

Mini-MicroSystems

A CAHNERS PUBLICATION

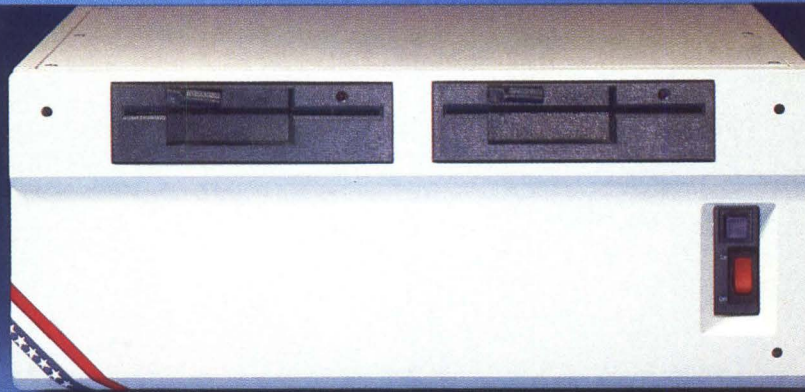
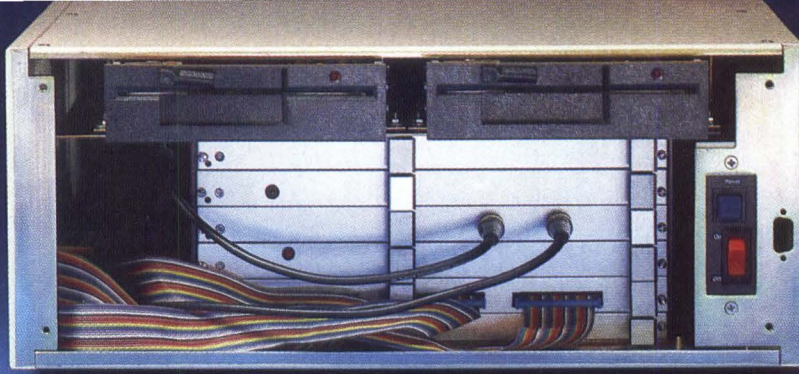
FEBRUARY 1986

SPECIAL REPORTS:

- **SCSI opens integration opportunities**
- **Super-SCSI controllers boost I/O performance**
- **Software tools speed integration**

**Controller combines
VMEbus and ESDI
for fast data transfer**





The Americanization of VME.

If you're faced with the problem of putting a VMEbus system together, then look at the American solution to the Eurocard packaging dilemma.

Look first at the location of the VME cards. The front panels are *behind* the enclosure front panel. So you can attach cables to card fronts without having them clutter your bench or dangle down your rack.

We even have enclosures with rear mounting card racks, so all cable and card access can be from the rear.

FCC Class A

Unlike most VME enclosures, ours are all designed to meet American FCC Class A EMI/RFI specs, because the front panel openings are hidden from the outside world.



Then look at the American style construction. Far from the erect-it-yourself framework of most Eurocard card racks, Electronic Solutions enclosures have a separate, ruggedly-built card cage inside the enclosure, along with a separate hard-wired power supply and an easily customized front panel. For appearance that counts, Electronic Solutions enclosures can make your VMEbus system deserve that second look.

Standard Peripherals

You can mount standard 5 1/4" disk drives or other devices in our 5-slot SE-805 and SE-805DM VME enclosures—you don't need specially-designed, expensive VMEbus modules to add peripherals. Each has room for two half-height 5 1/4" drives accessible from the front panel and room for an additional full height Winchester inside.

Electronic Solutions VME enclosures are available in a broad range of tabletop, rack mounting, and free-standing DeskMate™ styles, from 3 to 20 slots.

Call us today for all your VME packaging requirements.

 **Electