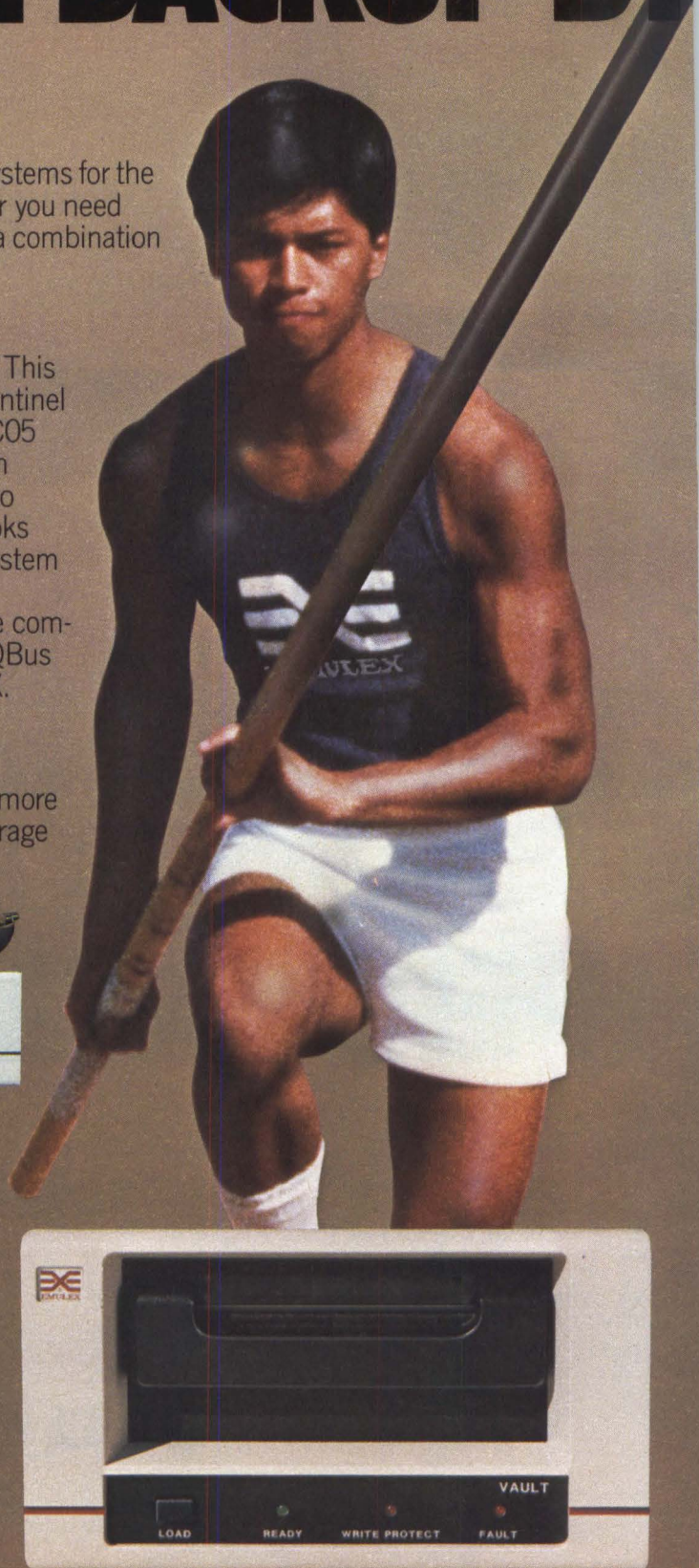
And since SABRE is an exact RLO2 emulation, all existing operating and diagnostic software can be used as is.

SABRE is 5 1/4" high and slips into any 19" RETMA enclosure. A desktop version is also available. Both come complete with power supply, host adapter and connecting cables.

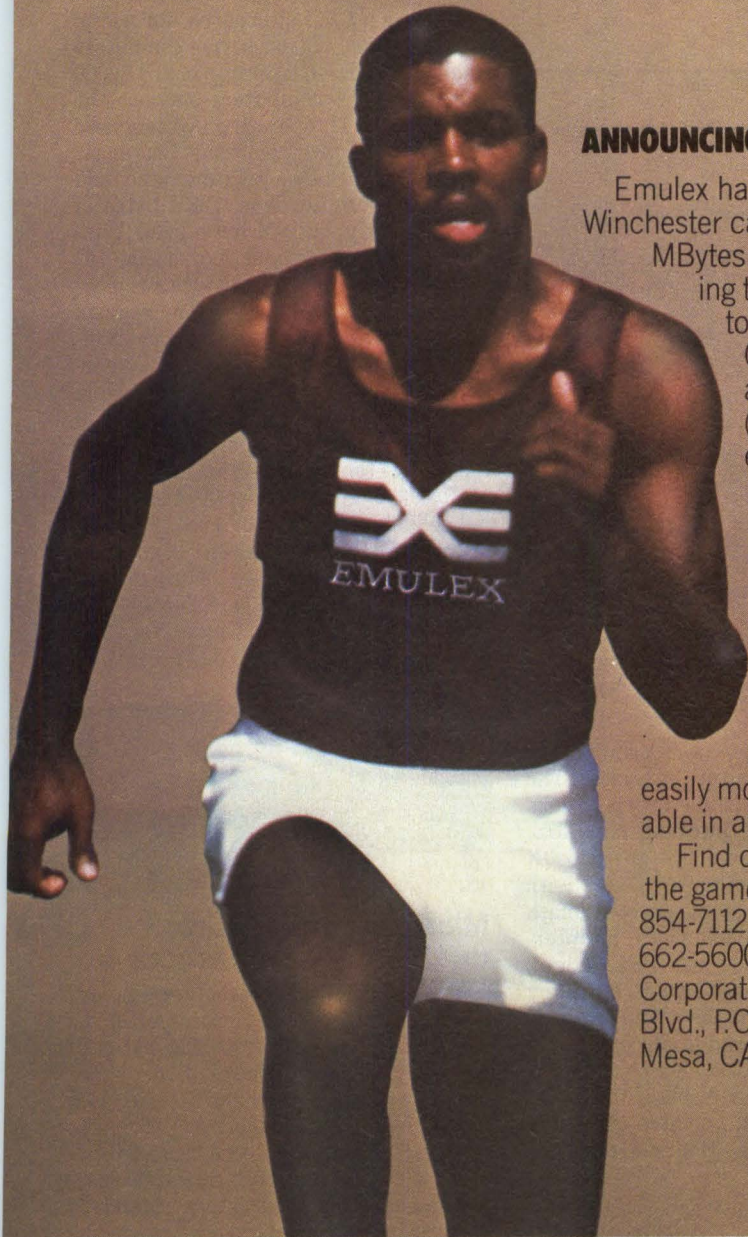
SABRE needs only one-eighth the space and one-quarter the power of four RLO2s. And it eliminates the need for a separate system bootstrap, bus terminator and clock control board.

*DEC, QBus, Unibus, TS11, MICRO/PDP-11, MICRO/VAX, LSI and RLO2 are trademarks of Digital Equipment Corporation. CDC and Sentinel are trademarks of Control Data Corporation.

GSA Contract # GS00K840155675



DEC DISK STORAGE LEAPS AND BOUNDS.



ANNOUNCING MEDLEY.™

Emulex has another winning combination with the Medley™ Winchester cartridge tape subsystem. It gives you either 35 or 110 MBytes of formatted storage and up to 70 MBytes of streaming tape backup. The Medley is fully software transparent to the operating system and diagnostic software of QBus and Unibus CPUs. And it uses the powerful and versatile Small Computer System Interface (SCSI) which keeps your options open for peripheral expansion.

Medley is interfaced to the system with a TC05/TC15 tape coupler and a UC02 (QBus) or UC12 (Unibus) host adapter. By using the Mass Storage Control Protocol (MSCP), the UC02 and UC12 allow the operating system to utilize the precise characteristics of the Winchester disk drive without patches or modifications to the operating system.

For convenience, Medley's disk drive, tape drive and power supply all fit into an attractive cabinet that easily mounts in a standard 19" rack. The Medley is also available in an attractive desktop version.

Find out how Emulex subsystems can keep you ahead of the game. Call toll-free (800) 854-7112. In California (714) 662-5600. Or write Emulex Corporation, 3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, CA 92626.



The genuine alternative.

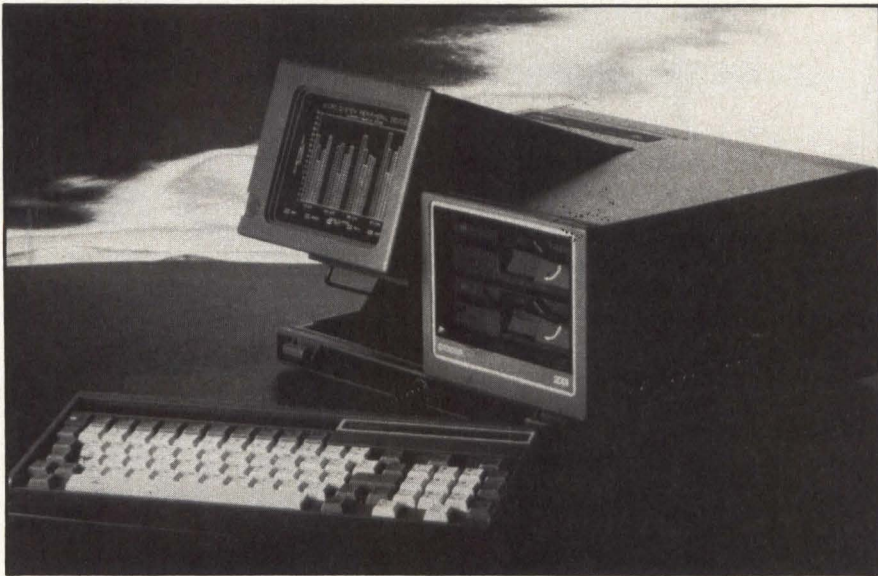
CIRCLE NO. 120 ON INQUIRY CARD



New Products

SYSTEMS

Portable computer converts to desktop workstation



The Otrona 2001 portable computer features an adjustable CRT and a detached, low-profile keyboard. All interfaces for peripheral devices are accessed and located on the unit's right side.

The Otrona 2001 portable computer weighs 19 pounds, measures 7 by 15 by 14 inches, and is said to be 100 percent IBM PC compatible. IBM PC software such as Lotus 1-2-3, Word, Multiplan and Flight Simulator can be used right off the shelf. Its expansion chassis accepts as many as three IBM PC-compatible expansion boards. The system recognizes both IBM PC and 96-tpi diskette formats. Its screen has the same resolution (640 by 200) as the IBM PC's, an IBM-style character set and an 80-column-by-25-line mode.

Priced at \$2,495, the standard configuration includes an 8088 microprocessor; 128K bytes of RAM; a 7-inch, adjustable amber display screen; one 5¼-inch, 360K-byte floppy disk drive; one RS232

port; one parallel port and a composite/RGB external monitor interface. The computer can be expanded with options such as a 10M-byte internal, rigid-disk drive, additional memory (up to 640K bytes), a Z80B microprocessor with CP/M operating system, an 8087 math coprocessor, a real-time clock, an internal 300- to 1,200-baud auto-dial modem, a high-resolution graphics board (640 by 400), additional I/O ports and internal DC power. With the additions of a printer or a plotter and a 13-inch color or 12-inch monochrome display, the product converts from a portable computer to a desktop workstation. **Otrona Advanced Systems Corp.**, 4725 Walnut St., Boulder, Colo. 80301, (303) 444-8100. **Circle No 300**

Computer features 8-inch Winchesters

The Universe 68/137 computer system incorporates 8-inch Winchester disk drives with 120M bytes of formatted capacity. The system is available with 512K bytes of parity-checking memory for \$26,900 or with 1M byte of error-checking and -correcting memory for

\$29,650. Both systems include a 45M-byte cartridge-tape drive, four DMA-controlled serial ports and a 12.5-MHz 68000 microprocessor. The proprietary real-time operating system, UNOS, or UNIX/System V, supports the Universe systems. **Charles River Data Systems Inc.**, 983 Concord St., Framingham, Mass. 01701, (617) 626-1000.

Circle No 301

68000-based computer uses FORTH

Offering a CPU alternative for use in Q-bus systems, Quest series computers employ the SBP-68Q single-board 68000 processor. The computers support the polyFORTH II operating system and the FORTH programming language. The series includes rack-mounted and tabletop configurations, 128K bytes of main memory, a 10M-byte fixed Winchester disk drive and four serial I/O ports. Each computer provides a removable-media storage device for program loading, software transfers and Winchester backup. The rack-mounted version comes with an RL01/02-compatible 5M-byte Iomega removable cartridge disk drive and sells for \$10,960 (10 units). The table-top version comes with an RX02-compatible floppy disk drive and sells for \$10,530 (10 units). **Ranyan Computer Enhancement Systems**, 15239 Springdale St., Huntington Beach, Calif. 92649, (714) 895-5504.

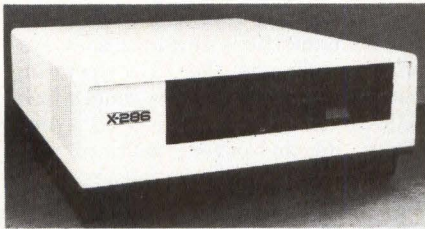
Circle No 302



Microcomputer uses dual 8-bit coprocessors

The MTX 512 microcomputer employs Z80A and 9928 8-bit coprocessors. The standard model features 80K bytes of user RAM, expandable to 512K bytes under program control and includes 16K bytes of dedicated video RAM. The unit offers 16 colors, 40-column text, 256-by-192-dot resolution graphics and 32 user-defined graphics characters. Standard outputs include a Centronics-type printer port, TV and composite video monitor ports, an uncommitted I/O port and a 2,400-baud cassette port. Other features include a real-time clock and a 79-key keyboard with eight function keys and a numeric pad. The machine's 24K-byte ROM contains MTX BASIC, assembler/disassembler and MTX graphics language. Eight independent virtual screens (windows) enable users to define screen sections. Prices start at \$595. **Memotech Corp.**, 99 Cabot St., Needham, Mass. 02194, (303) 449-6614.

Circle No 303



Desktop microcomputer implements XENIX

The X-286 desktop microcomputer implements the XENIX operating system on the 80286 processor. The basic configuration supports five users, expandable to 16. XENIX-286 includes the Bourne and Berkeley shells and enhancements for semaphores and file and record locks. The unit incorporates the iAPX 286 processor, an 80-bit 80287 numeric coprocessor and 512K bytes of error-detecting and -correcting RAM. The disk system includes a pipelined controller, 127M bytes (formatted) of Winchester disk storage, one 5¼-inch, 320K-byte floppy disk drive and a QIC-02 interface. \$17,900. **BDS Inc.**, 1400 Shepard Drive, Sterling, Va. 22170, (703) 430-0800. **Circle No 304**



Portable computers feature 25-line LCD screens

This three-product family of 16-bit portable and transportable personal business computers runs software written for the IBM PC. Features include 25-line LCD screens and a battery-powered, detachable intelligent keyboard with word-processing firmware. The trio uses an 80186 microprocessor with 128K bytes of RAM, and IBM-compatible, 5¼-inch floppy disk drives. All computers have two RS232C ports and a Centronics-type parallel interface. Model 9240, a lap-size, portable unit,

weighs less than 15 pounds, incorporates the 25-line LCD screen and includes one 360K-byte floppy disk drive. Model 9230, a completely transportable system, furnishes the 25-line LCD screen, two 360K-byte floppy disk drives, a built-in 80-column dot-matrix printer and an intelligent keyboard.

Model 9231 is a conventional unit with CRT display and two 360K-byte floppy disk drives. It can be equipped with the intelligent keyboard. Contact the company for prices. Mr. Jack Carroll, **International Quartz Ltd.**, 23505 Crenshaw Blvd., Torrance, Calif. 90505, (213) 539-8944. **Circle No 305**

TEST DRIVES.



Put Applied Data's PT-350 portable floppy drive tester through its paces and you'll find that it's the most thorough and economical drive tester on the market today.

Small, but powerful, the PT-350 offers capabilities comparable to larger systems with a higher sticker price. With a single command, up to 30 successive tests can be initiated and as many as 10 user-defined test strings can be stored in the 2K-bytes of CMOS static RAM with

a battery back-up.

You'll enjoy the easy handling and high performance of the PT-350, which is capable of testing all drives from 3" to 8" and utilizes Dysan's Digital Diagnostics (DDD) for verifying drive alignment.

The PT-350 comes complete with a 40 character/2 line display, carrying handle, storage area for 5 cables with options available for built-in printer and 2 serial ports. No other drive tester offers all these features.

Other products available from ADC: Winchester disk drive tester, diskette duplication equipment, Trans/Media conversion system and media certifier.

Prompt delivery of your new PT-350 if you order today.

ADC APPLIED DATA COMMUNICATIONS

14272 Chambers Rd. • Tustin, CA 92680 • (714) 731-9000

New Products

SYSTEMS

Computer employs iAPX 286 processor

The SuperMicro computer system employs an iAPX 286 applications processor and an iAPX 287 numeric coprocessor. Both processors are interfaced to a multi-channel DMA controller, prioritized interrupt system, real-time clock and as much as 2M bytes of memory. The computer incorporates an internal 500K-byte-per-second peripheral bus that conforms to the Small Computer System Interface (SCSI) standard. Permanent storage consists of one or two 50M-byte 5¼-inch Winchester disk drives backed up by a 45M-byte, ¼-inch streaming-cartridge tape drive. An industry-standard, 5¼-inch floppy disk drive provides program loading capabilities. A wide range of terminals, peripheral devices and communications equipment can be connected to the computer via as many as 16 RS232C ports and an IEEE-488 bus. The system runs Concurrent DOS and UNIX System V. \$15,500. **Rair Microcomputer Corp.**, 4101 Burton Dr., Santa Clara, Calif. 95050, (408) 988-1790. **Circle No 306**

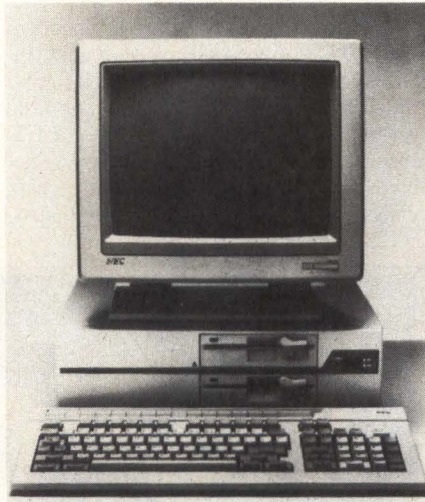
System runs concurrent OSs

The Series 9 multiuser, multiprocessor computer system allows the simultaneous operation of 8- and 16-bit processors and compatibility with five operating systems. The base model accommodates as many as nine application processors and includes 20M bytes of rigid disk storage, 320K bytes of floppy disk storage and a file processor card. Application processors include the model AP/186, an 80186-based card with 256K bytes of RAM, and Z80-based cards. The eight-port Terminal Concentrator Processor connects as many as eight terminals to the computer. Prices start at \$7,995. **Molecular Computer**, 251 River Oaks Parkway, San Jose, Calif. 95134, (408) 262-2122.

Circle No 307

Personal computer runs MS-DOS and UNIX

The Advanced Personal III runs MS-DOS 2.11 and UNIX. It comes with single or dual floppy disk drives (320K bytes each) or with one floppy disk drive and an internal 10M-byte Win-



chester disk drive. All models include an 8-MHz NEC 8086 16-bit microprocessor; 128K bytes of RAM expandable to 640K bytes; 32K bytes of ROM for bootstrapping, diagnostics and ROM BIOS; and 8K bytes of CMOS non-volatile memory. Standard input/output facilities include a Centronics parallel interface and RS232 port providing asynchronous and synchronous communications at speeds as high as 9,600 bps. Monochrome and color (RGB) monitor interfaces are standard. Both monochrome (white/black) and color systems use 14-inch, reduced glare monitors that display 25 lines by 80 columns. Character cells are 8 by 16 pixels. Graphics resolution is 640 by 400 pixels. The unit's IBM Selectric-style keyboard has 12 user-definable function keys that can be used in five modes for a total of 60 definitions. Prices start at \$1,995 for the single floppy drive version and at \$3,995 for the hard disk version. **NEC Information Systems Inc.**, 1414 Massachusetts Ave., Boxborough, Mass. 01719, (617) 264-8000. **Circle No 308**

Minicomputer targets multiple uses

Targeted at engineering, scientific and office-automation applications, the H60 minicomputer operates at 0.85 MIPS in single-precision whetstones and 0.81 MIPS in double-precision whetstones. Packaged in a 30-inch-high cabinet, the system consists of a two-board CPU, a communications controller (expandable to 16 lines), an 8-inch, 80M-byte Winchester disk drive, a 23M-byte,

¼-inch cartridge tape drive, an operator communications terminal as a systems console and the VOS operating system. Main memory size ranges from 768K to 12M bytes. The VOS event-driven, demand-paged, multiprogramming operating system supports multi-stream batch processing, interactive timesharing, database management, remote-job entry, real-time operations and transaction processing. Prices start at \$69,500. **Harris Corp., Computer Systems Division**, 2101 W. Cypress Creek Road, Fort Lauderdale, Fla. 33309, (305) 974-1700.

Circle No 309



MS-DOS portable mixes calculator, modem

Called Pivot, this portable 16-bit computer offers personal computing, a built-in modem, clock, calculator and 5¼-inch floppy disk storage in a nine-pound package. The system comes in three versions, with prices starting at approximately \$2,500. Based on the CMOS 80C86 microprocessor, the computer runs business applications software written under MS-DOS 2.X. Systems contain a parallel port that mimics IBM PC I/O; an RS232C port with programmable baud rates from 300 to 19.2K baud, synchronous or asynchronous; and an RJ11C port to connect the modem to telephone lines. The built-in modem operates at 300 baud under the Bell 102 protocol. Other features include 128K bytes of RAM, 16K bytes of ROM and a full-featured keyboard with 63 programmable keys, 10 membrane function keys and a 22-key calculator overlay. **Morrow Inc.**, 600 McCormick St., San Leandro, Calif. 94577, (415) 430-1970.

Circle No 310



Computer emulates IBM PC

The STM Personal Computer uses Intel's 80186 microprocessor and MS-DOS 2.0. Priced at \$3,449, the portable version weighs less than 17 pounds and includes 256K bytes of dynamic RAM (expandable to 512K bytes); an auto-dial, auto-answer, 300-/1,200-baud, direct-connect modem; speaker phone; a 25-line-by-80-column LCD display with electroluminescent backlit panel; dual 800K-byte each (formatted), 5¼-inch floppy disk drives; an integral 40-column thermal printer and a detachable, low-profile, 83-key keyboard with numeric keypad and 10 function keys. I/O ports include one Centronics-compatible parallel printer port, two synchronous/asynchronous RS232C ports, an SCSI-compatible hard disk interface and an IBM I/O bus expansion connector. A word processor, GW BASIC and the operating system software come standard. The computer runs all software that operates on an IBM PC. **STM Electronics Corp.**, 535 Middlefield Road, Suite 250, Menlo Park, Calif. 94025, (415) 326-6226. **Circle No 311**

Single-user workstation executes 8 MIPS

The Ridge 32S single-user, 32-bit workstation executes 8 MIPS and performs 1.5 million Whetstone operations per sec. It features virtual memory, four-stage pipelined architecture and an operating system designed to support scientific, engineering and graphics applications. The ROS 3.1 operating system is derived from UNIX System V and BSD 4.2. Software includes FORTRAN 77, C, Pascal and MAINSAIL languages. The product's virtual memory system offers 4G bytes of addressable code and data, 1M to 4M bytes of memo-

ry, demand-paged virtual memory with 4K-byte pages and a 375-nsec. memory cycle time. A monochrome display with 1,024- by 768-pixel resolution or a 19-inch color display with 1,024- by 800-pixel resolution are available. Priced at \$36,400, the basic configuration includes the CPU, 1M byte of main memory, a

78M-byte Winchester disk drive, a 1M-byte floppy disk drive and universal interfaces (two RS232, one printer/plotter and one lineprinter port). Delivery is 90 days ARO. **Ridge Computers**, 2451 Mission College Blvd., Santa Clara, Calif. 95054, (408) 986-8500.

Circle No 313

NEW

ONE SIZE FITS ALL

Heurikon presents Minibox – a multiuser UNIX workstation based on its powerful HK68™ single board microcomputer and Uniplus+™ UNIX System III or System V operating system with Berkeley enhancements.

Designed with the OEM in mind, *one size fits all*. Both compact and flexible, the Minibox includes within its 10.5" w x 13.9" h x 20.5" frame a 200 or 400 watt power supply, six slot Multibus™ card cage, (4-5 available for user use!), single double density floppy disk drive, streamer tape drive, and 31 or 65 Mbyte Winchester drive (expandable to 280 Mbytes). All this within the same cabinet! System status LEDs on the front panel inform the user of CPU and disk drive activity.

With Uniplus+™, Minibox becomes a flexible and affordable tool for program development, text preparation, and general office tasks. Included is a full "C" com-

piler, associated assembler and linker/loader. Optional languages are:

Macro assembler, ISO Pascal compiler, FORTRAN-77 compiler, RM-COBOL™, SVS BASIC (DEC BASIC compatible interpreter), SMC BASIC (Basic-Four BB3 compatible interpreter), and Ada™. Other utilities include UltraCalc™ multiuser spread sheet, Unify™ DBM, Ethernet™, and floating point processor. Alternate operating systems available are PolyForth™, Regulus™, CP/M 68K™, and others.

*UNIX is a trademark of Bell Laboratories. Unify is a trademark of Unify Corp. UltraCalc is a trademark of Olympus Software. Ethernet is a trademark of Xerox Corp. Uniplus+ is a trademark of UniSoft Corp. PolyForth is a trademark of Forth, Inc. Regulus is a trademark of Alcyon Corp. CP/M-68K is a trademark of Digital Research. Ada is a registered trademark of the U.S. government. Ada Joint Program Office. RM-COBOL is a trademark of Ryan-McFarland Corp. HK68 is a trademark of Heurikon Corp. Multibus is a trademark of Intel Corp.

HEURIKON

CORP

1983

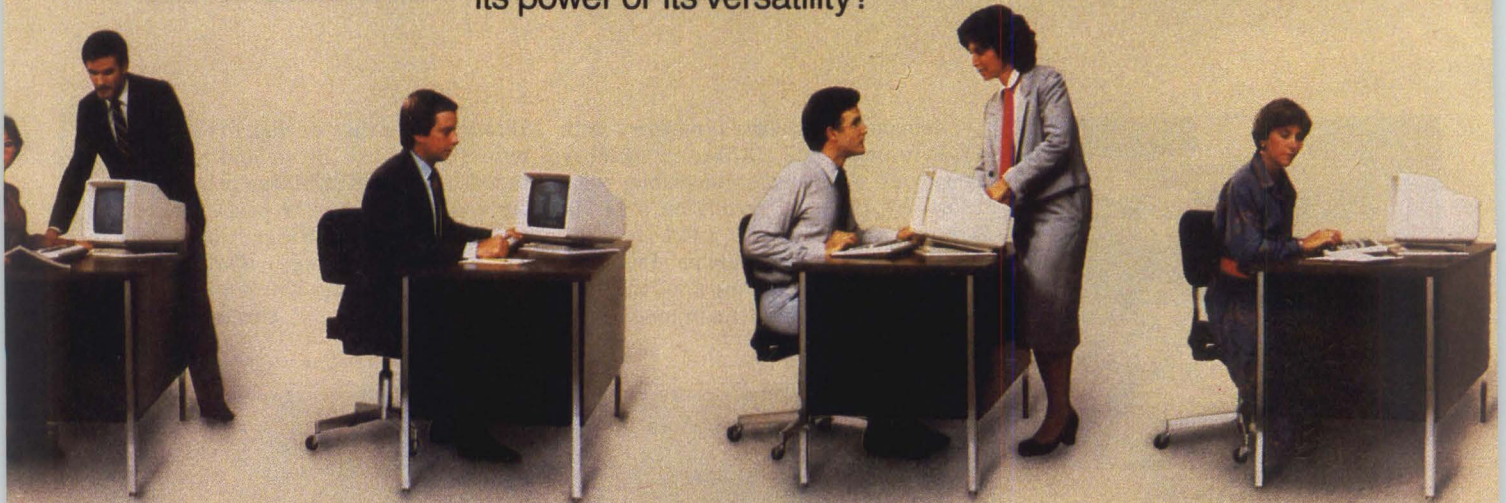
3201 Latham Drive
Madison, WI 53713

Telex 469532

800/356-9602
In Wisconsin
608/271-8700

What do you like
better about the VISUAL 2000...
its power or its versatility?

Personally,
I like its price!



Never has a UNIX-based multi-user system given so much to so many for so little.

Introducing the VISUAL 2000

The VISUAL 2000 is the full-featured system with the power and flexibility to support multiple users in real business applications at a surprisingly low cost per station. It can be used with inexpensive video terminals. Or as a database manager or file server for a cluster of intelligent workstations or PCs, including both the IBM® PC and VISUAL's own lightweight, portable, totally IBM PC compatible COMMUTER. In all applications it offers greater performance, more flexibility, and lower cost than any other system in its class.

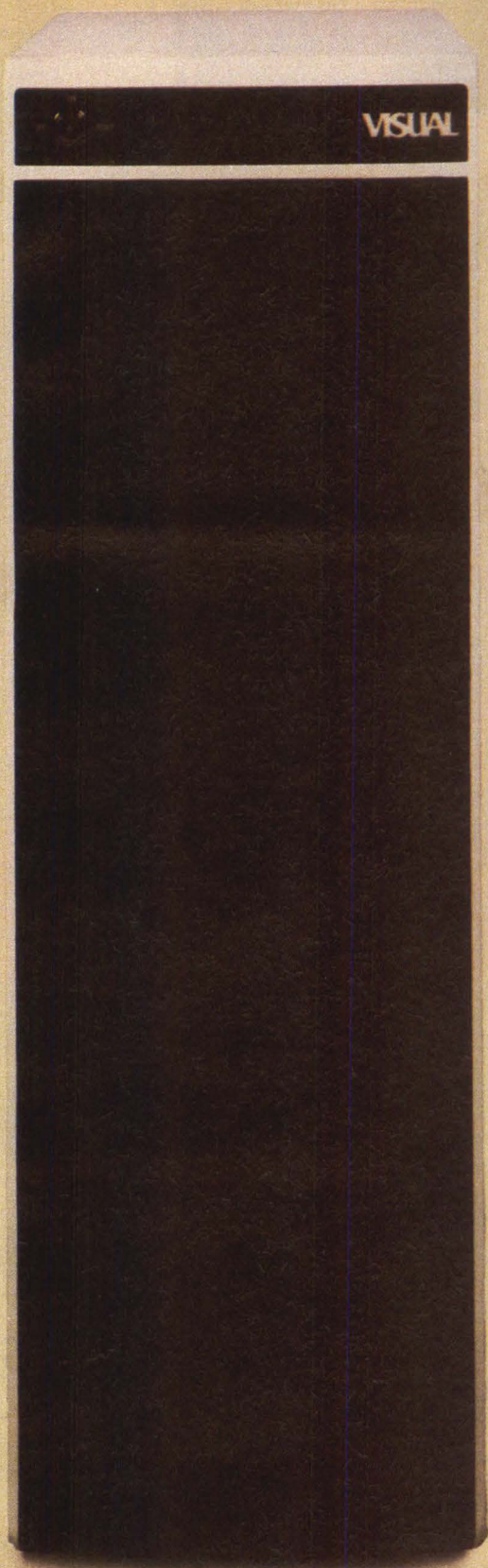
Powerful Intel 286 processor

The Intel 286 is today's chip of choice for UNIX™-based systems. Only the Intel 286 has on-chip memory management, an instruction set optimized for multi-tasking, and the optional 287 numeric co-processor to speed up floating point by a factor of 10.

What do these features mean to the VISUAL 2000 end user? Faster response time, more users supported, and lower system cost!

Cost-effective one-board design

A basic advantage of the VISUAL 2000 is its one-board base-level design. A single high-density board includes the 286 CPU, 512KB-2MB of RAM, controllers for Winchester, floppy, and streaming tape, an intelligent communications processor, six RS-232 ports, and a parallel printer port. Even a real-time clock with battery backup. One-board design means higher performance, lower cost, and greater reliability than comparable multi-board implementations.



Configurability and Expandability: VISUAL gives you more

The VISUAL 2000 spans a much wider range of configurability and expandability than other systems in its price class. Up to 16 independent users. 6 megabytes of RAM. 4 Winchester. Floppy. And streaming tape for simple, reliable disk backup. All in a small stand-up enclosure which looks right at home next to a desk.

And if a fully expanded VISUAL 2000 isn't enough, you can connect up to 254 VISUAL 2000s, PCs, and workstations in a local area network.

Extensive system software simplifies system integration

The VISUAL 2000 runs XENIX, Microsoft's popular, enhanced version of UNIX, derived from UNIX under license from AT&T, and designed to be faster, more secure, and easier to use in business applications.

And VISUAL has worked hard to simplify the system integrator's job, by providing all the tools needed to deliver end-user applications with a minimum of effort.

Languages such as C, SMC BASIC, RM/COBOL, TOM BASIC, SOFTBOL, and MicroFocus Level II COBOL, to provide instant compatibility with hundreds of proven business application programs.

Other system-building tools, like the INFORMIX database management system and RealWorld modular accounting system.

And productivity software, such as the 20/20 integrated spreadsheet and XED office-grade word processor.

The Bottom Line

High performance. Superior flexibility. Extensive software. And low cost... VISUAL 2000 systems start at under \$10,000, suggested list. No one gives you more in a UNIX-based multi-user system.

Whether you're an OEM, system house, distributor, or end-user, call today for further information on the VISUAL 2000 and see for yourself!



VISUAL See for yourself®

Visual Technology Incorporated
540 Main Street, Tewksbury, MA 01876
Telephone (617) 851-5000. Telex 951-539

REGIONAL OFFICES:
Northwest: (415) 490-1482
Southwest: (213) 534-0200
North Central: (513) 435-7044
South Central: (214) 255-8538
Northeast: (201) 528-8633
Southeast: (301) 924-5330

CIRCLE NO. 123 ON INQUIRY CARD



NOW THOUSANDS OF CALIFORNIA OEM'S AND SYSTEMS INTEGRATORS FOCUS ON JUST ONE SHOW.

And so can you...on Mini/Micro West.

Mini/Micro West is the one West Coast event that focuses entirely on computer design needs. That means you, as an exhibitor, can deal face to face with the prime concentration of OEM's, systems integrators and software developers.

Having their own event recognizes the importance of the California OEM market today. For you, it presents a unique opportunity to zero in on California OEM's face to face—in an environment undiluted by other interests.

Sponsored by California regional units of IEEE and the Electronic Representatives Association

So if you're after California OEM's and systems integrators, be at Mini/Micro West. For complete information, call toll-free: 800-421-6816. In California, 800-262-4208.

*The Anaheim Hilton Exposition Center,
February 5-7, 1985.*

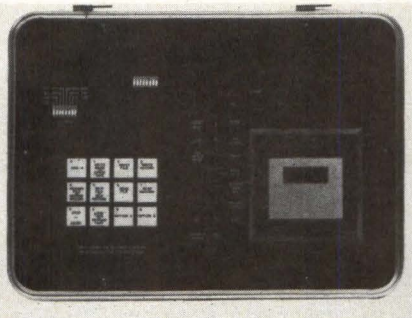


Mini/Micro West
FOCUSING ON THE OEM

CIRCLE NO. 124 ON INQUIRY CARD

New Products

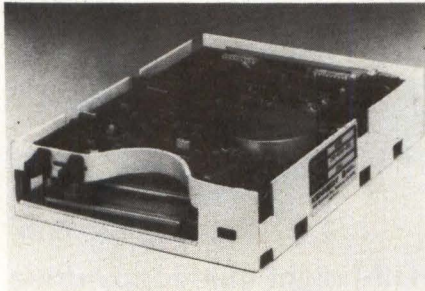
DISK/TAPE



Digital minicassette operates at two voltages

The dual-voltage model MTL-II RS232-type drive operates on 117V or 230V AC, 50/60 Hz. By recording data on four tracks at a density of 800 bpi, the system offers 0.5M bytes of storage on an 80-foot minicassette tape. The device moves the tape at 3 ips in start/stop mode. Communications speeds are user-selectable from 150 to 9,600 baud. \$550 (OEM quantities). **Braemar Computer Corp.**, 11950 12th Ave. S., Burnsville, Minn. 55337, (612) 890-5135.

Circle No 314



Streaming tape drive stores 60M bytes

Suited for Winchester backup and data storage, the nine-track series 6500 streaming tape transport has a formatted capacity of 60M bytes with a 600-foot cartridge and 45M bytes with a 450-foot cartridge. Time to backup 60M bytes takes 12 minutes. The transport ramps up to and down from its 90-ips operating speed in 150 msec. It employs self-clocking group-code recording (GCR) with an 8K-bpi recording density and a 10K-flux-reversals-per-inch flux density. Burst data transfer is 2M bytes per second; sustained data transfer is 720K bps. The product is available in a full-height configuration with formatter card installed that measures 5.75 by 3.25 by 8 inches and in a half-height configuration without formatter that measures 5.75 by 1.625 by 8 inches. The

formatter adopts the QIC-02 drive interface standard and is compatible with the QIC-11 and QIC-24 tape formats. \$1,275 with formatter, \$875 without formatter. **Kennedy Co.**, 1600 Shamrock Ave., Monrovia, Calif. 91016, (818) 357-8831.

Circle No 315



Tape subsystem enlarges DEC micro storage

Suited for use with DEC Micro/PDP-11 and PDP-11/23+ microcomputers, the TK25 ¼-inch, streaming cartridge tape subsystem has a 60M-byte capacity. It uses a standard DC600A cartridge and comes in a standalone, tabletop enclosure. Three operating systems—RT-11, RSX-11 and RSTS/E—support the unit. \$4,600. **Digital Equipment Corp.**, Maynard, Mass. 01754. Circle No 316

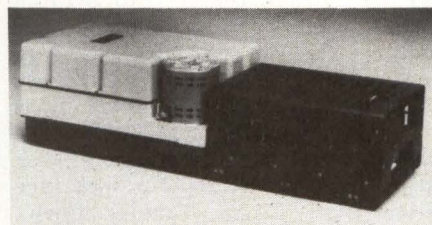


IBM-compatible streamer backs up 138M bytes

The PCT-1000, an IBM-format-compatible, nine-track streaming-tape drive, provides as much as 138M bytes of backup storage capacity for Winchester disk drives, read/write access to archival data banks and intercomputer data interchange. Two microprocessors and a real-time operating system control tape motion. The unit handles a variety of formats including 800 characters-per-

inch (cpi) NRZI, IBM and ANSI; 1,600-cpi PE, IBM and ANSI; and dual-density 3,200/1,600 cpi. The product is compatible with the Cipher/Perfec interface. Available in vertical mount and horizontal drawer-mount configurations, the device handles standard 7-, 8½- and 10½-inch tape reels. \$2,256 (100 units) for a 1,600-cpi, drawer-mount model. **Ibex Computer Corp.**, 20741 Marilla St., Chatsworth, Calif. 91311, (818) 709-8100.

Circle No 317



Memory system reads, writes on four surfaces

The MVP 212 8-inch Winchester disk drive contains a total of 212M bytes of unformatted storage through eight data surfaces split into two sets of four parallel read/write channels. At any time, this unit allows any read/write combination on four surfaces. The device consists of a mechanical module and an electronics module. The mechanical module is a sealed head-disk assembly that contains five disks, eight heads and rotary voice coil positioner. Average access time is 38 msec. The electronics module includes power amplifier, servo tachometer, microprocessor control, input/output and four sets of read/write PCBs. Equipped with an SMD interface and a transfer rate of 9.67 MHz per channel, the data rate using four channels is 38.6 MHz. \$7,500 in OEM quantities. Delivery time is 45 days. **Mega-Vault**, 6431 Independence Ave., Woodland Hills, Calif. 91367, (818) 884-7300.

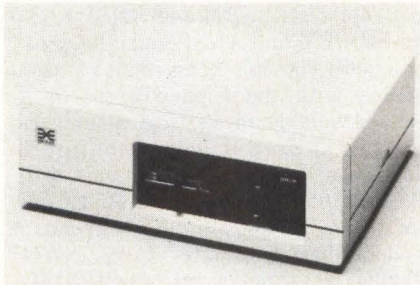
Circle No 318

SCSI-based subsystem handles varied CPUs

The Javelin, an SCSI-based, mass-storage subsystem, connects through an independent host adapter to a variety of CPUs, including the DEC Q-bus and Unibus, the Intel Multibus and the IBM PC, PC/XT and compatible microcomputers. The basic chassis incorporates

New Products

DISK/TAPE



an integral power supply, cooling fan, pertinent controller boards and a choice of two 5 1/4-inch storage peripherals. Storage devices can be two 5 1/4-inch Winchester disk drives or one disk drive and one 1/4-inch streaming cartridge tape drive. Each Winchester can range in capacity from 46M to 140M bytes (unformatted). Model ED2/70-T, which includes an 86M-byte Winchester disk drive packaged with the 1/4-inch tape drive, costs \$7,725. **Emulex Corp.**, P.O. Box 6725, 3545 Harbor Blvd., Costa Mesa, Calif. 92626, (800) 854-7112, (714) 662-5600.

Circle No 319

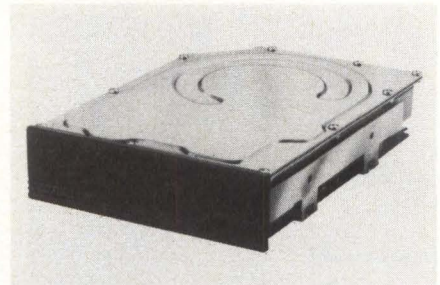
100M-byte Winchester uses thin-film heads

Using thin-film recording heads, a closed-loop servo system, plated media and the ESDI interface, the models 96202 and 96203 half-height, 5 1/4-inch Winchester disk drives store 61.8M and 103M bytes (unformatted), respectively. They employ a voice-coil-driven linear head positioner and average 30-msec. access times. Data transfer rate is 100M bps. Model 96202, \$1,150 (1,000 units); model 96203, \$1,475 (1,000 units). **Advanced Storage Technology Inc.**, 6580 Via Del Oro, San Jose, Calif. 95119, (408) 224-8010.

Circle No 320

Half-height Winchester stores 25M bytes

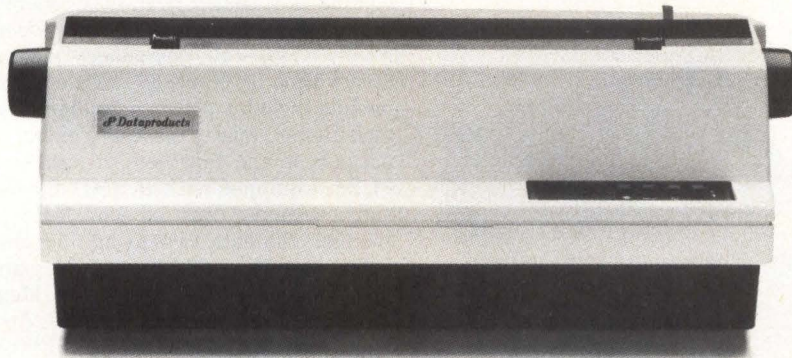
The MR522, a half-height, 5 1/4-inch Winchester disk drive, has 25.5M bytes of unformatted capacity, 6.37M bytes per surface and 10,416 bytes per track. The drive furnishes an industry-standard



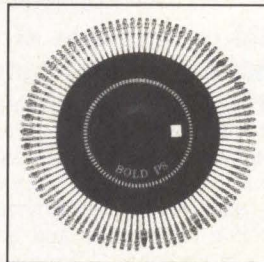
transfer rate, recording format and controller interface requirements and draws 18W. It incorporates two platters, four data surfaces and four magnetic data heads. Key features include an embedded servo positioning system, a rotary arm, stepper assembly, plated media and MnZn monolithic heads. \$875 in OEM quantities. Production units will be available in the fall. **Mitsubishi Electronics America Inc.** 991 Knox St., Torrance, Calif. 90502, (213) 515-3993.

Circle No 321

Better letters.

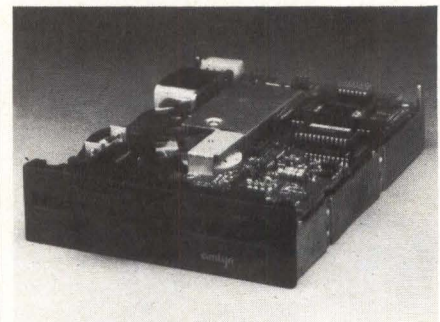


We can't help your spelling or grammar, but we can help your important correspondence look a little brighter than the next guy's. In less than a minute our DP-55 daisywheel dashes out a letter-perfect page. Throw out your white out, call your printer distributor. Or contact Dataproducts at (213) 887-3924, 6200 Canoga Avenue, Woodland Hills, CA 91365. In Europe, 136-138 High Street, Egham, Surrey, TW 20 9HL England.



Dataproducts Daisywheel Printers

CIRCLE NO. 125 ON INQUIRY CARD



Half-height minifloppy drive packs 3.2M bytes

The model 1865 half-height, 5 1/4-inch floppy disk drive provides 3.2M bytes of unformatted data capacity by recording at 10,250 bpi and 170 tpi. One hundred fifty-four tracks are placed on each side of an industry standard UHR-II high coercivity (600 Oersted) minifloppy diskette. Track-to-track access time is less than 2 msec. The drive reads data recorded on 48- and 96-tpi diskettes. Data can be written in FM or MFM coding with any soft-sectored format. The drive normally spins a 170-tpi diskette at 360 rpm to achieve its data-transfer rate of 500K bps. When a non-Amlyn diskette is inserted into the drive, the unit's microprocessor increases the spindle speed to 600 rpm. \$330 (1,000 units). **Amlyn Corp.**, 2450 Autumnvale Drive, San Jose, Calif. 95131, (408) 946-8616.

Circle No 322

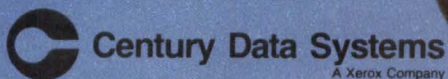
More than A Memory A Commitment To Quality

Every department, every person in our organization is dedicated to one goal—to deliver the finest in disk memories.

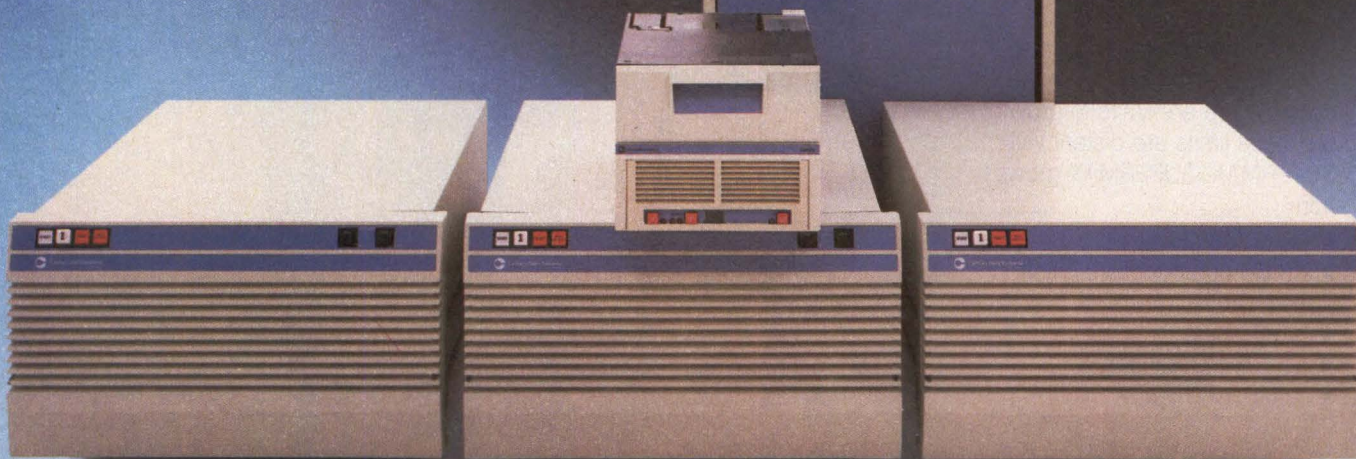
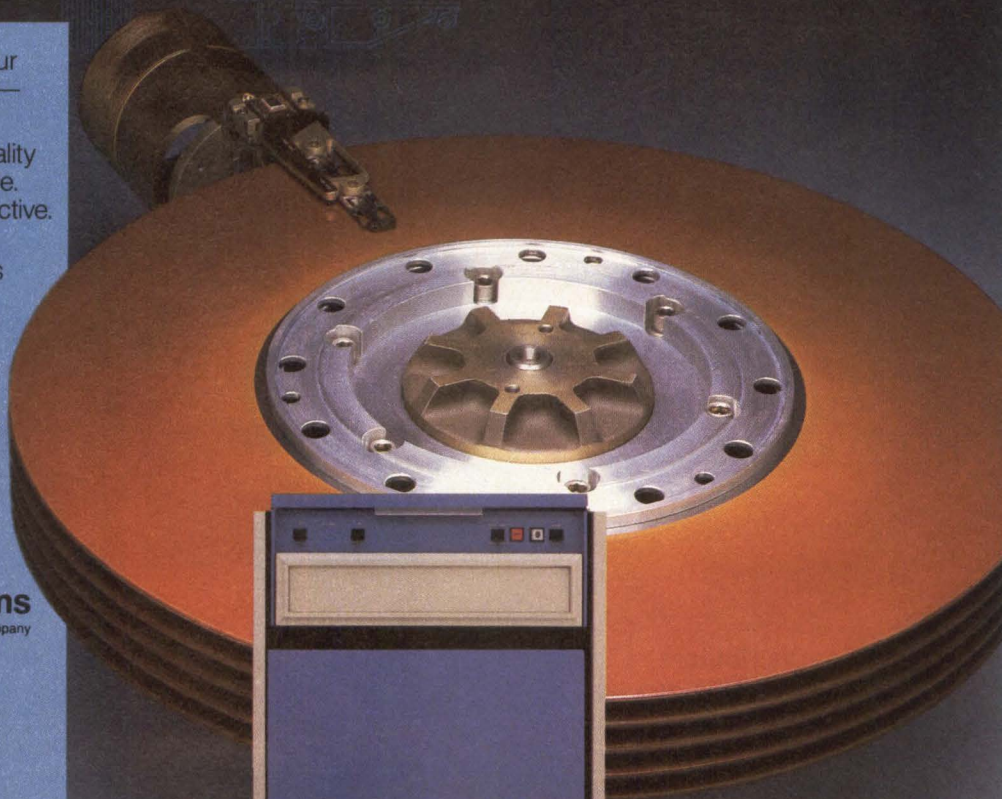
At Century Data Systems, we see quality as a pervasive, company-wide attitude. And our customers share this perspective.

Leading OEMs continue to rely on Century Data Systems disk memories for superb reliability, year after year. That's the real payoff from our total approach to quality.

At Century Data Systems, quality is much more than a memory. It's a living company commitment. And it can work to your advantage. Write or call for specifics.



Marketing Communications
1270 N. Kraemer Boulevard
Anaheim, California 92806
(714) 999-2660



CIRCLE NO. 126 ON INQUIRY CARD

NO LIMITS



OEMs/Distributors

Come to COMDEX and see Dansk Data Elektronik demonstrate its SUPERMAX, closely-coupled, multi-cpu Super Micro family.

A unique design, with 32 bit architecture, gives easy expansion in the UNIX* environment. Of course there are limits to growth, but these limits are distant with SUPERMAX. SUPERMAX grows from:

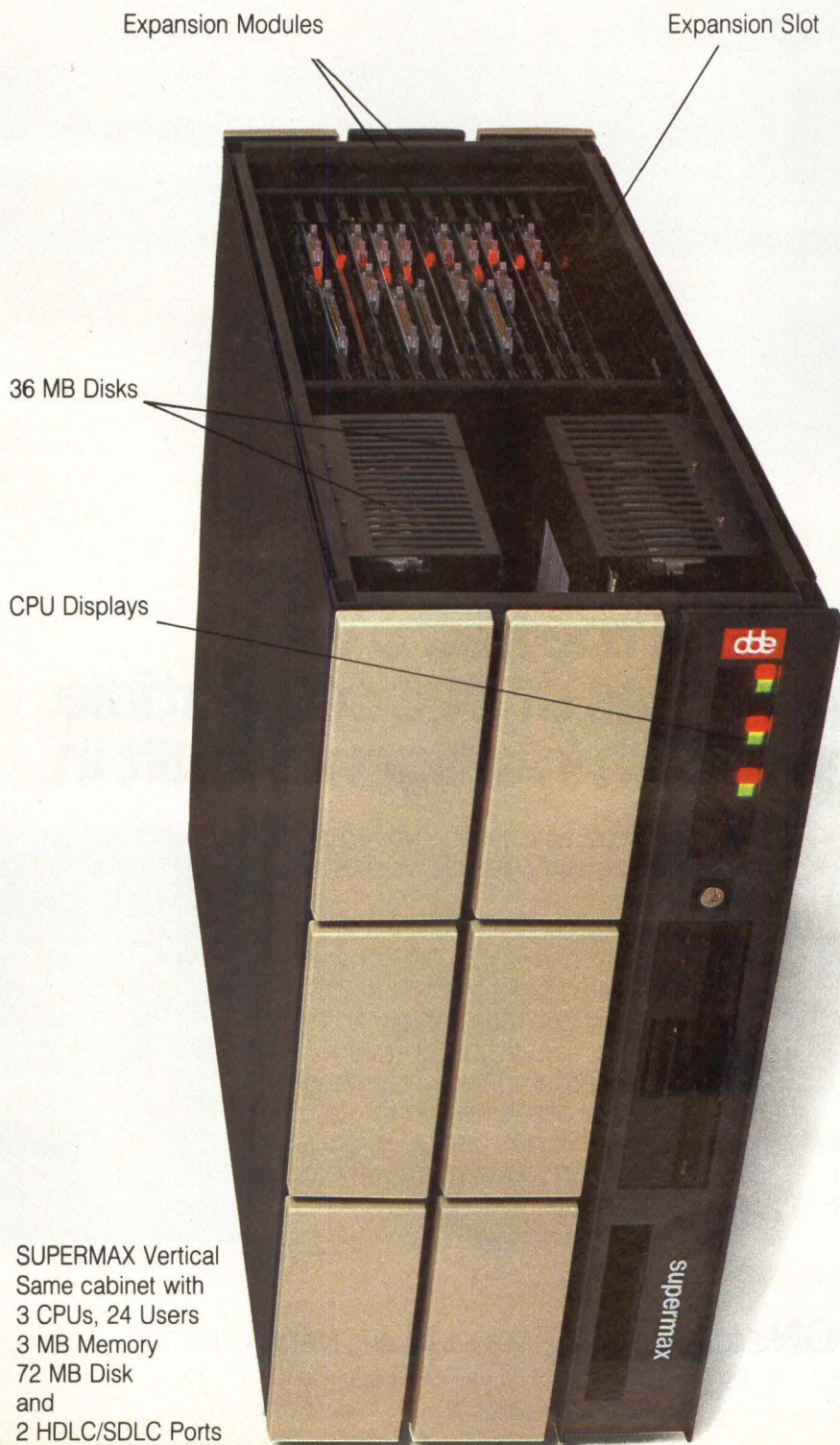
- 1-8 MC68000 CPUs
- 2-8 I/O coprocessors offload main CPUs
- 1-128 Users
- 1/2-128 MB Memory
- 20 MB-10 GB disk

SUPERMAX Vertical
1 CPU, 8 users
1 MB Memory
36 MB Disk


ALMOST



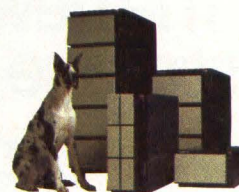
TO GROWTH



Easy, cost-effective Expansion

Expansion is simple and cost-effective: place more modules in the same SUPERMAX cabinet to increase number of users, memory, storage, and most important, POWER.

UNIX software remains the same regardless of expansion level. It supports, in a real-time environment, Bell-Licensed UNIX System III and tools with Berkeley enhancements. C, COBOL, Fortran, Pascal, SMC Basic, RDBMS, and a wide variety of communications protocols, including 3270 BSC and SNA are running and available.



Meet the SUPERMAX family of great Danes at COMDEX in Amsterdam, stand 804, 29 Oct.-1. Nov., or Las Vegas, stand W1055-W1064, 14-18. Nov.



Dansk Data Elektronik A/S
199, Herlev Hovedgade
DK 2730 Herlev, Denmark
Telephone: int. +45 284 50 11
Telex 35258 dde dk

UNIX is a trademark of Bell Laboratories

SUPERMAX Vertical
Same cabinet with
3 CPUs, 24 Users
3 MB Memory
72 MB Disk
and
2 HDLC/SDLC Ports

CIRCLE NO. 138 ON INQUIRY CARD

Get ready for the fastest drive of your life.



Introducing the Micro VIP™ The newest in a series of DEC compatible storage systems with intelligence built in.

It's the fastest, because it's the smartest. Now you can have a mass storage subsystem with the world's most advanced cache controller technology. And when you combine it with a Digital Equipment 16 or 32 bit microprocessor, you've got the fastest DEC* microcomputer system you can buy.

The Micro VIP (Virtual Information Processor) gives you high performance, mass storage with DEC Q-bus* compatible processors such as the 11/23*, 11/73*, and MicroVAX*. Our third generation adaptive cache management algorithms make

effective access time under 10 ms (512K cache) — using highly reliable winchester technology.

As a stand-alone, or all-in-one integrated system the Micro VIP is fully DEC compatible — and that includes the built-in 100 megabyte cartridge tape backup. And it's also available as a disk/tape subsystem.

So be quick about it! Take the time to call us for all the details. We can tell you how to put the world's fastest storage system to work in your systems without spending any more money. See ... even the call is free. 800-368-2811.



 **U.S. DESIGN** 5100 Philadelphia Way, Lanham, Maryland 20706
(301) 577-2880 • (800) 368-2811 • TWX 710-826-0417

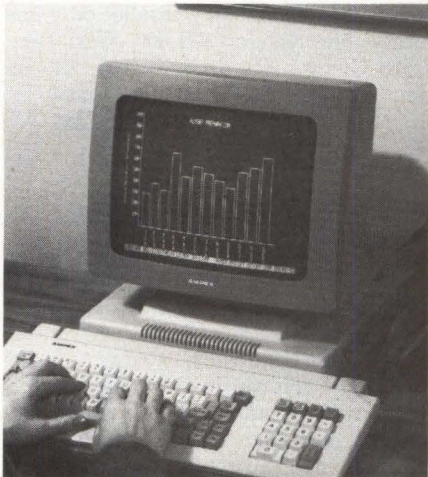
*Registered trademark of Digital Equipment Corporation. Micro VIP is a registered trademark of U.S. Design Corporation.

New Products

TERMINALS

Editing terminal emulates 14 models

The Ampex 210 editing terminal emulates TeleVideo's 925, 910+ and 910 models; Qume's QVT 102; Lear Siegler's ADM 5, ADM 3A+, ADM 3A and ADM 3; ADDS' Viewpoint, Regent's 25 and 20; and Hazeltine's 1500, 1410 and 1400 models. The 14 resident emulations are keyboard selectable. Video attributes include blinking, reverse video, underline, blank and half intensity. The terminal features a 14-inch diagonal, non-glare screen available in amber or green phosphors and a 24-line-by-80-character format with a 25th status line. It dis-

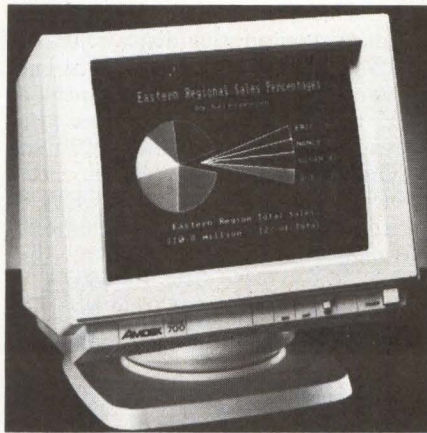


plays 96 ASCII characters, 32 control characters and 15 line graphic characters. Seven character sets are resident and user-selectable, including U.S., U.K., French, German, Norwegian, Swedish and Danish. \$549. **Ampex Corp.**, 401 Broadway, Redwood City Calif. 94063, (408) 725-2017.

Circle No 323

RGB monitors compatible with IBM, Apple

The Color 700 and 710 high-resolution video monitors interface with RGB-TTL output computers and work with the IBM PC and compatibles and Apple II and compatible computers. Its .31mm black dot-matrix picture tubes combined with high-resolution, 720 dots by 240 lines (non-interlaced) provide color displays for graphics applications. The series furnishes 96-column-by-25-line text display and features an on/off power switch with light-emitting-diode (LED) display, brightness, contrast and

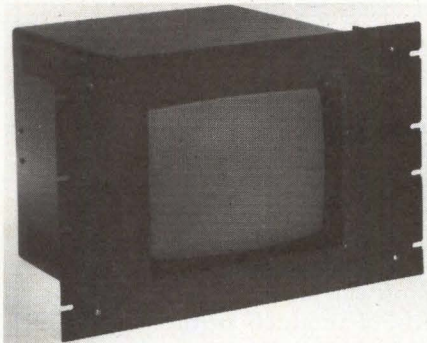


text switch. The Color 710 has an etched-glass CRT to reduce glare and a long-persistence phosphor for vertical resolution of 480. Color 700, \$749; Color 710, \$799. **Amdex Corp.**, 2201 Lively Blvd., Elk Grove Village, Ill. 60007, (312) 595-6890.

Circle No 324

Terminal serves industrial applications

The Rack Mount Touch Information Display, measuring 19 inches wide by 12 $\frac{3}{4}$ inches high, is an integrated touch-active terminal best suited for industrial control applications. It functions as a standard ASCII terminal and includes a standard ASCII keyboard port, emulates Lear Siegler ADM-3A cursor-addressing functions and communicates via a configurable RS232C interface at a rate of 19.2K baud. The 12-inch diagonal



amber (P134) phosphor CRT displays a 24-line-by-80-character format. Up to 648 active touch points can be defined; touch areas can be any size or shape. The unit employs an 8085 microprocessor and is housed in black anodized aluminum. \$1,500. **Electro Mechanical Systems Inc.**, 801 W. Bradley, Champaign, Ill. 61820, (217) 359-7125.

Circle No 325

Multi-purpose terminal performs text editing

The Model 8303 Delta Demon, together with its text-processing software, performs editing tasks such as cursor movement, insert, delete, search-and-replace functions and word wrap. The 16-bit microprocessor intelligent terminal furnishes a tilt-and-swivel monitor and a 127-key detachable keyboard. A 14-inch, high-resolution screen formats into 28 lines by 80 characters. The multi-task windowing capability is defined by eight available screen segments which operate independently. Additional features include document control with 40K of scrolling memory and a setup menu which configures the terminal for any operating environment. Settings are retained in a non-volatile EAROM for later use. \$2,395. **Delta Data Systems Corp.**, 2595 Metropolitan Drive, Trevose, Pa. 19047, (215) 322-5400.

Circle No 326



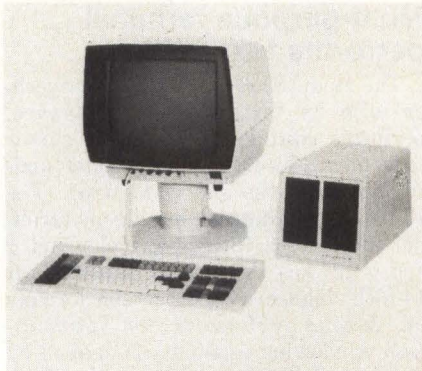
Video display terminals provide emulation

The Visual 60 and Visual 65 video display terminals are code-for-code compatible with the Esprit I, ADDS Viewpoint, Lear Siegler ADM-3A and DEC VT52. Ergonomic features include smooth scroll, 7-dot-by-9-dot matrix characters, non-glare screen and detached, low-profile keyboard. Both terminals offer Full 5 Attribute Selection, line-drawing character set, block mode, editing, bidirectional auxiliary port, 128-character set, 80-column-by-24-link screen format, 25th status line, columnar tabbing and independent receive and transmit rates. The Visual 65 includes 12 user-programmable function keys, extended editing features, selectable scrolling region and emulations of Hazeltine 1500 and 1510 and Visual 200 and 210. Model 60, \$595; Model 65, \$695. **Visual Technology Inc.**, 540 Main St., Tewksbury, Mass. 01876, (617) 851-5000.

Circle No 327

New Products

TERMINALS



Emulating terminals feature CP/M-80, MS-DOS

The 8200 VIS series combines universal terminal emulation with personal computing capabilities. Employing an MC68000 microprocessor with 128K bytes of RAM, the series emulates the IBM 3271, 3275 and 3277; the DEC VT100 and 200; ADDS' Regent 40; and Univac's UTS 30 and 40 terminals for communication with IBM host systems, DEC PDP-11 and VAX minicomputers

and Univac 1100 series computers. The standard configuration displays 10-dot-by-12-dot matrix characters in a 24-line-by-80-column screen format. Includes 128K bytes of memory; protocols for Univac's 200 and 400, IBM's 3270 and DEC's VT100 and 200 emulation; two 5 ¼-inch floppy disk drives and CP/M-80 personal computing option. \$4,340. **Megadata Corp.**, 35 Orville Drive, Bohemia, N.Y. 11716, (516) 589-6800.

Circle No 328

Terminal compatible with Tektronix 4010 series

The 2048-by-2048 addressable points on the Radiance 2000 terminal enable the user to create accurate drawings on a 20-inch diagonal screen with a 68-Hz refresh rate, using eight colors. A keyboard integrated-pad digitizer offers flexibility and speed in selecting a pixel. A bi-processor architecture employs both a 6809 and a 68000 as well as a high-speed graphic bus. Graphics in-

clude circles, histograms, pie charts and polygon filling. Two separately addressable memory planes display two sets of graphic information. One can be used as background, the other as a work plane. Horizontal or vertical scroll of one plane with respect to the other facilitates superposition application. Compatible with the Tektronix 4010 series, the terminal offers five types of programmed line textures, five character sizes and the ASCII and APL character sets. Raster-scan technology provides functions such as selective erase, color inversion and vector rectangle. Additional features include two asynchronous ports, from 110 baud to 38,400 baud rates, one Centronics parallel port and ergonomic design. \$24,000. **Gixi Inc.**, 7808 Glenroy Road, Suite 100, Bloomington, Minn. 55345, (612) 893-1350.

Circle No 329

Color graphics terminal provides high resolution

The Sibyl color graphics terminal features a resolution of 2,730 by 1,024 pixels, a 60-Hz non-interlaced refresh and a video bandwidth greater than 100 MHz. The unit can display more than 2.5 million colors simultaneously from a palette of more than 16.7 million colors. It provides pan and zoom over a 4K by 4K global memory within a 64K by 64K virtual workspace. A 68000 microprocessor handles display list management. Area fills occur at speeds as high as 1G pixels per second. The tabletop system consists of a 19-inch monitor, a VT100-style keyboard and a system controller in a RETMA rack-mountable case. \$24,500. Delivery in 120 days, ARO. **PsiTech**, 16902 Von Karman Ave., Irvine, Calif. 92714, (714) 863-0981.

Circle No 330

High-resolution terminal performs video scroll

Featuring a resolution of 1024 pixels by 1024 pixels, the video scroller terminal (VST) suits text processing, engineering and graphics applications. A plug-in card and cable interfaces the system with the IBM PC, PC/XT or XT 370. Its 17-inch screen displays a 7,310-Chinese-character set, drawing pixels at a rate of 39.6 megapixels per second; the user can create three-dimensional ob-

TOUGH LOCAL NETWORK PROBLEM:

"How can our department get our six computers and three printers to work together efficiently? We also want to be able to access outside data services and our future company LAN."

SIMPLE NETWORK SOLUTION: NetCommander

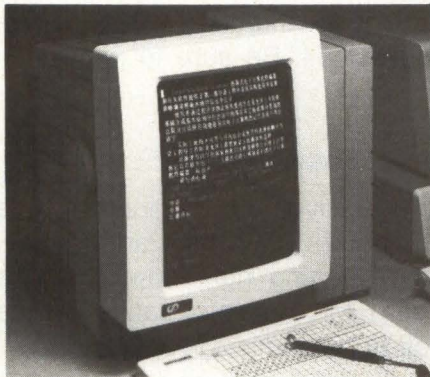
NetCommander is a smart, small Local Area Network manager. It lets you link from four to 40 computers and peripherals — in any mix of models and makes. A 50K buffer (expandable to 250K) makes sure that productivity is high — keeping fewer printers humming — while computer and PC users do their thing, without waiting for a printer, modem, or shared disk. Those devices can be specified with names defined by users — and allocated on the basis of availability and capability. And NetCommander handles multiple protocols and different baud rates simultaneously — without modifications to hardware or software. It will also tie into your company's LAN. The latest in a family of products in use since 1979, NetCommander is a smart, small, efficient network manager.

For more information, call or write:

NetCommander

Digital Products Inc. • The Simple Network Solution Company
600 Pleasant Street • Watertown, MA • 02172
(617) 924-1680 • Outside Mass., call 1-800-243-2333
And check out our 30-day trial evaluation.

CIRCLE NO. 129 ON INQUIRY CARD



jects and rotate them on the screen. The Advanced Micro Devices 16-bit micro-computer makes up the system architecture. The terminal receives data at a rate of 12 million bytes per second. With the available software, text such as financial and marketing plans that integrate words, data and graphics into documents can be processed. Connected to an IBM PC and a laser printer, the terminal facilitates in-plant typesetting and printing operation. The operator chooses different type fonts and displays graphics on a single sheet of paper. \$5,995. Delivery is 60 days A.R.O. **Corporate Data Sciences**, 302 Bryant St., Palo Alto, Calif. 94301, (415) 322-2072.

Circle No 331

Terminal offers telephony features

The Freedom 212 remote information station combines terminal functions and data-communications and telephony capabilities. The unit features a full-sized, tilt-and-swivel display, a 106-key keyboard with 47 programmable non-volatile function keys, an integral Bell 212A-compatible modem, a built-in 25-line phone directory and an automatic dialer. In a standalone terminal mode with the modem bypassed, it operates as a video display terminal and modem, as a standalone modem or as a display telephone. \$1,295. **Liberty Electronics**, 625 Third St., San Francisco, Calif. 94107, (415) 543-7000.

Circle No 332

Display station replaces IBM 3278 units

A plug-compatible replacement for the IBM 3278 display station, the Memorex 2178 display station connects to Memorex 2076 or 2074 cluster controllers or to IBM 3276 or 3274 cluster

controllers. The product consists of three detachable and interchangeable modules—the display module, the logic module and the keyboard. Three keyboard styles in a choice of 10 languages are offered including typewriter, data entry and typewriter with numeric keypad. Data is displayed in 24 lines of 80 characters each on a 12-inch diagonal,

non-glare green screen. Other features include automatic screen dimming after 20 minutes of inactivity, audible alarm, cursor position indicator and automatic diagnostics at power on. \$1,485. **Memorex Corp.**, San Tomas at Central Expressway, Santa Clara, Calif. 95052 (408) 987-3072.

Circle No 333

\$1850

THE IBEX MAINSTREAMER™



At \$1850* the price is the least of the breakthroughs!

This IBM format-compatible 9-track tape drive weighs 60% less than any equivalent system available. And occupies 25% less space. (Save up to \$200 on freight costs alone!). It's simple and reliable. Fewer moving parts. No automatic threading failures. No noisy blower. And look at all you get:

- Storage of up to 136M bytes per reel
- Transfer rates of 20K to 160K bytes / second
- 800 bpi NRZI, 1600 and 3200 bpi PE
- Cipher/ Pertec interface
- Internal diagnostics
- Mounting options: Door, Drawer or Table Top

The IBEX MAINSTREAMER. **Right for the times.**

Call, TWX or write today for the rest of the story. And for the telephone number of the sales office nearest you.

IBEX

Right for the times

*OEM quantities, 1600 bpi PE format, domestic prices.

Phoenix: ASR-NM, (602) 949-8293 • Los Angeles: Gemini Associates, (213) 594-9618 • Rochester, NY: Ossman Group, (716) 424-4460 • San Jose: Reptek - No. Calif., (408) 947-0622 • Chicago: SEA, Inc., (317) 846-2591 • Washington, D.C.: Scott Data Corp., (703) 765-7901 • Orlando: Southeast Data Prod., (305) 788-3686 • Union, NJ: Stearns Associates, (201) 686-2980 • Boston: Sturdy Corp., (617) 235-2330 • Dayton: Swenson Associates, (513) 866-3233 • Dallas: Thorson Company, (214) 233-5744

CIRCLE NO. 130 ON INQUIRY CARD

World's biggest event for DEC users.

If your computer is Digital Equipment, DEXPO West 84 is your show. It's the only show that's only for people like you. People who use and depend on DEC computers.

Which means that when you come to DEXPO West, you'll find exactly what you're looking for. More than 5,000 products and services compatible with DEC computers. That's more than at NCC. More than COMDEX too.

And you'll get personal attention from 400 vendors who speak your language. The kind of attention DEC users can't get at other computer shows.

More of what you want in less time.

Since DEXPO West is strictly for DEC owners, managers, dealers and users, it has everything you need to plan your entire system. For your VAX*. For your PDP-11*. For your Rainbow*. For every DEC computer.

And you'll find everything you need to make it all work together. Hardware, software, systems, services and supplies. All DEC compatible.

A bonus for DECUS* conference attendees.

If you attend the DEC Users Society (DECUS) Anaheim conference, you'll receive FREE admission to DEXPO West 84. Be sure to register in advance!

Don't miss your computer show.

Why will 10,000 executives and engineers come to DEXPO West 84? To save time and money. And you can, too, starting right now. Mail the attached reply card for free information on the show and get half-price admission tickets.

If the reply card is missing, write or call:

Angela Wright, Registrations Manager,
Expoconsul International, Inc.,
55 Princeton-Hightstown Rd.,
Princeton Junction,
New Jersey
08550
609-799-1661



Only One Show is Big Enough for Every

DIGITAL Computer User. DEXPO® West 84

*Registered trademarks of Digital Equipment Corp.

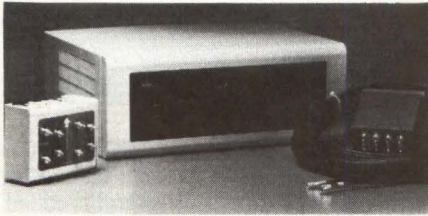
DEXPO is not sponsored by or affiliated with DECUS.

The Sixth National DEC*-Compatible Industry Exposition

Disneyland Hotel • Anaheim, CA • Dec. 11-14, 1984 • Tuesday - Friday

New Products

DATACOMM



Network is user-installable

The FastLAN network, user-installable cable system, consists of FastLAN-A, a broadband radio-frequency amplifier unit; FastLAN-B, a network branch with two coupler boxes that connects to the amplifier unit; and FastLAN-C, a drop cable with a four-port WangNet multiuser outlet that connects to a coupler box. The three components can be combined in configurations ranging from four to 640 ports and covering a radius of as much as 300 feet. The network employs a dual-cable broadband medium and CATV components for the concurrent exchange of data, text, image and video information. FastLAN offers five communications services: Wang Band for communications between Wang systems at speeds as high as 10M bps, a peripheral-attachment service for connecting Wang workstations and peripherals and IBM Type A 3270 devices to their host systems, an interconnect band for transmission pathways for industry-standard communications interfaces and protocols, a utility band for video applications and Professional computer service for connecting Wang Professional computers to the network. With Teflon cabling, FastLAN-A sells for \$1,300; FastLAN-B, \$800; FastLAN-C, \$180. **Wang Laboratories Inc.**, 1 Industrial Ave., Lowell, Mass. 01851, (617) 459-5000.

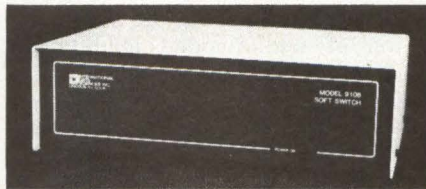
Circle No 334

Full-duplex modem uses five microprocessors

The WD212-X synchronous/asynchronous full-duplex modem operates at 1,200 bps. By using a five-microprocessor design, the modem features Bell 212A, Bell 103 and CCITT X.25 LAPB compatibility for error-free data transmission via dial-up telephone lines. Self-adaptive program logic in each microprocessor chip enables the modem to adjust automatically to the operating conditions of each telephone line. The modem's direct connect, auto

dial/auto answer features equip it for computer-to-computer, remote data access and local-area network communications. In synchronous mode the product is compatible with CCITT X.25 LAPB. In asynchronous mode it is compatible with most communications software packages developed for use with the IBM PC. The device is available as a printed circuit board for use within the IBM PC or as a standalone peripheral modem that connects through an RS232C port to any personal computer or data terminal. \$345 (1,000 units). **Wolfdata Inc.**, 187 Billerica Road, Chelmsford, Mass. 01824, (617) 250-1500.

Circle No 335



Soft switch links eight RS232-compatible devices

The model 9108 soft switch transfers data between eight RS232 ports via a common 8-bit data bus. This method allows port-to-port communication with as many as four pairs of ports at the same time. The device operates at asynchronous speeds to 9,600 bps. Features include a queue facility that provides auto-connect; an activity timer to prevent system tie-ups, DTE/DCE selection, port status report, user-selectable log off and port naming. \$895. **International Data Sciences Inc.**, 7 Wellington Road, Lincoln, R.I. 02865, (401) 333-6200.

Circle No 336

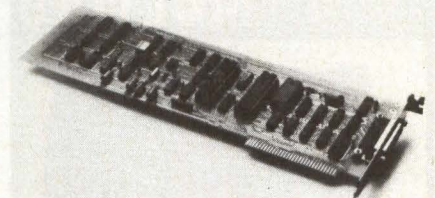
LAN uses Diplomat, locks records and files

The L-Net MS-DOS-based LAN extends the company's Diplomat natural language to multiple users with record-and file-locking capability. This linear-bus network supports as many as 64 workstations connected with a twisted-pair cable as long as 10,000 feet. The LAN uses an Ethernet-like CSMA/CD protocol with a 2.5M-bps data-transmission rate. Workstations can be any combination of IBM PC-compatible machines that are configured with the appropriate Logical network workstation conversion kit. Installations can desig-



nate any hard-disk workstation as one of several file servers. The Diplomat application language uses nouns and verbs to create data files, entry screens and reports. When running on L-Net, Diplomat ensures that only one user can update a single record at a given time. File-server kits for converting hard-disk computers cost \$1,890. Kits for converting a standalone microcomputer into a workstation cost between \$775 and \$1,200. Network repeaters for each 600-foot extension of the data bus are priced at \$615 each. **Logical Business Machines**, 1294 Hammerwood Ave., Sunnyvale, Calif. 94086, (408) 744-1290.

Circle No 337



Packages enable micro-to-mainframe communications

Consisting of a printed-circuit board, user's choice of emulation software and documentation, the IRMAcom package allows IBM PC and IBM PC-compatible personal computers to attach to networks using synchronous protocols across leased or switched lines. IRMAcom software provides SNA 3274 controller emulation, BSC 3274 controller emulation, SNA 3770 RJE station emulation, BSC 3770 RJE station emulation or BSC 2780/3780 RJE station emulation. The printed circuit board and one emulation program cost \$895. Additional emulation programs cost \$495 each. **Digital Communications Associates Inc.**, 303 Technology Park, Norcross, Ga. 30092, (404) 448-1400.

Circle No 338

New Products

DATACOMM



Data link controller serves Multibus systems

When attached to the company's NT10 transceiver, the NI3210 Multibus Ethernet/IEEE-802.3 communications controller provides a link-level connection to Ethernet for Multibus systems. The controller board performs the specified data link and physical channel functions, permitting 10M-bps data communications between stations separated by as much as 2,500 meters. The product employs 8K bytes of dual ported RAM, linked list buffer management, an on-board DMA controller and a program-

mable byte swap facility. It includes two sets of diagnostic tools. One set indicates network faults by furnishing tools such as internal and external loopback modes. Another group generates data for characterizing the network's quality of service. Optional NS4244 XNS Internet Transport Protocols for UNIX System V offer network software support. \$760 (100 units). **Interlan Inc.**, 3 Lyberty Way, Westwood, Mass. 01886, (617) 692-3900. **Circle No 339**

Modems feature 68000 microprocessing power

The 2600 series modems use the Motorola 68000 microprocessor as a controller. The modems feature implementation of trellis-coded modulation (TCM), data transmission at speeds as high as 16,800 bps, automatic speed adjustment to changing line conditions, down-line loading of new options or customized features and built-in network control. The series consists of model



2640 for 9,600-bps transmission, model 2620 for 4,800-bps transmission and model 2660, which uses trellis-coded modulation for data transmission of 9,600 to 16,800 bps and features an adaptive rate system that continuously senses varying line conditions and automatically adapts the main channel data rate for the highest possible throughput. Diagnostic procedures include power-up self-test, audio, digital and terminal loop-back, modem check, test-tone generation, poll test and bit error rate tests. Prices range from \$4,175 for the model 2620 to \$13,000 for the model 2660. **Codex**, 20 Cabot Blvd., Mansfield, Mass. 02048, (617) 364-2000. **Circle No 340**



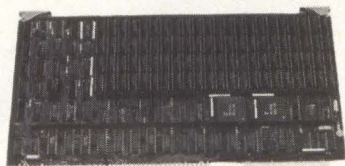
Interface transmits data and control signals

The TR2000 fiber-optic RS232C modem interchanges data and control signals between electronic equipment and a fiber-optic cable. Two TR2000 modems and a duplex fiber-optic cable furnish a full-duplex transmission link as long as 3,600 feet at data rates as high as 150K bps. The modem plugs into the RS232 port on the equipment and can be powered from the equipment itself or an external 120V AC source using a 12V DC power pack. It operates in the DTE or DCE mode and can monitor the transmitted data. \$99. **American Photonics Inc.**, 71 Commerce Drive, P.O. Box 289, Brookfield Center, Conn. 06805, (203) 775-8950. **Circle No 341**

Output device interface features printer emulation

IRMAprint allows asynchronous ASCII output devices such as an IBM PC printer to operate as output peripherals within IBM 3270 networks. It is compatible with all IBM 3274, 3276 and

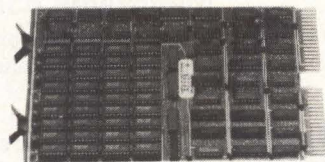
UNFORGETTABLE MEMORIES MULTIBUS — QBUS



MULTIBUS MEMORY 512KB TO 2MB EDC

- Error Detecting and Correcting (EDC)
- Faster Access Times

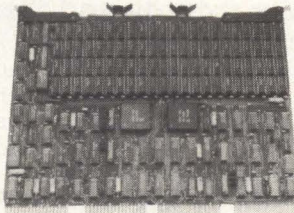
	SINGLE QTY. PRICE	
	Without/EDC	W/EDC
512KB	895.00	1495.00
2MB	3595.00	4595.00



Q-BUS MEMORY 256KB TO 4MB

- Battery Backup Mode
- Block Mode DMA, ECC or Parity
- Works with LSI-11, J-11, MicroVAX

SINGLE QTY. PRICE	
1MB	1695.00
256KB	525.00



"OFFERING QUALITY WITH AFFORDABLE PRICING"



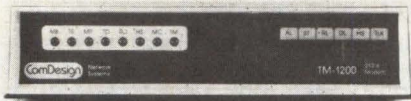
Chrislin Industries, Inc.

31352 Via Colinas • Westlake Village, CA 91362 • 818-991-2254
TWX 910-494-1253 (CHRISLIN WKVG)

J-11, LSI-11, MicroVAX, Q-BUS are trademarks of Digital Equipment Corporation. MULTIBUS is a trademark of Intel Corporation.

43XX integral terminal controllers with type "A" adapters, whether in SNA/SDLC or BSC environments. The product services the IBM coax protocol and emulates an IBM 3287 printer through a standard coaxial cable connection to a 3270 controller. Data transmitted from the 3270 controller is converted to the asynchronous ASCII format and sent to the ASCII output device through an RS232C or Centronics interface. Tested transmission rates run from 45 to 38,400 bps. \$1,295. **Digital Communications Associates Inc.**, 303 Technology Park, Norcross, Ga. 30092, (404) 448-1400.

Circle No 342



Modem transmits at 300 and 1,200 bps

The TM-1200, a Bell 212A-compatible modem, operates full-duplex asynchronous at 300 bps or full-duplex synchronous/asynchronous at 1,200 bps, over a two-wire dial-up circuit. Front-panel controls allow users to exercise analog, digital and remote digital loop-back tests and self-test diagnostics at either of two operating speeds. The unit also features automatic answer capability. A built-in abort timer disconnects the modem from the line when the absence of a carrier is detected. \$750. **Com-Design**, 751 S. Kellogg Ave., Goleta, Calif. 93117, (800) 235-6935 or (800) 368-8092.

Circle No 343

Baseband network links Kaypro microcomputers

The Web networking system addresses as many as 100 Kaypro microcomputers at distances of up to 2,000 feet. The system consists of a circuit board that plugs into the computer, software and connecting cable. The network operates on a bus topology at 500K baud and supports CP/M programs. It features a direct communication mode, electronic mail, remote read/write and security provisions. \$350 per workstation. **Adevco Inc.**, P.O. Box 606, Camp Hill, Pa. 17011, (717) 763-1799.

Circle No 344

SWITCHING TERMINALS A PROBLEM?

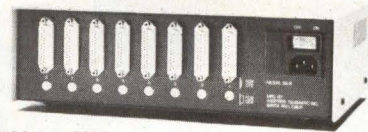
wte
has a lineup of low cost, reliable RS232 interface problem solvers.



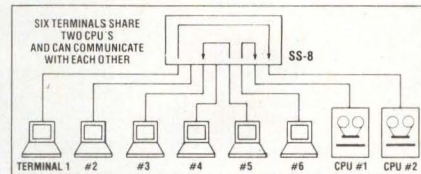
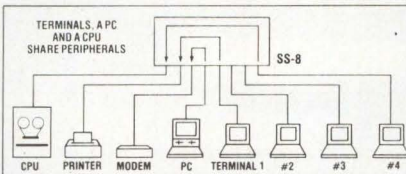
THE ANY-PORT-TO-ANY-PORT SMART SWITCH

- Allow more users to share the computer.
- Connect to multiple computer systems and equipment.

Here's an affordable way to switch up to eight RS232 ports in any interconnection. Any port can select any other port, with up to four pairs communicating at the same time. "User friendly" commands aid in port selection, port status and sign-off. The unit even signals you when the port you wanted is no longer busy. Push buttons define each port as either DTE or DCE, for quick and easy installation.



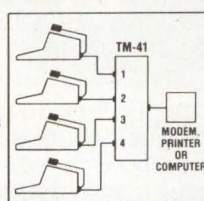
Model SS-8 = \$895.



4 PORT PUSH BUTTON SWITCHING

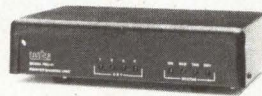


Fed up with the hassle of plugging and unplugging data cables or running around flipping switches on a mechanical box? The TM-41 electronic switch is capable of switching common RS232 signals between 4 input ports and 1 output port to select a printer, modem or computer.



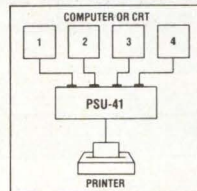
Model TM-41 = \$295.

PRINTER SHARING UNIT



The PSU-41 allows up to 4 computers or CRTs to share one printer. It scans each port until the data has been sent to the printer, then resumes scanning.

Model PSU-41 = \$395.



AB MINI SWITCH...\$89.00



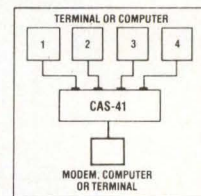
The ABS provides economical push button switching between two ports A & B, and a common port.

4 TO 64 PORT CODE ACTIVATED SWITCHING



Let your computer do the switching... automatically!

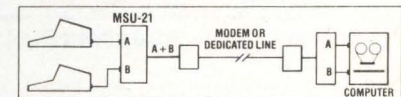
The CAS-41 lets your computer select one or any combination of up to 4 RS232 ports by a user selectable code sequence. The CAS-161 offers the same capabilities with 16 ports which can expand to 32, 48 or 64 ports.



Model CAS-41 = \$395.

Model CAS-161 = \$795.

2 TERMINALS SIMULTANEOUSLY SHARE ONE MODEM!



The MSU-21 allows 2 ASCII terminals to simultaneously share one modem or data line. MSU-21 = \$295.

AND MUCH MORE!

- Printer Buffers
- Data Cables
- Multiplexers
- Line Boosters

Send for your complete catalog. We are continuously adding new products, so if you don't see what you want, give us a call. We help hundreds of people solve their RS232 switching problems.

Call toll free for immediate information...

1-800-854-7226



western telematic inc.

2435 S. Anne St., Santa Ana, CA 92704 • (714) 979-0363 • Telex 467741

CIRCLE NO. 132 ON INQUIRY CARD

PHILON™ FAST COMPILERS

Now for MC68000/UNIX*

PHILON FAST/Compilers provide the speed of execution demanded by computer professionals.

Why so fast? PHILON FAST/Compilers are true compilers—not interpreters. Powerful optimization techniques greatly increase the efficiency of programmer's code. And, PHILON FAST/Compilers are specifically designed for the more powerful 16/32-bit architectures, not merely moved from the 8-bit environment.

PHILON FAST/Compilers for the BASICs, COBOL, and C provide winning benchmark timings for software application systems. For example, PHILON FAST/COBOL benchmarked up to 45 times faster than leading competitors!

But that's just the beginning.

Development time is slashed, too. Extensive and easy-to-read error messages and an interactive debugger help produce error-free code quickly and efficiently. Philon also provides outstanding detailed documentation and responsive customer support.

Find out more about PHILON FAST/Compilers. Just complete the coupon or call Bob Gildenberg, Vice President, Marketing at (212) 807-0303.

*UNIX is a Trademark of AT&T/Bell Laboratories

I'd like to learn more about PHILON FAST/Compilers.

Name	()	
Title	Phone #	
Company		
Address		
City	State	Zip
Computer(s)		
Operating System(s)	MMS/O	

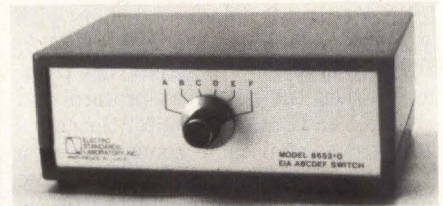
Philon, Inc., 641 Avenue of the Americas, NY, NY 10011 (212) 807-0303

PHILON™ FAST/Compilers... The Speed to Succeed

CIRCLE NO. 133 ON INQUIRY CARD

Products

DATACOMM



Interface switch provides peripherals sharing

The model 8652-D (desktop) and the model 9106 (rack-mount) EIA RS232 A, B, C, D, E, and F switches allow six terminals to use one I/O port or share one modem, or six minicomputers or microcomputers to share one printer. All connections are made via seven female 25-pin EIA connectors on the rear panel. Setting the front-panel switch routes signals from the common connector to the A, B, C, D, E or F connector. The products are speed- and code-transparent and require no power. 8652-D: \$395, 9106: \$495. **Electro Standards Laboratory Inc.**, P.O. Box 9144, Providence, R.I. 02940, (401) 943-1164.

Circle No 345

Front-end processors work with Ethernet

The EXOS 200 series of front-end processors are compatible with the Ethernet V1.0, V2.0 and IEEE 802.3 standards. EXOS 201 is a single standard Multibus board that supports 20- and 24-bit host memory addressing. EXOS 202 is a single, double-width VME board that supports 24 bits of host memory addressing and provides a 6-bit address modifier. EXOS 203 is a single quad Q-bus board that provides 18- and 22-bit memory addressing. EXOS 204 is a single quad Unibus board that supports 18-bit memory addressing. The boards employ an 8-MHz 80186 microprocessor and 128K bytes of RAM. All RAM is dual-ported between the EXOS CPU and the network. The NX 200 operating system, provided in 16K bytes of EPROM-based firmware with each EXOS 200 series product, manages the Ethernet hardware, gathers network statistics and furnishes on-board diagnostics. All EXOS 200 series products include an SBX bus with a connector that supports additional concurrent links such as RS232, RS422 or IEEE 488. Prices range from \$1,125 to \$2,225 (500 units). **Excelan Inc.**, 2180 Fortune Drive, San Jose, Calif. 95131, (408) 945-9526.

Circle No 346

New Products

SOFTWARE

Cross assembler runs on IBM PCs

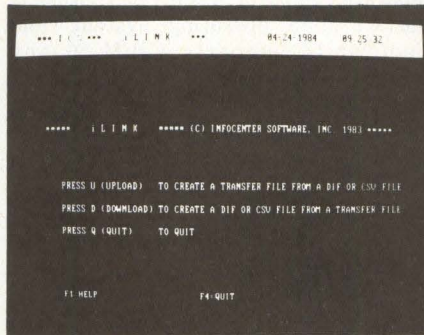
The 68000 cross assembler development system, which is written in C and runs on the IBM PC under MS-DOS, consists of a macroassembler, a linker, an object-module librarian and a cross-reference utility. The assembler features EXORmacs compatibility, conditional assembly, relocatable and absolute modes (16 sections), an include file facility, multiple input and command files, as many as 30 character symbol names, full macro capability with argument substitution and a virtual symbol table. \$500. **Oasys Inc.**, 60 Aberdeen Ave., Cambridge, Mass. 02138, (617) 491-4180. **Circle No 347**

BASIC language supports external subroutines

Applications BASIC, a business-oriented BASIC language for MS-DOS or 8-bit CP/M systems, offers external subroutines that provide procedure- and function-like features found in Pascal and C. The language supports ISAM, random and serial file handling for 65,535 records per file, one to 32,767 characters per record and one to 32,767 fields per record with optional automatic field separation. As many as 63 files can be opened simultaneously. Data-handling capabilities include automatic variable passing to other program segments, automatic decimal rounding and numeric-to-string conversion with masking. \$395. **Soft Gold Inc.**, P.O. Box 2718, Newport Beach, Calif. 92663, (714) 476-3004. **Circle No 348**

File-transfer package is dictionary-driven

With the iLink dictionary-driven software-transfer program, users can down-, up- or cross-load data files from IBM PC database and spreadsheet applications that use DIF or CSV file formats to IBM mainframe information-center products. The program downloads data by transforming mainframe data files into DIF or CSV formats that can be read by the IBM PC. The iLink package up-loads data by transforming DIF or CSV files into mainframe exchange files that can be accessed by products, packages or languages running under VM/CMS, including SAS, RAMIS, FOCUS, ADRS, APLDI and



FPS. Other features include an electronic note pad, partial source-file extraction, record ID creation, field name and width modification, row/column transposition for each transfer procedure and automatic default options. \$12,500 including magnetic tapes for two database links, 10 IBM PC diskettes, documentation and tutorials. **InfoCenter Software**, 171 Main St., New Paltz, N.Y. 12561, (914) 255-8925. **Circle No 349**

Software links VAX minis, IBM mainframes

The jnet networking software product allows VAX-11 computers running the VAX/VMS operating system to exchange files, electronic mail and real-time messages with IBM 370, 4300 and 308X computers running VM/SP and CMS. With jnet, VAX-11 computers can communicate over binary synchronous communication lines using the remote spooling communications subsystem (RSCS) networking program product protocol. To IBM computers, an attached VAX-11 using jnet appears to be another IBM computer running VM/SP. VAX/VMS digital command language commands are provided for sending files, network commands and messages over an RSCS network. Price for a 20-year license ranges from \$2,500 to \$5,000, depending on the size of the VAX processor. **Joiner Associates Inc.**, 1124 Edgehill Drive, P.O. Box 5445, Madison, Wis. 53705, (608) 238-8134. **Circle No 350**

Package develops interactive software

The NaturalLink technology package supports software development for the TI Professional and Portable Professional computers. Applications developed using NaturalLink present users with on-screen English descriptions of

command choices in an application. The NaturalLink interface guides users by controlling the selection of on-screen items. The package furnishes a screen builder for specifying the appearance and behavior of the screen in an application; a message builder for specifying help and error messages; and an interface builder for debugging grammar, specifying a lexicon and building and testing the interface file that drives NaturalLink. The package also includes linkable object code for the NaturalLink software and high-level language interface routines that allow users to call this software from MS-FORTAN, MS-Pascal or Lattice C. \$8,000. **Texas Instruments Inc.**, **Data Systems Group**, P.O. Box 1444, H-702, M/S 7929, Houston, Texas 77521, (713) 895-4600. **Circle No 351**

FORTH implemented on 68000-based computers

FourByteForth, a 32-bit implementation of the FORTH language for 68000-based computers, runs under CP/M-68K. This development system incorporates an interpreter, compiler, editor, decompiler and debugging tools. It executes the Byte Sieve in 18 seconds (10 iterations) and compiles screens at 125 per minute. The multifunction screen editor inserts, deletes and moves text around the screen or to different screens. Users can single-step through the execution of a definition from the editor, viewing the stack before and after each word is executed. \$250. **Software Architects**, 1912 Grant, Berkeley, Calif. 94703, (415) 549-3185. **Circle No 352**

ROM BIOS software makes micros IBM-compatible

Developed under strict controls to avoid copyright infringement and insured against infringement suits, this ROM BIOS software makes a microcomputer fully compatible with the IBM PC. The package also includes PC-DOS-compatible utilities, a version of MS-DOS 2.11 that uses the company's ROM BIOS software and the GWBASIC language configured to resemble BASICA. **Phoenix Software Associates Ltd.**, 1420 Providence Highway, Suite 260, Norwood, Mass. 02062, (617) 769-7020. **Circle No 353**

New Products

SOFTWARE

Electronic-mail packages utilize multiuser micros

The ComNet-8 and -16 electronic-mail software packages for 8- and 16-bit microcomputers, respectively, operate with multiuser microcomputers, in which four to 32 microcomputer users share a host computer, or within a local-area network, in which each user runs a

separate computer. ComNet-8 supports the CP/M-86 operating system, and ComNet-16 supports CP/M-86 and MS-DOS. The packages provide a keyboard-labeling system for identification of messages, distribution lists and name aliases as well as codes to identify a message's status—unread, answered, unanswered, deleted, copied or filed. ComNet-16's function-key feature ena-

bles users to invoke mail commands with one keystroke. ComNet-8N and -16N are inter-network communications packages that pick up and deliver mail and files and allow telecommunications interfaces for access to other networks via hard-wire, telephone/modem links or standard gateways. ComNet-8 and -16: \$395 each, ComNet-8N and -16N: \$495 each. **Action Technologies Inc.**, 1804 Broadway, San Francisco, Calif. 94109, (415) 775-9396. **Circle No 354**



Btrieve and Xtrieve. B-tree file access for all your programming languages. With the query tool your users demand.

Introducing a powerful data base combination for PC application developers. Btrieve™, the most sophisticated file access method for your IBM™ PC. In single user and network versions. And Xtrieve™, a new menu-driven query tool that gives you—and your users—fast access to information.

Btrieve: for professional programmers. Btrieve provides fast, flexible file management for all your application development. All your programming languages—BASIC, Pascal, Cobol, C. With multikey access to records. Automatic file recovery. Unlimited records per file. Duplicate, modifiable, and segmented keys.

With Btrieve, you can develop better applications faster.

Xtrieve: easy window interface. The ideal complement to Btrieve,

Xtrieve is the non-programmer's interface. Xtrieve's full relational capabilities let users define a virtual table of data from multiple files. Then Xtrieve speeds them through query building with a series of easy-to-follow windows.

No command language. Xtrieve is completely menu-driven, so there's no need to memorize command language. Or special syntax. Everything you need is on the screen.

Xtrieve features a full range of restriction criteria. Online help messages. And interfaces to access information from Lotus 1-2-3™ and dBase II® files.

Network capabilities. Network versions of Btrieve and Xtrieve allow data sharing in PCnet™, NetWare™, EtherSeries™, MultiLink™, and OmniNet™ LANs.

For more information or to order, contact:



SoftCraft Inc.

P. O. Box 9802 #590 Austin, Texas 78766 (512) 346-8380

Suggested retail prices: Btrieve, \$245; Xtrieve, \$195. Btrieve/N (network), \$595; Xtrieve/N, \$395. Dealer inquiries welcome. Btrieve requires PC-DOS or MS™-DOS 1.X or 2.X; Xtrieve, PC-DOS or MS-DOS 2.X.

Btrieve and Xtrieve, IBM, 1-2-3, dBase II, PCnet, NetWare, EtherSeries, MultiLink, OmniNet, and MS are trademarks of SoftCraft Inc., International Business Machines, Lotus Development Corp., Ashton-Tate, Orchid Technology, Novell Data Systems, 3Com Corp., Davong Systems Inc., Corvus Systems, and MicroSoft Inc.

CIRCLE NO. 134 ON INQUIRY CARD

System runs four PC-DOS, CP/M applications

Concurrent PC-DOS, for IBM PC or IBM PC-compatible computers with 256K bytes of memory and two floppy disk drives, runs as many as four PC-DOS or CP/M application programs simultaneously. The product supports most popular PC-DOS applications, including Lotus 1-2-3, dBASE II, Wordstar, Multimate and SuperCalc 3. Users monitor applications through windows that can be positioned anywhere on the screen and scrolled or sized to display parts of each application. A communications capability allows users to work on one application while the system receives information from a database. Productivity tools include a print spooler and a Rolodex. \$295. **Digital Research Inc.**, 160 Central Ave., Pacific Grove, Calif. 93950, (408) 649-3896.

Circle No 355

Package converts FORTRAN to C

FORTRIX-C converts FORTRAN programs and files to C code. The package includes integer-character string converters, space allocators and string parsers. In operation, FORTRIX-C converts FORTRAN flow control statements (DO, GOTO, IF ELSE, ELSE IF, CONTINUE, RETURN, END, CALL) to functionally equivalent sets of C instructions: DO loops reconstructed in C as FOR loops; CONTINUE statements are reduced to null statements; I/O statements are expanded into fully parallel sets of I/O instructions; read and write field widths are retained and the C code spacing requirements equal those of the parent FORTRAN program. The product executes at a typical conversion rate of 600 lines of code per minute. \$2,500. **Rapitech Systems Inc.**, 565 Fifth Ave., New York, N.Y. 10017, (212) 687-6225.

Circle No 356

Compiler reproduces dBASE II programs

The db/Compiler translates a dBASE II application program into low-level, directly executable modules that are generally smaller than the original application and do not require dBASE II to operate. Depending upon the characteristics of the command and data files involved, some applications execute faster when compiled. The product can legally reproduce dBASE II programs for different operating environments, including CP/M-80, CP/M-86 and MS-DOS. \$750 with the ability to produce code for one environment. Cross-linkers to produce code for additional environments cost \$350 each. **WordTech Systems Inc.**, P.O. Box 1747, Orinda, Calif. 94563, (415) 254-0900.

Circle No 357

DBL furnishes software virtual memory

Written in C, the Data Business Language (DBL) runs under MS-DOS on the HP 150, IBM PC, DG model 10, Wang PC and DEC Rainbow microcomputers. DBL, a superset of DEC's DIBOL-11, is upwardly compatible with all versions including DIBOL-83. Language enhancements include software virtual memory, full-screen programming functions and a symbolic debugger. DBL also features multikey ISAM files with a find statement for rapid lookup of random records, multidimensional arrays to support table structures and integrated sort and merge facilities for sorting sequential files. Scan and replace statements facilitate string search and replacement and fixed-point decimal data simplifies the handling of monetary data. The product also supports compile-time constants. Prices start at \$449. **Digital Information Systems Corp.**, 3336 Bradshaw Road, Suite 340, Sacramento, Calif. 95827, (916) 363-7385.

Circle No 358

C utilities provide screen-control functions

This C utilities package for IBM PCs provides functions for controlling the screen and peripherals and for performing graphics, animation and math tasks. Screen-control utilities include functions for menu selection, function-key selection, full-screen input, window

scrolling, multiple-screen pages, inverse video, blinking characters, multiple color strings and various cursor sizes. Peripheral-control utilities furnish a random-number generator, date/time function, RS232 serial port control, parallel-printer port control, input and output port control, background music and sound generator and a terminal emulator. Users can draw dots, lines,

circles or ellipses with the graphics utilities and perform multiple pattern fills and animate and store pictures with the animation utilities. The math utilities calculate sine, cosine, tangent, arctangent, arcsine, arccosine, ln, log₁₀, exponent, power, root and square root. \$119. **Software Labs**, 1221 Matisse St., Sunnyvale, Calif. 94087, (408) 730-8108.

Circle No 359

GCR

Take a minute... let's talk about the benefits of GCR (group-coded recording) tape subsystems.

Today's disk drives offer faster transfer rates and larger storage capacities than ever before, placing stringent demands on the tape subsystems used to back them up.

A high density GCR tape subsystem is your logical choice for high performance backup.

Let's Talk Benefits

GCR packs data at 6250 bits per inch—a standard tape reel holds up to

YOUR BACKUP REMEDY

180 megabytes of data! That translates into fewer tape mounts and rewinds, reducing operator involvement... and that's a saver. GCR also provides an outstanding improvement in read/write reliability. Time that was previously spent in retries and error recovery can now be used for computing. That's another saver!

Let's Talk Affordability

Until now, many thought GCR technology was out of their budget. Not anymore! At CCG - California Computer Group, our GCR subsystems start as low as \$10,500

Let's Talk Choice

You can't make the right choice unless you have a choice. And CCG helps you choose the right GCR subsystem for your DEC, DG, HP, PE and TI systems. Whether it's a Kennedy 9400, a CDC 92185 "Keystone" or a STC 2920 "Avalanche"

Let's Talk Expertise

At CCG, we're not just selling hardware... we're sharing knowledge. Our configuration specialists examine your needs, then help you determine the right GCR subsystem for your application.

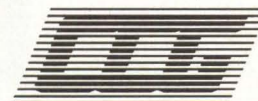
And CCG's been around—our clients include Lockheed, USC, TRW, Citibank, Mobil Oil, University of Chicago... even Notre Dame.

Let's Talk Teamwork

CCG works with you every step of the way... from your first call until your systems are up and running. And whenever you need us, we're only a phone call away.

Let's Talk

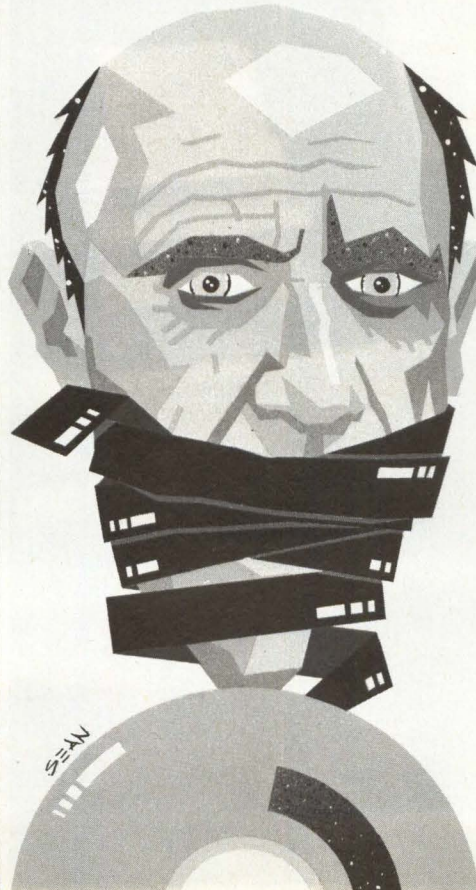
There's so much more to talk about. Call us—we'll show you how CCG can put GCR to work for you!



California Computer Group, Inc.
Making A Good System Better.

3303 Harbor Blvd., Suite G-10
Costa Mesa, CA 92626

(800) 854-7488 - Nationwide
(800) 232-1661 - California
(714) 966-1661 - Corporate



DEC, DG, HP, PE and TI are trademarks of Digital Equipment Corp., Data General Corp., Hewlett-Packard Corp., Perkin-Elmer Corp. and Texas Instruments, Inc., respectively. © Copyright 1984, California Computer Group, Inc.

If you think all port expanders are equal... HERE'S THE SWITCH!



No more scraps to see who gets to use the printer first. No more tangles with cables everytime you want to connect to peripherals. No more jostling heavy equipment around the office.

WOULDN'T YOU RATHER SWITCH THAN FIGHT?

Portal allows you to quickly and easily introduce a comprehensive switching system that will handle terminals, printers, modems, CPUs and other RS232 compatible devices. Up to 32 ports can handle 16 simultaneous connections.

SAVING TIME AND MONEY— NOW THAT'S A SWITCH

Portal gives you network capabilities at a fraction of the cost. With features such as hunt group (acts much like a multi-line telephone that will ensure the user gets through to an open mode) and wait queues that will automatically notify user once the requested peripheral is available. There's more good news and features. Call or write today for complete details.

PORTAL
ENFIN RESOURCES INC.

150 Metcalfe St.
Suite 102B, Ottawa
Ontario K2P 1P1
613-230-1759

CIRCLE NO. 136 ON INQUIRY CARD

Products

SOFTWARE

System produces BASIC source code

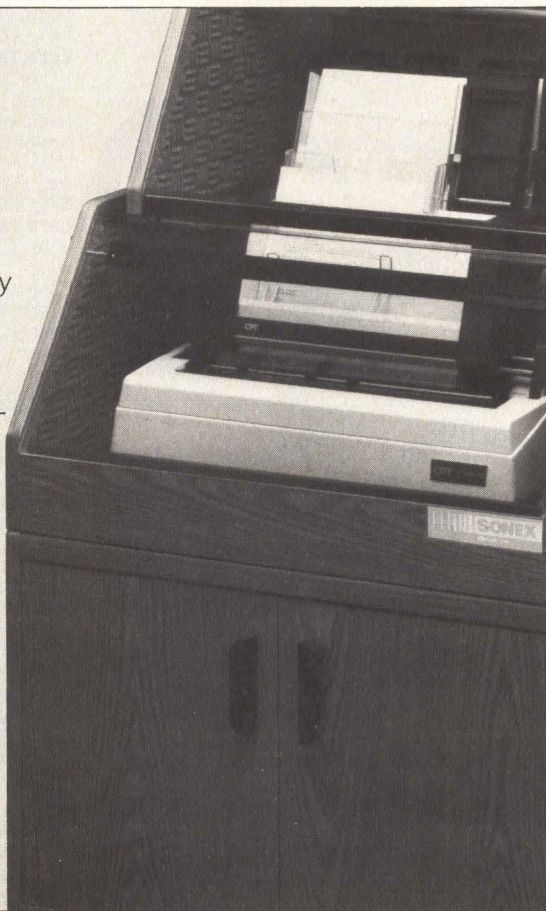
RIMS/MPG-PLUS is an application program generating system for DEC PDP-11 and VAX computers using BASIC under the RSTS/E and VMS operating systems. It allows users to produce most of the data-entry, data-manipulation and data-output programs, and the source code for those programs. The system consists of seven software modules including a dictionary (data file definition) and six program-generating modules. Features include user-selectable field and record-size maximums; multi-key/multi-file cross-referencing capabilities; multiple dictionary definitions of the same file; field redefinition capabilities; alternate and partial key look-up capabilities; standard and user-definable data types; hierarchical record structure and automatic dictionary integrity checking. For pricing information, contact **Information and Systems Research Inc.**, Airport Office Park, Building One, 410 Rouser Road, Coraopolis, Pa. 15108, (412) 262-5507.

Circle No 360

SONEX Printer Covers

Here's a quiet solution to noisy computer printers from the SONEX sound-proofing experts. SONEX acoustical foam, with a unique anechoic wedge design, has controlled industrial, computer and pro audio sound for years. Now available in a printer cover, SONEX can be ordered directly from our factory. To learn more about our printer covers and the sound control technology behind them, call us at 612/521-3555, or write for our free color brochure: 3800 Washington Ave. North, Minneapolis, MN 55412.

illbruck/usa
techniques with foams



CIRCLE NO. 137 ON INQUIRY CARD

Word-processing package is object-oriented

The CrystalWriter word-processing package is object-oriented: users specify the type of document, such as a business letter, a personal letter, a memo, a report or an envelope, to be created, and the system automatically adjusts the margins, vertical spacing, justification, tabbing, document length and printing style. Within any type of document, users can invoke a variety of appropriate formats. Once users create a text file, they can reformat it by changing document types. The package uses 20 English commands and terminal function keys with on-screen soft-key labels. Users can work with as many as 12 files at once and move back and forth among them without saving them on disk each time. The product runs on UNIX 68000-based multiuser computers. \$1,000. **Syntactics Corp.**, 3333 Bowers Ave., Suite 145, Santa Clara, Calif. 95051, (408) 727-6400.

Circle No 361

New Products

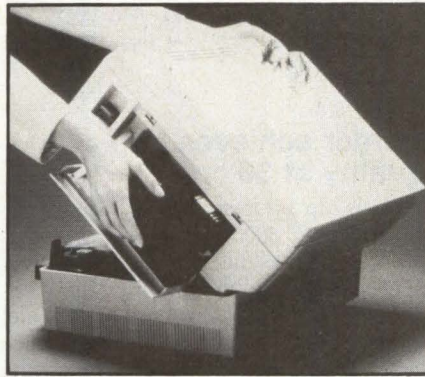
PRINTERS

Laser printer works with personal computers

The LaserJet printer produces eight pages per minute and registers a noise level of less than 55 decibels. The printer is targeted for the small business and office and works with personal computers such as the HP 150, IBM PC and IBM PC compatibles. An RS232 interface comes as standard equipment. The product can print horizontally for business correspondence or vertically to create spreadsheets, using a compressed character font. It is compatible with software packages such as Lotus 1-2-3, Multimate, Wordstar, PFS Write and BPI Accounting.

Featuring 300-by-300-dpi resolution, the unit mixes text and graphics. Users can mix four typefaces on one page. Courier 10 is standard. Other fonts are available in three-font, plug-in font cartridges.

The printer uses standard cut-sheet paper plus legal-size paper and European sizes A4 and B5. It handles bond paper with preprinted letterhead, envelopes, labels and transparencies designed for copiers. A built-in sheet feed-



Hewlett-Packard's Laserjet printer uses Canon LBP-CX technology.

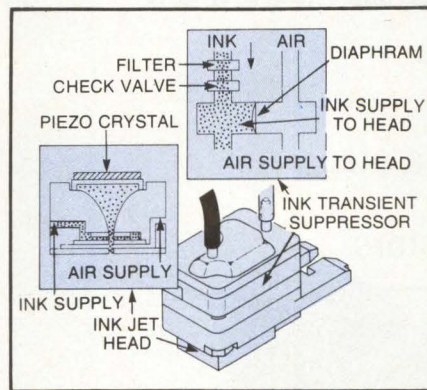
er accommodates 100 sheets of paper.

The printer employs replaceable electro-photographic cartridges that contain key imaging components including the drum. Each disposable print cartridge yields 3,000 pages. \$3,495. Hewlett-Packard Co., 1820 Embarcadero Road, Palo Alto, Calif. 94303.

Circle No 362

Ink transient suppressor adorns color ink-jet copier

Compatible with the Tektronix 4107, 4109, 4113B (option 9) and 4115B (option 9) color display terminals, the model 4692 color graphics copier uses air-assisted, drop-on-demand ink-jet technology and features an ink transient suppressor that increases copier reliability. The copier supports two printing modes. The fixed-resolution mode prints at the copier's 154-dpi addressability, producing as many as 1536 by 1152 dots in an A-size (8½ by 11-inch) image during a two-minute printing period. The variable resolution mode selectable under software control produces copies in less than one minute, depending on the image format and signal source. The product produces images on clay-coated paper or transparency film. Its interface protocol and electrical characteristics are of the Centronics type, modified to accommodate color data, four-channel copier multiplexing and the higher data rates required by color copiers. \$5,995. Tektronix Inc., Marketing Communica-



The Tektronix model 4692 color graphics copier's ink transient suppressor uses a five-micron mesh filter to trap bubbles and particles that may have worked their way into the ink system. A one-way valve prevents ink from flowing away from the ink jet heads, and a flexible diaphragm, exposed to air on one side and ink on the other, suppresses shock when the copier is jolted and moved.

tions Department, Mailing Station 63-635, P.O. Box 500, Beaverton, Ore. 97077, (503) 644-0161.

Circle No 363

Printers feature bit-mapped graphics

This line of IBM PC-compatible dot-matrix printers features an IBM extended character set and screen dump graphics. Models 12CQI and 32CQI correspondence-quality printers offer 80 or 132 columns, respectively. They print at 150 cps in draft mode using a 9-by-11 dot matrix and at 60 cps in correspondence-quality mode using a 16-by-36 dot matrix. Model 10I, an entry-level, 80-column, 80-cps printer, furnishes draft-quality printing. All three models have block, line and bit-map graphics capabilities. They handle cut sheets and fanfold paper and three-part (model 10I) or five-part (models 12CQI and 32CQI) forms. A centronics interface comes standard. \$499 to \$995. Diablo Systems Inc., 901 Page Ave., P.O. Box 5030, Fremont, Calif. 94537, (415) 498-7000.

Circle No 364



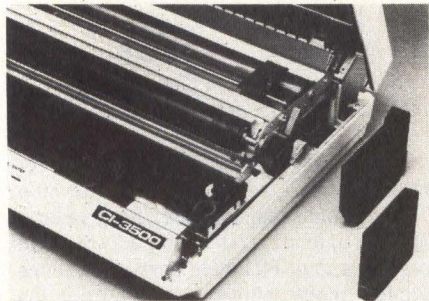
Dot-matrix printer touts long print head life

The Legend 1000 dot-matrix printer features a print head life rated at more than 100 million characters and an MTBF of more than five million lines. The printer offers a nine-wire print head, 9-by-11 dot matrix, logic-seeking bidirectional printing and incremental printing. User-selectable character sets include standard ASCII, UK ASCII, French, German and JIS. Pica, elite, condensed, double-width and double-width condensed modes are available in fixed or proportional spacing. The unit supports bit image graphics modes with a dot-pitch ratio of one-to-one and a density of 576 dots per line. Graphics and a variety of text styles can be mixed in one document. Interfacing is via a Centronics-type parallel (standard) or RS232C (optional). Friction and tractor paper feeds come standard. \$359. CAL-ABCO, 14722 Oxnard St., Van Nuys, Calif. 91401, (818) 994-0909.

Circle No 365

New Products

PRINTERS



Printer has removable interface cartridges

The DEC LA100-compatible CI-3500/model 10 printer provides task-dedicated printing speeds of 87.5 cps for letter-quality/word-processing applications, and 350 cps for data and list processing. The product plots 240 by 144 dpi in the bit-image graphics mode. Character matrixes are 17 by 16 in letter-quality mode and 9 by 9 in draft mode. Key highlights include removable interface and font cartridges. Standard features include bold face, slanting, superscripts, subscripts, variable print

densities and remote setup and forms control. An RS232C interface comes standard. Friction and tractor paper feed are provided for cut sheet or continuous forms printing. \$1,995. **CIE Terminals Inc.**, 2505 McCabe Way, Irvine, Calif. 92714, (714) 660-1421.

Circle No 366

Printer achieves letter quality at 30 cps

Made up of four models, the Paper Tiger/Series 8000 dot-matrix printers produce letter-quality output using a dual-pass technique and a staggered 18-wire print head. The high-end model achieves letter-quality printing with only one pass. The 80-column model 8010 (\$649) and 132-column model 8020 (\$849) are black-and-white units that print draft correspondence at 180 cps, text at 90 cps and letter quality at 30 cps. Models 8050 (\$1,895) and 8070 (\$2,395) are 132-column color devices. Model 8050 prints at 200, 110 and 35 cps;



model 8070 prints at 400, 200 and 75 cps. All printers support multiple-part forms, cut sheets and fanfold paper. Paper can be fed from the front, rear and bottom, manually or automatically. The printers support eight international and three scientific character sets and can print in superscripting, subscripting, bold, expanded, underscore, auto justification and emphasized styles.

Dataproducts Corp., 6200 Canoga Ave., Woodland Hills, Calif. 91365, (213) 887-8451.

Circle No 367

Eight-pen plotter fits on a desktop

The M260 drum platen plotter with x and y stepper motors fits on a desktop. The eight-pen plotter produces multicolor bar graphs, pie charts, line graphs and character graphics with 500-step-per-inch resolution. Total plotting area is 7¼ by 10½ inches on 8½-by-11-inch transparent film or non-porous paper. The plotter's repeatability is 0.002 inches without pen changes and 0.008 inches with pen changes. The unit's graphics language is a subset of HP-GL. \$995. **Strobe Inc.**, 897 Independence Ave., Building 5A, Mountain View, Calif. 94043, (415) 969-5130.

Circle No 368

Letter-quality unit prints at 50 cps

The TP 750 daisy-wheel printer operates at 50 cps at 12 pitch "AAA" pattern or at 42 cps in Shannon text. It prints 132 columns at 10 pitch. Pitch selections include 10, 12 or 15. With proportional spacing, the unit can print as many as 271 cpl. The product handles paper as wide as 15 inches. Other features include bidirectional printing, automatic centering and justification and an industry-standard instruction set. A Centronics interface comes standard. \$1,595. **TeleVideo Systems Inc.**, 1170 Morse Ave., Sunnyvale, Calif. 94086, (408) 745-7760.

Circle No 369

A Closer Look...

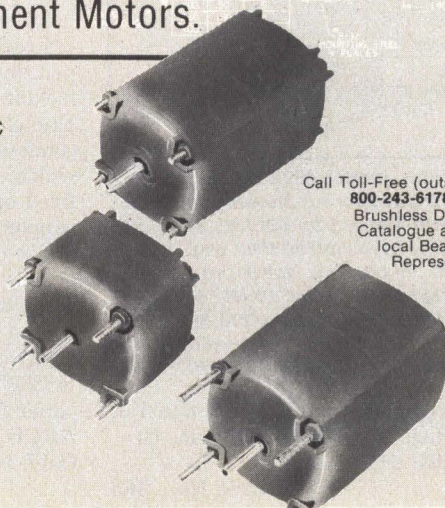
A closer look at the Beau DC Instrument Motors will show you why we're a step ahead of conventional AC and DC Instrument Motors.

It's Brushless!

- "Drop-in" replacement W/AC
- Built-in Commutating Circuit
- 4:1 Speed Variation Option
- High Torque
- Quiet Operation
- Brushless DC Servo Ratings

UMC

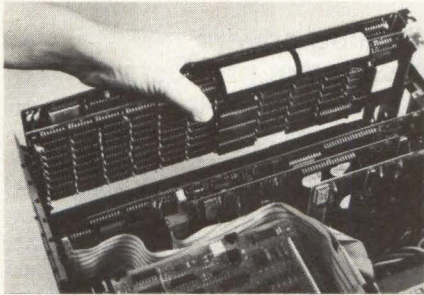
BEAU MOTOR DIVISION
UMC Electronics Company
460 Sackett Point Road
North Haven, Connecticut 06473
Phone (203) 288-7731



Call Toll-Free (outside CT)
800-243-6178 for our
Brushless DC Motor
Catalogue and your
local Beau Motor
Representative.

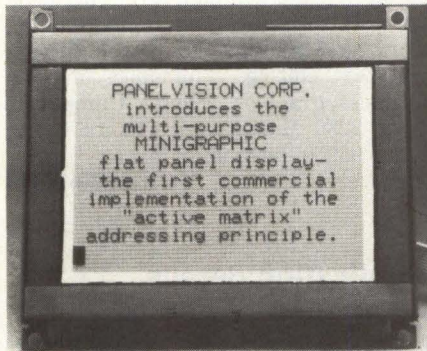
New Products

SUBASSEMBLIES



Card set turns IBM PC into graphics workstation

Featuring 672-by-480-dot resolution graphics with 512 colors per pixel, the Midas two-card set replaces the IBM color card in an IBM PC or PC/XT microcomputer. It provides 4,096 standard colors with an optional palette of 16.8 million colors. The card set also furnishes 384K bytes of graphics RAM, nine bit planes, hardware zoom with roam, DMA from its 80188 microprocessor to frame buffer, light-pen support and an MS-DOS 2.0 software driver. \$2,295. **Vectrix Corp.**, 2606 Branchwood Drive, Greensboro, N.C. 27408, (919) 288-0520. **Circle No 370**

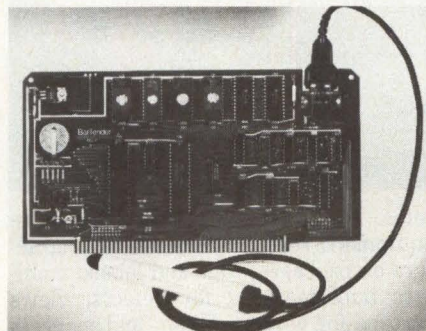


Flat panel display employs matrix addressing

The MiniGraphic liquid crystal flat panel displays up to 512 of 5 by 7 dot matrix characters in a 16-row-by-32-column format. With 24,576 pixels within a 2.56-by 3.84-inch viewing area (arranged in 128 rows of 192 pixels each), the product suits combined alphanumeric and graphics applications. Employing active matrix addressing, it offers an 8-to-1 contrast ratio, a 90-degree viewing cone, low-power operation and reflective or transmissive lighting options for ambient light conditions. The thin-film transistor-active matrix circuitry writes or updates the entire

panel in 16 msec. The display is available with a PCB controller that integrates video control, video refresh and user I/O functions. Ports are provided for serial, parallel and direct memory access inputs in bit or byte formats. Seven data communications rates are selectable from 150 to 9,600 baud. Display only, \$360 (500 units); display including controller, \$700 (500 units). **Panelvision Corp.**, 265 Kappa Drive, Pittsburgh, Pa. 15238, (412) 963-9635.

Circle No 371



S-100 board reads, prints eight bar-code formats

Using a Z80 microprocessor, the Bartender S-100 bus-compatible printed-circuit board reads eight bar-code formats. It reads bidirectionally as many as 42 bar-code data characters per label. Through a multicode feature, the product identifies and reads any scanned code. Multicode can also be programmed to read subsets of the available codes and reject others. Check digits, when applicable, are computed internally, freeing the host computer or programmer from this task. \$649 including wand, real-time clock, manual and sample programs in Z80 assembly, BASIC, Pascal, C, FORTRAN and dBASE II languages. **Bytewrite**, 5715 Klump Ave., N. Hollywood, Calif. 91601, (818) 985-5715. **Circle No 372**

System merges images and text for display, printing

The model 800 Word Image Processing System operates with the IBM PC XT computer as a front-end peripheral. It consists of the model 680 graphic scanner, the model 110 image-processing interface, WIPS software and necessary cables. The graphics scanner contains an electronic digitizing mechanism

and an illumination source. Its 8-bit, 1728-by-2846 picture-element resolution provides as many as 256 shades of gray. Scan times, scan area windows and scan modes are programmable. The scanner has a parallel interface that includes an 8-bit bidirectional data bus, plus control lines. The software enables users to create documents that integrate words and images. It interfaces with word-processing and database packages such as *Wolkswriter Deluxe*, *Visiword*, *Microsoft Word*, *Lotus 1-2-3* and *Condor 3*. \$9,945. **Datacopy Corp.**, 1215 Terra Bella Ave., Mountain View, Calif. 94043, (415) 965-7900.

Circle No 373

Controller mates SMD disks, Q-bus computers

The model DQ215 Winchester disk controller interfaces two 8- or 14-inch SMD-compatible disk drives with DEC LSI-11 series and Micro/PDP-11 computers. The self-contained quad module plugs into one Q-bus slot and connects to drives by flat cables. Features include 56-bit ECC for error detection and correction, 22-bit addressing for 4M-byte data access, and compatibility with RT-11, RSX-11 and RSTS operating systems. \$1,150. **Distributed Logic Corp.**, 12800 Garden Grove Blvd., Garden Grove, Calif. 92643, (714) 534-8950. **Circle No 374**

Multibus video controller supports four displays

The MSBC-QV3 Multibus-compatible display controller supports four independent displays. Display formats (characters per line and lines per page) are user definable to 2,000 characters per display maximum. On-board color manipulation capabilities allow independent selection of background color and foreground and underline components of each displayed character. Each component can be programmed to blink to a different color. A hardware character generator contains a 128 ASCII character set. The controller generates RS-330 video signals that drive most standard RGB video display monitors. Four built-in DTMF keyboard interfaces permit interaction with each of the four displays. \$1,620. **Matrox Electronic Systems Ltd.**, 5800 Andover Ave., Montreal H4T 1H4, Canada (514) 735-1182.

Circle No 375

New Products

LITERATURE

Brochure lists graphics software for plotters

This guide to personal computer plotters and graphics describes six graphics software packages that enable users of the HP 150 touch-screen personal computer to produce charts and graphics on the HP 7470A and 7475A graphics plotters. The guide details the features of each software package; includes sample plots to illustrate graphics capability; and lists hardware requirements, ordering information and prices. **Hewlett-Packard Co.**, 1820 Embarcadero Road, Palo Alto, Calif. 94303.

Circle No 376

Pocket guide covers enhanced UNIX

The 103-page "Quick Reference Guide to Zilog's Enhanced UNIX System" summarizes all operating-system commands and formats, serving as an easy-to-use guide for System 8000 users. The guide covers user and administrator commands, the C shell, library routines, system calls and text-processing tools. **Zilog Inc., Corporate Publications**, 1315 Dell Ave., Campbell, Calif. 95008, (408) 370-8000.

Circle No 377

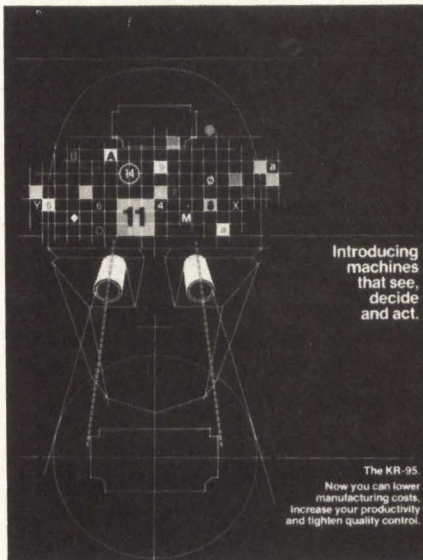
Catalog lists UNIX-based applications software

The Software Products Catalog lists more than 50 horizontal and vertical UNIX-based applications packages that run on CIE Systems computers. The publication covers business applications software such as general accounting and legal time billing, office automation software such as word processing and electronic spreadsheet, and support software such as language processors, utilities and program generators. Each entry is indexed by Standard Industrial Classification Code and by the source language in which the software is written. **CIE Systems**, 2515 McCabe Way, Irvine, Calif. 92713, (714) 660-1800.

Circle No 378

Color brochure describes vision-system applications

A four-page color brochure describes a variety of industrial vision-system applications and the use of the KR-95 image-recognition and -inspection sys-



tems. The brochure illustrates how the equipment reads alphanumeric characters on packages, tags and labels; monitors bulk material for defects; views cartons for correct filling; and inspects bottle and jars. **Key Image Systems Inc.**, 20100 Plummer St., Chatsworth, Calif. 91311, (818) 993-1911.

Circle No 379

Brochure explains UPS operation

A 20-page, illustrated brochure details electrical and performance specifications of the company's line of uninterruptible power systems. The brochure contrasts various power protection alternatives, and explains UPS operation, selection and design. **Sola Electric**, 1717 Busse Road, Elk Grove Village, Ill. 60007, (312) 228-1393.

Circle No 380

VMEbus products described in bulletin

A new line of VMEbus hardware and software products is summarized in a four-page, color bulletin. Bulletin VPSI-384 describes the primary technical and operating characteristics of products such as single-board computers, memory boards, controllers and input/output boards, backplanes, power supplies, firmware and software. **Plessey Microsystems, Customer Service Department**, One Blue Hill Plaza, Pearl River, N.Y. 10965, (914) 735-4661.

Circle No 381

Catalog covers datacomm products

A 14-page, illustrated short form catalog and price list covers Micom Systems Inc.'s range of data-communications and local-networking equipment. The booklet describes data concentrators, protocol converters, data PABXs, modems, voice/data multiplexers and mini datasets. It includes U.S. pricing for currently available products. **Micom Systems Inc.**, 20151 Nordhoff St., Chatsworth, Calif. 91311, (213) 998-8844.

Circle No 382

UNIX catalog contains 150 packages

A new Plexus computers' software referral catalog lists more than 150 UNIX application software packages available on its supermicrocomputer systems. Suited for UNIX resellers and users, the catalog serves as a reference for integrating the Plexus systems for vertical applications and for improving performance through networking and language development. Typical packages offered are for high-level language-compilation, database management, word processing, spreadsheet displaying, text editing, communications and business graphics. **Plexus Computers Inc.**, 2230 Martin Ave., Santa Clara, Calif. 95050, (408) 988-1755.

Circle No 383

Publication details datacomm products

The 32-page, color catalog covers Racal-Milgo's network components, communications networks and office network products as well as customer support services. Included in the network components section are modems, multiplexers, data service units and data encryption products. The communications network section describes large-scale network management systems as well as test sets and accessory products. The office networks section details local-area networks, protocol and code translators, terminals, printers and communications controllers. **Racal-Milgo, Corporate Communications Department**, MS 1302, 8600 N.W. 41st St., Miami, Fla. 33166, (305) 592-8600.

Circle No 384

New Products

LITERATURE

Newsletter targets engineering applications

Dedicated to showing engineers and scientists how to use their personal computers as data-acquisition systems, computer-aided design workstations, logic analyzers or microcomputer development systems, *Personal Engineering and Instrumentation News* presents industry news and application stories. This monthly newsletter permits readers to exchange tips and comments on products and design techniques. The \$25-per-year subscription fee includes membership in the Personal Engineering Computer Users' Society. **Personal Engineering Communications**, Box 983 Back Bay Annex, Boston, Mass. 02117, (617) 536-8124.

Circle No 385

Study analyzes optical data storage

A market analysis published by Freeman Reports predicts that the market for computer optical data storage will grow to \$7.3 billion by 1990. The study attributes the growth to graphics and image-storage applications and to large databases. Titled *Optical Disk Storage Outlook*, the 295-page report analyzes market characteristics and technology status, forecasts worldwide shipment volumes and revenues for three product classes from 1984 through 1990 and assesses the likely impact of optical techniques on magnetic storage. Profiles of 28 manufacturers developing optical products are included. \$1,650. **Freeman Associates**, 311 East Carrillo St., Santa Barbara, Calif. 93101, (805) 963-3853.

Circle No 386

Book explains EMI compliance

Compliance Engineering, 1984, co-edited by Glen Dash and Isidor Straus, conveys the latest information and engineering solutions for computer product EMI compliance with FCC Part 15. Articles cover site design, test, redesign and retrofit-to-comply procedures. The 175-page handbook also explains the FCC's own test procedures and site design. \$49.50. **Compliance Engineering**, 593 Massachusetts Ave., Boxborough, Mass. 01719, (617) 264-4479.

Circle No 387

Handbook clarifies graphics standards

Conflicting standards for business, engineering, scientific, educational, entertainment and publication graphics systems are compared and evaluated in the *Graphics Standards Handbook*. Edited by Edmund Van Deusen, the 300-page publication covers the Core System, Graphics Kernel System, Virtual Device Metafile, Initial Graphics Exchange Standard, Virtual Device Interface and North American Presentation-Level Protocol Syntax. It describes the functions, commands, elements, entities and control codes specified by each standard. It also includes a cross-referenced glossary of graphics standards terms. \$145. **CC Exchange**, P.O. Box 1251, Laguna Beach, Calif. 92652, (714) 494-4310.

Circle No 388

Report assesses IBM marketplace

IBM Microcomputer Strategies: Hardware and Software analyzes microcomputer markets through 1988 with particular focus on IBM's activities, products and strategies. The report predicts that IBM will claim 50 percent of the market by 1986. While noting that market barriers are on the rise, the report also delineates the competitive strategies essential for survival with IBM in the market, and for maintaining a strong market position. \$1,600. **Creative Strategies International**, 4340 Stevens Creek Blvd., Suite 275, San Jose, Calif. 95129, (408) 249-7550.

Circle No 389

Directory describes software package

The *International Engineering Software Directory*, organized by application, furnishes a technical description of engineering software packages for minicomputers, microcomputers or mainframes. The standardized directory includes information regarding minimum memory requirement, required hardware and software environments, list price, documentation, availability of updates and source code, technical support, warranty policy, delivery time and company description. \$35. **Technical DataBase Corp.**, P.O. Box 720, Conroe, Texas 77305, (409) 539-9688.

Circle No 390

Software directory lists 34,000 packages

The eighth edition of the *PC Telemart Software Directory*, edited by E.J. McFaul, contains more than 34,000 listings and descriptions of software packages. The 1,400-page, softbound book describes software products for more than 180 types of microcomputers, with listings referenced by application category and operating system, and includes a directory of software publishers. Software packages are listed for business software, programming tools, educational software, programs for home and personal use and specialized vertical market software. \$39.95. **PC Telemart**, 11781 Lee-Jackson Highway, Fairfax, Va. 22033, (703) 352-0721.

Circle No 391

Directory lists OEMs, system houses

The 1984 *Directory of Systems Houses and Computer OEMs* details more than 2,000 companies. It provides company name, address, phone number, annual sales, year established, number of employees, key personnel, end-user industries serviced, along with brand names and quantities of minicomputers and microcomputers purchased for resale, and more. A market statistics section tracks industry growth rates and compares competitive market shares of the leading minicomputer, microcomputer and peripheral equipment producers. \$397. **Sentry Database Publishing**, 5 Kane Industrial Drive, Hudson, Mass. 01749, (617) 562-9308.

Circle No 392

Graphics software survey covers 60 products

A survey of 60 graphics software packages for microcomputers, released by Data Decisions, explains which environments are suited for graphics presentation. The survey, titled *Microcomputer Graphics Software*, highlights product features via a dot chart. Each product description, arranged alphabetically by vendor, comprises applications, date of product's introduction, hardware operating system requirements, display and output capabilities, text chart features, business graphic features and retail price. \$29. **Data Decisions**, 20 Brace Rd., Cherry Hill, N.J. 08034, (609) 429-7100. **Circle No 393**

Calendar

**Your low-cost direct line
to the value-added market**

Mini-Micro Systems

DIRECT RESPONSE INFORMATION CARDS

- Sell products and services directly
- Introduce new products
- Distribute catalogs and literature
- Investigate new applications
- Develop quality sales leads

Format

Loose Card Deck / Card
Size—3½" × 5½", Live
Copy—3½" × 5½"

Mechanical Requirements

Negatives—right
reading emulsion side
down. Camera ready
mechanicals—
110 line screen

1984 Postcard Schedule

Materials Closing Date:
2/7 4/13 8/10 10/8
Mailing Date:
March May Sept. Nov.

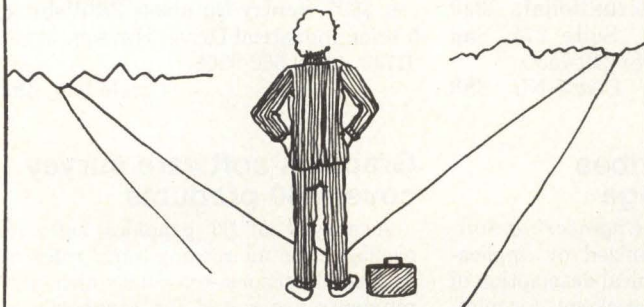
Rates

		Advertisers	Non-advertisers
1 card		1350	1600
2 cards		1300	1550
3 or more cards		1250	1500

Contact: Carol Anderson, Sales Manager
Mini-Micro Systems
Direct Response Postcards
221 Columbus Avenue, Boston, MA 02116
(617) 536-7780

CIRCLE NO. 139 ON INQUIRY CARD

**Wondering
Where
To Turn
Next?**



**Turn To
Mini-Micro Systems
Career
Opportunities
Section**

OCTOBER

- 15 Combination Show and Technical Conference for MMG members and Multibus users**, Sunnyvale, Calif., sponsored by Multibus Manufacturers Group. Contacts: Debbie Fanucchi, Microbar Systems, (415) 964-2862 or Anne Weber, MultiDynamics Inc., (213) 424-4412. Also held in Anaheim, Calif. on Nov. 9.
- 15-16 Solid Modeling Conference, "The Solid Modeling Revolution: Are You Ready?,"** Boston, co-sponsored by CAM-I and CAD/CAM ALERT. Contact: Jacqueline Cooper, CAD/CAM ALERT, 824 Boylston St., Chestnut Hill, Mass. 02167, (617) 232-8080.
- 15-17 1984 APL Users Meeting, "The Information Centre and Changing Technologies,"** the Westin Hotel, Toronto, sponsored by I. P. Sharp Associates Ltd. Contact: Rosanne Wild, Conference Coordinator or Mary Kopfensteiner, Registration Coordinator, I. P. Sharp Assoc. Ltd., 2 First Canadian Place, Suite 1900, Toronto, Ontario, Canada. (416) 364-5361.
- 16-18 West Coast Electronic Office Expo & Conference (EOE '84)**, San Jose Convention Center, San Jose, Calif., sponsored by Carlidge & Associates Inc. Contact: Show Management, Carlidge & Associates Inc., Suite 205, 4030 Moorpark Ave., San Jose, Calif. 95117, (408) 554-6644.
- 16-18 UNIX EXPO**, Sheraton Centre Hotel and Marina Expo Complex, New York, produced by National Expositions Co. Inc. Contact: Robert P. Birkfeld, National Expositions Co. Inc., 14 West 40th St., New York, N.Y. 10018, (212) 391-9111.
- 17-18 Calgary Computer and Office Automation Show and Conference**, Roundup Centre, Calgary, Alberta, Canada, sponsored by Canadian Information Processing Society, Calgary. Contact: James K. Mahon, Group Show Manager, Industrial Trade Shows, 20 Butterick Road., Toronto, Ontario, M8W 3Z8, Canada, (416) 252-7791.
- 22-25 General Electric CAE Schedules User Seminars**, Hyatt Orlando, Orlando, Fla., sponsored by General Electric CAE International Inc. and Structural Dynamics Research Corp. (SDRC). Contact: Mary Ward, GE-CAE, 300 Technecenter Drive, Milford, Ohio 45150, (513) 576-2151.
- 23-25 SEMICON/Southwest '84**, Dallas, Texas, sponsored by Semiconductor Equipment and Materials Institute Inc. Contact: Susan Castillo, Semiconductor and Equipment and Materials Institute, Suite 212, 625 Ellis St., Mountain View, Calif. 94043, (415) 964-5111.
- 25-26 "Effective Utilization of Microcomputers" Course**, Atlanta, Ga., sponsored by the Institute of Industrial Engineers. Contact: Lane Gardner Camp or Phil Harrison, IIE, 25 Technology Park/Atlanta, Norcross, Ga. 30092, (404) 449-0460. Also held on Oct. 27-28 in Atlanta.

Classified Ads

software

MicroPERT®
Project Management
for Tektronix, IBM PC, XT
 For information, call or write
SHEPPARD SOFTWARE COMPANY
 4750 Clough Creek Rd.
 Redding, CA 96002
 (916) 222-1553

CIRCLE NO. 225 ON INQUIRY CARD

IBM-PC - PLOT-10

PC-PLOT-III is an intelligent emulation of the Tektronix Model 4010 graphics terminal which runs on the IBM-PC. The program allows display and creation of picture files when connected to a host computer running PLOT-10 (tm) or compatible software. The user may save picture data files on a local diskette as they are received from the host. The program also includes local printer control, and a serial line debug mode. Utility programs included allow the drawing of a local picture data file on the screen, plotting it on a HP Model 7470A pen plotter, printing on a local printer, and scaling. VISA, MasterCard, checks, PO's accepted. \$95.00

MicroPlot Systems Co.
 2151 East Dublin-Granville Rd.
 Suite 205
 Columbus, OH 43229
 614-882-4786

CIRCLE NO. 226 ON INQUIRY CARD

software

DISKIM
 DISK I-O CACHE for 11-M
D-M-DRIVER
 DISK in MEMORY for 11-M
 Call 415-420-9579

Proto Systems 1238 Josephine St.
 Berkeley, California
 94703

CIRCLE NO. 227 ON INQUIRY CARD

INTEGRATED ACCOUNTING

System for
 CP/M Microcomputers
 GL, AP, AR, & Payroll
 Total \$300.00!
 Source Code Included
BASIC BUSINESS SYSTEMS
 P.O. Box 3453,
 Reston, VA 22090

CIRCLE NO. 228 ON INQUIRY CARD

This space should be
 working for you.
 For details call:



Linda Lovett
 (617)536-7780

hardware

**HEWLETT
 PACKARD**
 Desktop CAD/CAM
 Computer
 Systems 

**SAVINGS ON ALL
 SERIES 200/500
 WORK STATIONS**

9836S 9000 Non-HP memory
 9020S 9826A and peripherals
 CALL OR WRITE FOR DISCOUNT PRICES

**graphia
 systems center**

Box 23051 Portland, OR 97223 USA
 503-246-0202
 International Sales Telex 360-143

CIRCLE NO. 229 ON INQUIRY CARD

inventions wanted

**Inventors, Entrepreneurs,
 Product Promoters**

wanted to display concepts at
 national technology trade show

Call: 1-800-528-6050 X831

CIRCLE NO. 230 ON INQUIRY CARD

Copy Deadline:

Space reservations and advertising copy must be received by the 10th of the month preceding the issue date. Camera-ready mechanicals must be received by the 15th of the month preceding the issue date. For example, to appear in the February issue, copy must be received by January 10; mechanicals by January 15.



Linda Lovett
 (617)536-7780

CLASSIFIED ADVERTISING ORDER FORM

Mini-Micro Systems classifieds reach more mini-micro people

Rates: \$80.00 per column inch (non-commissionable)

6x program earns 5% discount; 12x program earns 10% discount.

There is no charge for typesetting classified listings. Plan approximately 50 average words to a column inch, 8 lines of approximately 38 characters per line (3 inch maximum). Please send clean typewritten (double-spaced) copy.

Category: The following categories are available; be sure to specify the category you wish to be listed under: Business Opportunities, New Literature, Selling, Buying, Trading, Seminars, Services, Software, Supplies & Accessories. (Other categories may be employed at our discretion.)

Run this ad in _____ (number issues) Reader Inquiry No. YES NO
 Ad size 1 col. wide by _____ inches deep Under _____ (category)
 Check enclosed for \$ _____ (Pre-paid orders only)

Signature _____

Name _____ Title _____

Company _____ Telephone No. _____

Address _____

City _____ State _____ Zip _____

**MAIL TO: Linda L. Lovett, Classified Advertising, Mini-Micro Systems,
 221 Columbus Ave., Boston, MA 02116**

BOSTON

Robert K. Singer
National Sales Manager
Norma E. Lindahl
Assistant To The National
Sales Manager
John J. Fahey
Regional Manager
Katie Kress
Sales Coordinator
221 Columbus Ave.
Boston, MA 02116
(617) 536-7780

PHILADELPHIA

Stephen B. Donohue
Regional Manager
1837 Route 70, Suite 302
Cherry Hill, NJ 08003
(609) 751-0170

ATLANTA

Larry Pullman
Regional Manager
6445 Powers Ferry Rd.,
Ste. 140
Atlanta, GA 30339
(404) 955-6500

CHICAGO

Robert D. Wentz
Regional Manager
Marianne Majerus
Sales Coordinator
Cahners Plaza
1350 E. Touhy Ave.
P.O. Box 5080
Des Plaines, IL 60018
(312) 635-8800

DALLAS

Don Ward, Regional Manager
13740 Midway Suite 515
Dallas, TX 75234
(214) 980-0318

DENVER

John Huff
Regional Manager
270 St. Paul St.
Denver, CO 80206
(303) 388-4511

LOS ANGELES

Len Ganz
Regional Manager
12233 West Olympic Blvd.
Los Angeles, CA 90064
(213) 826-5818

ORANGE COUNTY

Debra Huisken
Regional Manager
2041 Business Center Dr.
Suite 109
Irvine, CA 92715
(714) 851-9422

SAN FRANCISCO

Frank Barbagallo
Regional Manager
Rick Jamison
Regional Manager
Janet Ryan
Regional Manager
Laura Obradovic
Sales Coordinator
Sherman Building, Suite 1000
3031 Tisch Way
San Jose, CA 95128
(408) 243-8838

AUSTRIA

Elan Marketing Group
Neutor g. 2
P.O. Box 84
1010 Vienna, Austria
Tel: 43-222-663012 or -638461

BENELUX

Elan Marketing Group
Boschdijk 199B
5612 HB Eindhoven
The Netherlands
Tel: 32-40-455724

ISRAEL

Elan Marketing Group
13 Haifa St., P.O. Box 33439
Tel Aviv, Israel
Tel: 972-3-252967 or -268020
Telex: 341667

JAPAN

Tomoyuki Inatsuki
General Manager
Trade Media Japan Inc.
R. 212 Azabu Heights
1-5-10 Roppongi Minato-ku,
106, Japan
Tel: (03) 587-0581

TAIWAN

Mr. Donald H. Shapiro
Trade Winds, 2nd Floor
132 Hsin Yi Road, Sec. 2
Taipei, Taiwan

UNITED KINGDOM

Elan Marketing Group
5th Floor, Suite 10
Chesham House
136 Regent St.
London W1R 5FA
Tel: 437-6900
Telex: 26153

SWEDEN

Elan Marketing Group
Humlegardsgatan Nr. 5
11446 Stockholm, Sweden
Tel: 46-8-677243 or -676243

WEST GERMANY

Elan Marketing Group
Sudring 53
7240 Norb/Neckar, West Germany
Tel: 49-7451-7828

Mini-Micro Marketplace

Norma Lindahl
221 Columbus Ave.
Boston, MA 02116
(617) 536-7780

Direct-Response Postcards

Carol Anderson
221 Columbus Ave.
Boston, MA 02116
(617) 536-7780

Career Opportunities

Peggy Gordon
Recruitment Advertising Manager
P.O. Box 10277
8 Stamford Forum
Stamford, CT 06904
(203) 328-2550

Cahners Magazine Division

J.A. Sheehan, President
William Platt
Executive Vice President
Tom Dellamaria, VP/Production
Ira Siegel, VP/Research

Promotion Staff

Susan Rapaport
Marketing Communications Director
Wendy Whittemore
Promotion Coordinator
Mary Gregory
Promotion Coordinator
Liz Phillips
Promotion Assistant

Circulation

Denver, CO:
(303) 388-4511
Sherri Gronli
Group Manager

Calendar

25-28 Twin Cities Computer Show & Software Exposition, Minneapolis, sponsored by CompuShows, Inc. Contact: Ann Katchef, CompuShows, P.O. Box 3315, Annapolis, Md. 21403, (301) 263-8044 or (800) 368-2066. Also held at Civic Center, Atlanta, December 13-16.

29-31 ONLINE '84 San Francisco Hilton and Tower, San Francisco, sponsored by Online Inc. Contact: Online Inc., 11 Tannery Lane, Weston, Conn. 06883, (203) 227-8466 or (800) 824-7888.

30-31 Seventh Annual Newport Conference on Fiber-Optic Markets, Newport, R.I., sponsored by Kessler Marketing Intelligence. Contact: Conference coordinator, Kessler Marketing Intelligence, 22 Farewell St., Newport, R.I. 02840, (401) 849-6771.

29-(1) COMDEX/EUROPE '84, RAI Congress and Exhibition Centre, Amsterdam, The Netherlands, presented by The Interface Group. Contact: Peter B. Young or Linda M. Yogel, The Interface Group Inc., 300 First Ave., Needham, Mass. 02194, (617) 449-6600 or (800) 325-3330. In Europe, Rivierstaete, Amsteldijk 166, P.O. Box 7000, 1007 MA, Amsterdam, The Netherlands, Telex: 12358NL.

30-(2) Mini/Micro West '84 Computer Conference and Exhibition, Anaheim, Calif., produced by Electronic Conventions Inc. Contact: Nancy Hogan or Kent Keller, Electronic Conventions Inc., 8110 Airport Blvd., Los Angeles, Calif. 90045, (213) 772-2965.

30-(2) Wescon '84 High-Technology Electronics Exhibition and Convention, Anaheim, Calif., produced by Electronic Conventions Inc. Contact: Nancy Hogan and Kent Keller, Electronic Conventions Inc., 8110 Airport Blvd., Los Angeles, Calif. 90045, (213) 772-2965.

31-(2) Edmonton Computer & Office Automation Show, Edmonton Convention Centre, Edmonton, New Brunswick, Canada, sponsored by Canadian Information Processing Society, Edmonton. Contact: James K. Mahon, Group Show Manager, Industrial Trade Shows, 20 Butterick Road., Toronto, M8W 3Z8, Canada, (416) 252-7791.

NOVEMBER

6-8 Federal Office Automation Conference, Washington Convention Center, Washington, DC, sponsored by the National Council for Education on Information Strategies. Contact: Exposition Director, Federal Office Automation Conference, P.O. Box E, Wayland, Mass. 01778, (617) 358-5301.

13-15 INTERFACE I, Conrad Hilton Hotel, Chicago, sponsored by Society of Manufacturing Engineers, its Computer and Automated Systems Association (CASA/SME) and the American Production and Inventory Control Society (APICS). Contact: Society of Manufacturing Engineers, One SME Drive, P.O. Box 930, Dearborn, Mich. 48121, (313) 271-1500, or American Production & Inventory Control Society, 500 West Annandale Road., Falls Church, Va. 22046, (703) 237-8344.

Career Opportunities/Recruitment Advertising

Rates

	Page	3/4	1/2	1/3	1/4	Col. Inch
1x	\$3,990	\$3,140	\$2,145	\$1,605	\$1,075	\$110
3x	3,885	3,025	2,060	1,550	1,015	100
6x	3,765	2,935	1,995	1,490	985	95
9x	3,655	2,845	1,935	1,445	955	90
12x	3,530	2,755	1,880	1,430	930	85
15x	3,425	2,675	1,820	1,385	900	80
18x	3,295	2,565	1,750	1,370	870	75
24x	3,235	2,520	1,720	1,310	850	70

Circulation

Over 122,000 technically sophisticated professionals in computer operations/systems management, data communications, engineering management, systems engineering/integrators, educators and systems programming specialists.

Recruitment
Hot Line

(203) 328-2550

Call your ad in—
we'll set the type
at no charge.

Mail Film to:

Peggy Gordon

Recruitment Manager

CAHNERS PUBLISHING CO.

8 Stamford Forum

P.O. Box 10277

Stamford, CT 06904

Computer Consultants Corner

TKC

• THE KEENAN CORPORATION

FCC 15J WE WROTE THE BOOK

"Digital Design for Interference Specifications"

• FCC/VDE & Static Retrofit and Testing
• "Front End" Design Guidance

R. Kenneth Keenan, Ph.D.

8609 66th Street North Pinellas Park, FL 33565
(813) 544-2594

CIRCLE NO. 241

UNIX

System V Consultants

A professional team, with specialties in
• Applications in the C Programming Language
• UNIX Internals and Device Drivers
• Telecommunications
Contact: Marty Poulsen

PROTOCON INCORPORATED
140 Statesir Place
Red Bank, New Jersey 07701
(201) 747-8974

Micro-Mini Software Developers - Sunbelt \$30,000 to \$50,000

Telecommunications, P.C.'s, graphics, office automation, controls, data communications — op. systems, appl. diag. Q.A., tools, util. supp. — C, assembler, PASCAL, FORTRAN, PL-1, — Proj leaders, S.W. Engrs. Systems Prog., Prog. Analysts. Fees and relo paid. Call or send resume.

SALLY KING, CPC
KING COMPUTER SEARCH
9221 LBJ Freeway, Suite 208,
Dallas, Texas 75243

ELECTRONIC ENGINEERS SOUTHEAST

Openings for design engineers of circuits, computers, logic, signal, communications, testing, ATE, systems, and controls. Professional confidential service. Fee paid by employer. Send resume to:

Ted McCulloch
McCulloch & Co.
P.O. 10211
Greenville, SC 29603

CIRCLE NO. 242

Explore growth opportunities, Check BEALL!

New Plant and Plant Expansion Teams need:
Fee Paid

Technical-R & D, Manufacturing, Telecommunications
Engineering-Design, Systems, Products
Automatic-Test, Assembly
Management-Production, QC, Facilities
Planning
BEALL ASSOCIATES-Call Ray Schmitt
919/887-3193, or mail resume
P.O. Box 5225 High Point, NC 27262

System Developers 800-231-5920

Inviting resumes from individuals in the more highly technical computer related vocations such as: PHD Computer Scientists, Operating System Developers, Data Base Developers, Porting Specialists, Networks and Telecommunications, Architecture, Artificial Intelligence, Graphics Systems Developers, Microcoders and Firmware Developers, Compiler Development, etc. Special interest in emerging technology such as novel architecture, UNIX, ADA, etc. Similar interest in scientific applications developers including military, process control, data acquisition, telemetry and communications, CAD/CAM, simulation and modeling, etc.—we are a professional employment firm managed by graduate engineers. Fees are paid by the employer. All geographic locations. Send resume or call D. A. Redwine and ask for our free resume workbook & career planner.



Scientific Placement, Inc.

P.O. Box 19949 CW, Dept. MMS 2 Houston, TX 77224 713/496-6100
UNIX is a trademark of Bell Labs

CIRCLE NO. 243 ON INQUIRY CARD

DATA PROCESSING POSITIONS

\$25-\$70,000+

East Coast - Midwest - West Coast - Southeast - Southwest

• Directors of D.P. • D.P. Managers
• Project Leaders • Systems Analysts
• Programmer • Analysts • Software Programmers • IBM, DEC, Univac, Honeywell • Mfg., Banking, Insurance, Telecommunications.

Please send resume & location Preference to P.B. Darrah, (402) 330-2814.

RELIABLE "COMPUTERS"

11318 Davenport Street
Omaha, Nebraska 68154

ENGINEERS

Choice positions available in New England and Nationwide. If you earn \$25,000 or more we have a more rewarding job for you.

**Networking • Communications
ATE Engineers • Tools & Utilities SW
Real-Time SW • Memory Design**

All fees & expenses paid. Call or send resume to:

LARSEN PERSONNEL
1492 Highland Avenue
Needham, MA 02192
(617) 449-3840

Serving the high tech industries.

HUGHES

THE PEOPLE BEHIND MISSILE TECHNOLOGY'S NEXT STEP

Talented...determined...proud. The people behind Hughes Missile Systems in Tucson are leading the challenge to new technical horizons.

At Missile Systems/Tucson, Hughes people are enjoying the hospitality and sunshine of America's fastest growing technological oasis.

There is a stimulating relationship between the people and their work environment. That's what Hughes Missile Systems in Tucson is all about. People. People like you.

Current openings:

• Mechanical Design Engineers • Test Equipment Design Engineers • Production Support Test Engineers • Circuit Design (Digital/Analog/Hybrid) Engineers • Industrial Engineers • Assembly Planning Engineers • Manufacturing/CAD/CAM Engineers • Quality Assurance Engineers • RF/Microwave Design Engineers • Software Design/Scientific Programmers • Missile Systems Test and Analysis Engineers • Subsystems Design and Analysis Engineers • Components and Materials Engineers • Reliability/Product Effectiveness Engineers

Please call collect to (602) 295-4953 or send your resume to: Hughes Aircraft Company, Professional Employment, Dept. MM-10, P.O. Box 11337, Tucson, AZ 85734. Proof of U.S. Citizenship Required. Equal Opportunity Employer.

HUGHES
AIRCRAFT COMPANY

MISSILE SYSTEMS/TUCSON

CIRCLE NO. 244 ON INQUIRY CARD

National
Business
Employment
Weekly

Current
Career
Opportunities
Coast to Coast

Are you looking for a really good EDP position?

Start Your Job Hunt Right Here...
with the National Business
Employment Weekly

Every week, it includes hundreds of the best executive, managerial and professional positions available across the country. Jobs in every field, including data processing and virtually every area of technical expertise. Jobs at salaries from \$25,000 to \$250,000.

PLUS... weekly editorial features covering every aspect of career advancement. Articles on writing resumes, interviewing, salary statistics, regional employment trends, and much more.

LOOK FOR OUR SPECIAL OCTOBER 28th
"DATA PROCESSING" ISSUE WHICH
WILL INCLUDE ADDITIONAL EDP OP-
PORTUNITIES AND RELATED EDITORIAL.

Pick up a copy of the National Business Employment Weekly at your newsstand today.

Or we'll send you the next 8 issues by first class mail. Just send a check for \$32.00 to:

National Business Employment Weekly
Dept. MM 420 Lexington Ave., NY,
NY 10170

CIRCLE NO. 245 ON INQUIRY CARD

Microcomputer Systems at Advanced Micro Devices

Our Microcomputer Systems team (MCS) grew 50% last year. We plan to grow another 60% this year by taking the lead in high-performance multibus products and software for Computation, Communication, Instrumentation and OEMs.

MCS products stress leading-edge technology by using AMD's proprietary ICs. Work with state-of-the-art products like our 80186-based Communications Controller with UNIX front-end software... our megabyte memory board... 10-Mhz 8086 CPU, or intelligent storage controller. Or bring new products to market, including an Ethernet controller with networking software, a 16mb ECC memory subsystem, and a 32-bit floating point array processor board with firmware.

Communications Software Managers

Supervise a group of hardware and software communications engineers writing and porting computer communications software onto microcomputer boards. Contribute to product definition and planning, and provide technical

leadership. Requires BSEE/CS and 5 years computer communications software experience with mini or micro software development and applications.

Senior Software Engineers

Participate in the development, installation and evaluation of computer communications software products. Utilize VAX and UNIX tools to develop communications protocol and local area network software. Requires BSEE/CS and 3 years computer communications software experience. Prefer familiarity with C, UNIX, local area networks and/or communications protocols.

Product Marketing Engineers

Interface daily with Field Sales and customers to develop product strategies and sales tactics, extending MCS product line leadership for both existing and new products. Requires BSEE/CS with at least 2 years experience in technical marketing.

AMD offers an outstanding benefits package, including cash profit sharing, salary investment and various stock programs. Call Barry Greenberg weekdays at (800) 538-8450, ext. 3034 TOLL FREE. Or send your resume to Advanced Micro Devices, Dept. MM-984, MS-57, 901 Thompson Place, P.O. Box 3453, Sunnyvale, California 94088. An equal opportunity employer. Principals only, please.

**Advanced
Micro
Devices**

PICTURE YOURSELF AT BOEING COMPUTER SERVICES.

COMPUTER PROFESSIONALS.

Go ahead. Picture yourself at Boeing Computer Services, one of the largest suppliers of computer services in the nation.

Salaries are competitive. And the benefits package is comprehensive.

Plus, there's a bonus. You'll be working and living in the beautiful Pacific Northwest. In Seattle. One of the country's most livable cities. And, there are additional opportunities in eastern U.S. cities.

THESE KEY POSITIONS ARE AVAILABLE RIGHT NOW.

Operating Systems

- Develop system utilities to communicate between CYBER, CRAY and IBM 30XX computers over an NSC Hyperchannel. Experience with NOS operating system and Hyperchannel desired.
- Develop user interface software for a file management system. Experience with CYBER, CRAY or IBM 30XX required.
- Design and develop 3270 networking capability between IBM, CDC and CRAY host processors. Experience with VM/370 or Hyperchannel Technology required.
- MVS-XA, VM, CICS and IMS maintenance and problem resolution for IBM 30XX and IBM 43XX computer systems
- Performance and capacity measurement and analysis for IBM Large and Medium Scale On-Line systems.

Scientific Applications Programmers

- Engineering/scientific workstation development on micro computers. Three years FORTRAN experience required. Knowledge of DEC, PDP-11, IBM-PC and CYBER/CRAY desirable.
- CADAM Graphics software maintenance, application support and problem resolution for IBM 308X/MVS systems.



Programmer/Analysts

- Analyze the system performance of IBM MVS and VM hosts, distribution 4300, 8100 processors and SNA communication network.
- Develop Business Systems using HP3000. IMAGE, FORTRAN, PASCAL required.
- Develop and maintain Engineering applications. Relational database experience; i.e., DB2 or SQL required.
- Investigate and apply new Technology to factory automation systems. Technology includes MRC, ROBOTS, FMS and Communication.
- Perform IMS systems design and programming in a COBOL, MFS, OS, JCL, environment. Structured analysis, design and coding desired.
- Perform computer graphic software construction and maintenance on VAX computers. FORTRAN and computer graphics experience required.
- Develop/produce programmer productivity tools. Requires 3-5 years experience with UNIX Operating Systems and programming "C."

Artificial Intelligence Specialists

- Advanced degree in Computer Science, Physics or Math with 3-5 years research (or industry experience) in Expert Systems, Robotics, Natural Language Processing, Heuristic Programming, Vision, Voice, Machine Learning or Knowledge Based Systems.

Software Engineers/Analysts

- Assist in the design coding, test and integration of software for real-time (C³I) systems and simulation software. VAX/VMS, INTEL, FORTRAN and/or PASCAL desired.

Advanced Network Application

- Test, voice, image and graphics messaging and transformations, and implementation of ISO and NAPLPS protocols.

Telecommunications Programmer/Analysts

- Design, develop telecommunications software systems. LAN experienced required.

BOEING COMPUTER SERVICES

A Division of The Boeing Company

Just send your résumé to Boeing Computer Services, P.O. Box 3707-FBY, Seattle, WA 98124. Or, if you're interested in opportunities in eastern U.S. cities, send your résumé to Boeing Computer Services, 7980 Gallows Court, Dept. FBY, M.S. CV-19, Vienna, VA 22180. An equal opportunity employer.

CIRCLE NO. 246 ON INQUIRY CARD

CAREER OPPORTUNITIES...

Spokane, Washington

ISC Systems Corporation, the leader in microprocessor-based terminal systems for the financial industry, has outstanding opportunities for **HARDWARE AND SOFTWARE PROFESSIONALS** to join our expanding Spokane operation.

We are seeking:

RELIABILITY ENGINEERS - 5+ years in micro design analysis, MTBF calculations and failure analysis.

COMPONENTS ENGINEERS - 3-5 years components engineering experience in state-of-the-art microprocessor technology.

VENDOR LIAISON ENGINEER - 3-5 years in computer industry selecting, qualifying and coordinating electronic and mechanical vendors for a high volume production environment.

MANAGER - QUALIFICATION TEST - 5-10 years experience managing a qualification test organization in the computer industry.

TEST ENGINEER - 5+ years experience in product design and qualification testing.

DIAGNOSTICS TEST ENGINEER - 3-5 years experience writing diagnostic software for microprocessor-based products.

SENIOR DIGITAL DESIGN ENGINEERS - 5-7 years designing with microprocessors for a high volume production environment. Must have project management experience.

GURU - OPERATING SYSTEMS DEVELOPMENT - define and develop a structured multi-tasking O/S with open-ended migration path in a micro networking environment.

SOFTWARE DEVELOPMENT SPECIALISTS - 5-7 years microprocessor experience on operating systems, networks, data communications, languages and file-server applications.

BANKING APPLICATIONS SPECIALISTS - 4+ years software design experience on credit systems and commercial lending systems.

INTERNATIONAL SOFTWARE SPECIALISTS - 4-5 years of software design experience, preferably using Z-80 assembler on financial applications. Commercial banking and data communications experience a plus.

SOFTWARE SUPPORT ENGINEERS - 2-4 years microprocessor experience preferably in Z-80 assembler language.

ISC offers an excellent salary, extensive fringe benefits and plenty of room for advancement. To explore these unparalleled opportunities, please send your resume to: **Bill Baumann, ISC Systems Corporation, P.O. Box TAF C-8, Spokane, WA 99220.** ISC is an equal opportunity employer.

WE'RE CHANGING THE PACE OF BANKING!



Career Opportunities/Recruitment Advertising

RESUME FORWARDING SERVICE

To have your resume forwarded on to the company of your choice, simply write in the box at the right the name of the company that interests you.

Forward my brief resume to:

(Never more than 3 companies, please)

Complete the following brief resume and mail to: Peggy Gordon
MINI-MICRO SYSTEMS
P.O. Box 10277
8 Stamford Forum
Stamford, CT 06904

(Please type, or print using all caps in dark ink.)

1.

Last Name First Middle Initial

Home Address (Street, City, State, Zip)

Home Phone (Area Code) Other (Area Code)

2. *EDUCATION INFORMATION: Schools Attended*

Name Location: Degree:

Name Location: Degree:

3. *EMPLOYMENT INFORMATION:*

Name & Address of Present Employer (Will not be contacted)

Position (Please give brief description of your title and current job assignment)

Length of time with current employer _____

4. Are you willing to relocate? _____

What are your geographical preferences? _____

5. Please Check One:
U.S. Citizen _____ Permanent Resident _____ Student Visa _____

6. Foreign Language
Read _____ Write _____ Speak _____

7. Please indicate current salary _____

*Please Sign Here

Date

*Your signature will authorize us to forward the above information on to the company of your choice, in the strictest confidence. Your current employer will not be contacted.

10-84

Advertisers Index

Able Computer	226	ExpoConsul International .	248-250	Pertec Peripherals Corp.	128
Advanced Electronic Design . . .	84	Facit Data Products	229	Philips Peripherals	147
Ampex Corp., Computer Products		Falco Data Products	152	Philon Inc.	254
Div.	194-195	Flexible Computer	88-89	Plexus Computers	102
Ampex Corp., Disc Media		Fujitsu America Inc.	39	Precision Visual	224
Operation	26-27	Genicom	94	Priam	142-143
Applied Data Communications	233	Gould Inc. Software Div.	78	Pyramid Technology	22
Atron	192	Gould Inc., Distributed Systems		Qantex (Div. of North Atlantic	
AT&T Technologies, Inc.	68-69	Div.	5	Inc.)	193
Bridge Communications	6-7	Hamilton/Avnet Electronics . . .	131	Qualogy Inc.	110-111
Bubbl-tec Inc.	149	Hayes Microcomputer		Qubix	164
C. Itoh Electronics	E7	Products	174-175	RCA	53
CalComp	63, 223	Hermes Precisa Int'l	45	RDS-Relational Database	
California Computer Group . . .	257	Heurikon Corp.	235	Systems	204-205
Cambridge Digital Systems (Div.		Hewlett-Packard	50, 179	Rodime	8
of Compumart)	105	Houston Instrument Div. of		Rosscorp Corp.	218-219
Canon U.S.A. 209, 211, 213, 215, 217		Bausch & Lomb	112	Scientific Micro Systems	176
Centronics Data Computer Corp. 67		Hunter & Ready	56-57	SGS Systems Div.	18
Century Data Systems		Ibex Computers Corp.	247	Shugart Corp.	10-11
(a Xerox Co.)	241	IBM Corp.	167	Siemens Corp.	96A-B, 97
Chrislin Industries, Inc.	252	Illbruck/USA	258	Silicon Systems	206
Chung Telecommunications	4	Imperial Technology Inc.	160	Simpact Assoc. Inc.	87
CIE Systems	47	Infotron Systems Corp.	106	SoftCraft Inc.	256
CIE Terminals	21, C3	Intel Corp.	73	SyQuest Technology	144
Cipher Data Products, Inc. 150-151		Interface Group	190	Systems Strategies Inc.	168
Citizen America	132-133	Iomega Corp.	30	Tandon Corp.	48-49
Codex Corp.	115	ISI International	12, 199	TeleVideo Systems Inc.	98-99
Cogito Systems Corp.	161	Kennedy Co.	C2	Telex Computer Products Inc. .	182
Compaq Computer Corp.	75	Kimtron	173	Toei Electronics	108
CompuPro	25	Lear Siegler Inc.	116	TransNet Corp.	183
Computerwise Inc.	81	Liberty Electronics USA	200	UMC Electronics	260
Control Data Corp.—Business		Logical Microcomputer	130	Unify Corp.	196
Prod. Group	93	Madzar Corp.	160	Unisoft Systems	119
Control Data Corp.—OEM	220	Marinco Computer Products 122-123		Universal Data Systems Inc. .	136
Convergent Technologies	76-77	Masscomp	100-101	U.S. Design Corp.	244
Craden Peripherals Corp.	17	Maxtor Corp.	162-163	Versatec Inc., A Xerox Co. . . .	90
Craig Data Cable	183	Megatek Corp.	134-135	Viking Software Services	13
Cuesta System Inc.	216	Megavault	109	Visual Technology inc.	236-237
Danish Data Electronics	242-243	Metapath	184	West Computer	E4
Data Language Corp.	55	Micom Systems Inc.	C4	Western Telematic, Inc.	253
Dataproducts	127, 240	Microbar Systems	42	Wyse Technology	156-157
Delta Airlines	36	Micro Peripherals Corp.	264	Xebec	120-121
Digi-Data Corp.	158	Microscience International . . .	140	Xylogics, Inc.	34
Digital Engineering	186-187	Mini-Micro Systems	264	Zaisan	189
Digital Laboratories, Inc.	246	Mostek Corp.	64-65	Zetaco Div. of Custom Systems	138
Digital Sound Corp.	1	Motorola GMBH	E9-E10	Zilog Inc.	170
Dilog (Distributed Logic		Moya Corp.	228	Zitel	58
Corp.)	28-29	Multi Solutions	154	Ziyad	61
Electronic Conventions	238	NCR Corp.	180-181		
Electro Design Inc.	216	NCR-Board Level Products . . .	124	See P. 265 for Classified Advertisers	
Emulex Corp.	40-41, 230-231	Okidata Corp.	70, 203	See P. 267-271 for Career Opportu-	
Enfin Resources Inc.	258	Olivetti	E3	nity Advertisers	
Epson America, Inc.	169	Otari Data Inc.	82-83	See P. 273-274 for Mini-Micro	
Equinox Systems	33	Perkin-Elmer Corp.	14	Marketplace	

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

Mini-Micro MARKETPLACE

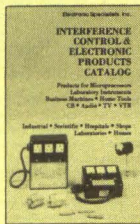
Products and services for the value-added market.

READERS: Please circle reader service numbers for additional information.

DON'T BLAME THE SOFTWARE!

Complete Hi-Tech Equipment
Protection: Write for Free Catalog!

- Power line isolators
- Spike/surge suppressors
- Power line filter/suppressors
- Twist type socket protection
- Line voltage regulators
- Line conditioners
- Modem protectors



Electronic Specialists

171 S. Main, Natick, MA 01760 (617) 655-1532
Toll Free Order Desk 1-800-225-4876

CIRCLE NO. 200 ON INQUIRY CARD

Z80 MADE E—Z

EZT, the most POWERFUL Z80* software debug tool available today for CP/M* systems features:

- Assembly Language Input.
- Disassembler.
- Direct Instruction Execution.
- Trace with Traps.
- Up to Seven Breakpoints.
- Search Mode.
- On Line Calculator.
- Binary, Octal, Decimal, Hex, ASCII.

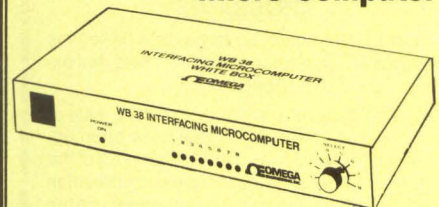
\$44.95 includes complete 100 kbyte source program on diskette. Visa, MC, P.O. or personal checks accepted.

TAYLOR MICRO TECHNOLOGY
1800 Mariposa Lane
Fullerton, CA 92633
(714) 773-4882

* registered trademarks of Zilog and Digital Research.

CIRCLE NO. 201 ON INQUIRY CARD

NEW FROM OMEGA! WB-40 Interfacing Micro-Computer



The White Box™ 40 stands alone or converts up to 8 analog signals to RS-232C format for full two-way communications with any compatible computer.

**OMEGA
ENGINEERING, INC.**

One Omega Drive, Box 4047, Stamford, CT 06907 U.S.A.
Telex 996404 Cable OMEGA FAX (203) 359-7700

(203) 359-RUSH

CIRCLE NO. 202 ON INQUIRY CARD



ALGO Message Concentrator 600

An easy, inexpensive way to network IBM-PCs or compatibles with existing mini/micro computers without the use of special bus cards or communications software. The 600 can save on telephone line costs.

- Local/Remote Networking for any group of computer systems using only one RS-232-C Port/system.
- Obeys simple command strings from your applications program.
- 6 Asynchronous RS-232 Ports.
- No special PC-Bus Cards or System Software Needed.
- Automatic, Easily Modified Message Routing.
- Complete Error Control.

Six Ported Message Concentrator priced at 1545.00

ALGO

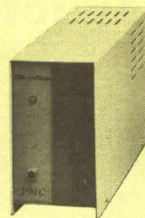
ALGO, INC.
9198-C Red Branch Rd.
Columbia, MD 21045
301-730-7442

CIRCLE NO. 203 ON INQUIRY CARD

Micromate

"the terminal converter"

128K
with
Bundled
Software



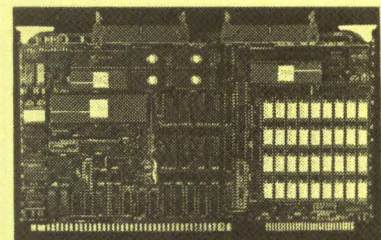
Lowest
priced
Business
Computer

You already have half of your next personal computer if you own a terminal. Just add our Micromate to run thousands of CP/M software programs and still keep the same mainframe connection.

Personal Micro Computers, Inc.

275 Santa Ana Court, Sunnyvale, CA 94086
(408) 737-8444

CIRCLE NO. 204 ON INQUIRY CARD



"68000 MULTIBUS FAMILY OF SINGLE BOARD COMPUTERS. Featuring 8 or 10 MHz processors, 128 or 256kB single or dual port no-wait-state memory, expandable to 8MB. Async, Bisync, and HDLC ports with RS232, 423 and 422. Up to 64kB of EPROM, 6-16 bit timers, Centronix or SASI parallel I/O. All are multimaster, 5V only and software compatible. Available with UNIX, Fortran, Pascal and others. From \$1990 qty/1. PACIFIC MICROCOMPUTERS, 119 Aberdeen Drive, Cardiff, CA 92007. (619) 436-8649.

PACIFIC

MICROCOMPUTERS, INC.
119 Aberdeen Drive
Cardiff, California 92007
Telephone (619) 436-8649

CIRCLE NO. 205 ON INQUIRY CARD

TALK BACK to your PC ...and listen

TRUE SPEECH CAPABILITY FOR THE IBM PC!

The DIALOG Voice System digitizes speech in real time, stores it on disk, and plays it back on command. Each board comes complete with the software drivers to hook our hardware to the applications program of your choice.

WHAT WILL IT DO FOR ME?

Applications include verbal annotation of text, electronic mail and messaging, intelligent phone management, telemarketing, and remote data entry. Dialogic provides the optimum speech I/O "engine" for the IBM PC world.

HOW DO I GET ONE?

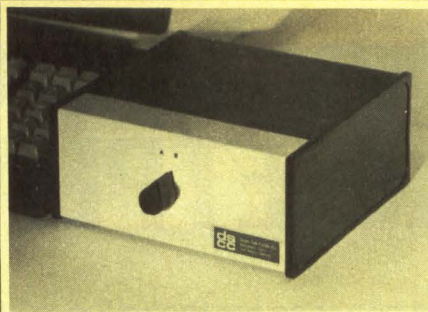
DIALOG/1, the basic model, is priced at \$295. DIALOG/2, with an intelligent phone interface and touch-tone decoding, is \$495. DIALOG/3, with modem, is \$595. Each board comes with a detailed user's manual, diskette, with the software drivers, and demo package.

Call or write us for detailed specs.
Toll-free at 800 221-0393, or direct at 201 386-0202.
DIALOGIC CORPORATION/164 McKinley Avenue
East Hanover, NJ 07986



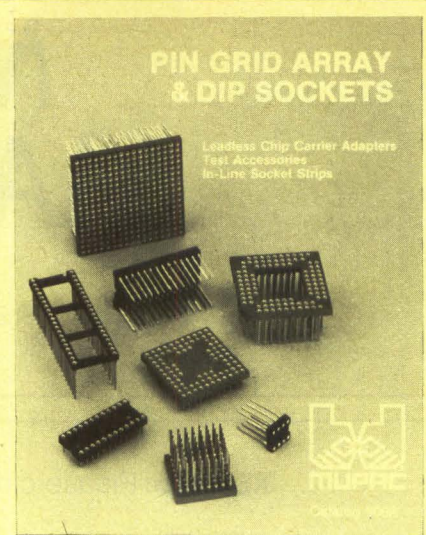
Talk back. With DIALOGIC.

CIRCLE NO. 206 ON INQUIRY CARD



SWITCH BOXES CAN ADD TO THE VERSATILITY OF YOUR HARDWARE. Data Set Cable provides ABC & ABCDE boxes in a wide variety with all kinds of connectors. Avoid need to change cables manually. Economical, too - ultra-compact ABC Single Coax box only \$55. In addition, Data Set has the biggest selection of interface cables, test equipment and other essentials to support your DP department. Send for catalog to **Data Set Cable Co.**, 722 Danbury Road, Ridgefield, CT 06877 - (203) 438-9684 or Las Vegas - (702) 382-6777.

CIRCLE NO. 207 ON INQUIRY CARD



PIN GRID ARRAY & DIP SOCKETS

Leadless Chip Carrier Adapters
Test Accessories
In-Line Socket Strips

10 Mupac Drive, Brockton, MA 02401
Tel (617) 588-6110 TWX (710) 345-8458

CIRCLE NO. 208 ON INQUIRY CARD

Winchester Back-up/Restore for CPM 86 CPM and DOS with CROSSAVE™

Now you can back-up large data base files from a Winchester to a floppy for files that exceed the diskette capacity.

CROSSAVE will save and/or restore a file or a selected group of files that have been updated. It also backs up and restores all of the files on the Winchester. It uses compression to reduce storage space requirements on the floppy and expands the file upon restoration. Requires IBM PC/XT or clone with 128K RAM, one floppy and one hard disk drive, CP/M 86, CCP/M or PC DOS 2.0. Price \$99.00



**AWARD
SOFTWARE,
INC.**

236 North Santa Cruz Ave., Los Gatos, CA 95030
(408) 395-2773

CIRCLE NO. 209 ON INQUIRY CARD

DEDUCT MY
COMPUTER?



ONLY IRS
IF YOU PROVE
50% BUSINESS
USE!

DEDUCT YOUR COMPUTER?

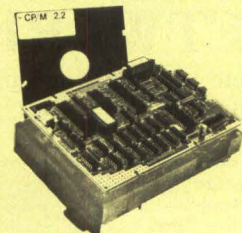
New tax laws require proof of 50% business use. The *PYD* (Prove Your Deduction) program records and reports use on most CP/M and MS-DOS computers.

Only \$24.95
Call BCD = COMPUTERS
(800) 223-5369 EXT 242

CIRCLE NO. 210 ON INQUIRY CARD

The Little Board™ ...\$199*

The world's simplest and least expensive CP/M computer



- 4 MHz Z80A CPU, 64K RAM, Z80A CTC, \$728 Boot ROM
- Mini/Micro Floppy controller: (1-4 Drives, Single/Double Density, 1-8 sided, 40/80 track)
- Only 5.75 x 7.75 inches, mounts directly to a 5 1/4" floppy drive
- 5 RS232C Serial Ports (75-9600 baud & 75-38,400 baud), 1 Centronics Printer Port
- Power Requirement: -5VDC at .75A; +15VDC at .05A/On-board -18V converter
- CP/M 8.0 BIOS • ZCP/3 CCP • Enhanced AMPRO BIOS
- AMPRO Utilities Included:
 - read/write to more than 5 dozen other formats (Kaypro, Teletype, IBM CP/M86....)
 - format disks for more than a dozen other computers
 - format/copy/verify all in one
 - menu-based system customization
- SCSI OPTION • BIOS and Utilities Source Code Available
- Custom Versions: Contact Factory • OEM enclosure available

AMPRO
COMPUTERS, INCORPORATED

67 East Evelyn Ave. • Mountain View, CA 94041 • (415) 962-0230 • TELEX 4940302

CIRCLE NO. 211 ON INQUIRY CARD

ZX-5000™ EXTENDED RANGE™ SURGE SUPPRESSORS



SULTON DESIGNS INC

111 S. Cayuga, Suite 200 • Ithaca, NY 14850 • 607-277-4301

CIRCLE NO. 212 ON INQUIRY CARD

Like-new products



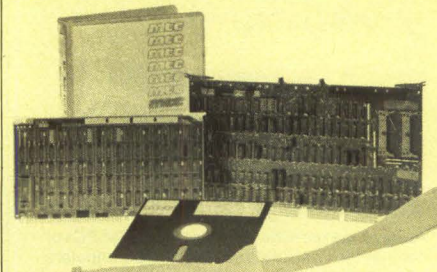
Like-new
electronic
instruments
For Sale
Now!

Catalog
(800) 225-1008

REI Sales Company

For free catalog,
phone toll-free (800) 225-1008
In Massachusetts (617) 938-0900
Genstar REI Sales Company

CIRCLE NO. 213 ON INQUIRY CARD



HIGH SPEED BUS COUPLER

MTC's Bus Couplers provide high speed DMA Data Transfers between Multibus and Unibus, Q-Bus or other Multibus based computers. Transfer rates from one to four MB/SEC are possible depending on the busses connected. Double buffered operations, 64K word block transfers and a parity mode are also possible. The link to DEC Systems is DR11W compatible and fully supports interprocessor link mode.

A coupler kit includes two boards, cables, user manual, and an iRMX 86 Driver. OEM configurations available.

MESA TECHNOLOGY CORPORATION

16021 Industrial Drive, Gaithersburg, MD 20877
Tel.: 800-638-2039. Inside MD 800-492-3198

CIRCLE NO. 214 ON INQUIRY CARD



You won't get over what this 350 CPS printer does for under \$2,000.

When you see what the CI-3500 Serial Printer can do, you might not believe it's priced under \$2,000.

Besides giving you data processing printing at 350 CPS, the CI-3500 delivers letter quality printing at a rapid 87 CPS—more than twice the speed of most daisy wheel printers.

And you also get the capability for high resolution graphics, up to 240 X 144 DPI.

The office friendly CI-3500 is as flexible as it is versatile, especially for a table top, workstation printer. For example, a convenient interface cartridge system allows you to change your printer interface simply by changing cartridges.

A DEC-LA100® compatible cartridge is standard, but additional cartridges are available for interfacing with other systems, such as the IBM PC.

A similar font cartridge system accommodates multiple fonts and character sets, so you can avoid costly PROM installations.

The CI-3500 Serial Printer for under \$2,000. Whatever you need in a printer, you won't get over what it will do for you. To find out more, just write or call CIE Terminals, 2505 McCabe Way, Irvine, Ca. 92714-6297. (714) 660-1421.

Or call toll-free 1-800-854-5959. In California, call 1-800-432-3687.



CIE TERMINALS
A CITICORP ELECTRONICS COMPANY

® DEC LA100 is a Registered Trademark of Digital Equipment Corp.
© CIE TERMINALS, INC. 1984

CIRCLE NO. 141 ON INQUIRY CARD

Local networks are easy— until you have to install one yourself.

Then you'll find they can be a real mess. You have to determine optimal wire runs, make up the right cables with the right connectors, meet FCC shielding requirements and local insulation codes, perhaps drag cable above drop ceilings, through walls, and between floors of your building. And then document where each cable runs and what it serves.

At best, do-it-yourself cabling can be a headache; at least as often, it turns out to be a real nightmare.



But it doesn't have to be that way. You can let INSTANET Cable's professionals "cater" to your networking requirements—from network design, to installation, to finished documentation—anywhere in the country.

You don't install networks every day; they do. It's that simple. Regular twisted pair? Coax? Voice/data? Ethernet? They've done them all.

Avoid the mess. Call our toll-free 800 number today for a menu of our cabling products and services.



**Avoid the
local network
cabling mess.**

**Enjoy cabling
à la carte from
INSTANET CABLE.**

INSTANET™ CABLE

INSTANET Cable, Inc., a subsidiary of MICOM Systems, Inc. • 1 Map Hill Drive • Babson Park, MA 02157 • (617) 235-5964
Regional Offices • Atlanta, GA (404) 435-2999 • Boston, MA (617) 527-4010 • Chicago, IL (312) 964-0551 • Dallas, TX (214) 258-0774
Los Angeles, CA (805) 583-8600 • San Francisco, CA (415) 327-0890 • St. Louis, MO (314) 576-7626 • Teaneck, NJ (201) 836-4000

For literature please call: (800) "MICOM U.S."

Or contact your nearest representative directly. • AK: Anchorage (907) 561-1776 / Juneau (907) 789-4101 • AL: (800) 327-6600 • AR: (214) 620-1551 • AZ: (602) 994-5400
CA: Anaheim (714) 635-7600 / Lodi (209) 334-1961 / San Diego (619) 565-1557 / San Jose (408) 298-7290 • CO: Denver (303) 777-8070 • CT: (617) 235-5520 • DE: (800) 537-8324
FL: (800) 432-4480 • GA: (800) 327-6600 • HI: (808) 537-9758 • IA: (402) 895-5850 • ID: (801) 466-6522 • IL: (312) 255-4820 • IN: (317) 846-2591 • KS: (816) 252-3700
KY: (502) 228-5401 • LA: (800) 327-6600 • MA: (617) 235-5520 • MD: (301) 340-0600 • ME: (617) 235-5520 • MI: (313) 588-2300 • MN: (612) 425-4455
MO: Independence (816) 252-3700 / St. Louis (314) 721-0401 • MS: (800) 327-6600 • MT: (801) 466-6522 • NC: (800) 327-6600 • ND: (612) 425-4455 • NE: (402) 895-5850
NH: (617) 235-5520 • NJ: (800) 537-8324 • NM: Albuquerque (505) 292-1212 / Las Cruces (505) 524-9693 • NV: (714) 635-7600 • NY: Albany (518) 459-5891 /
Buffalo (716) 662-4568 / New York City (914) 368-0325 / Rochester (716) 424-7492 / Syracuse (315) 455-5841 • OH: Cleveland (216) 524-5930 / Dayton (513) 434-7500
OK: (405) 478-5000 • OR: (503) 224-3145 • PA: East (215) 672-5412 / West (412) 892-2953 • RI: (617) 235-5520 • SC: (800) 327-6600 • SD: (612) 425-4455
TN: (800) 327-6600 • TX: Dallas (214) 620-1551 / Austin (512) 327-8600 / El Paso (915) 542-1762 / Houston (713) 353-7728 • UT: (801) 466-6522 • VA: North (301) 340-0600 /
South (800) 327-6600 • VT: (617) 235-5520 • WA: (206) 454-2383 • WI: (414) 784-9379 • WV: East (301) 340-0600 / West (412) 892-2953 • WY: (303) 777-8070
Washington, DC: (301) 340-0600 • Puerto Rico: (809) 753-1771

IC003

CIRCLE NO. 142 ON INQUIRY CARD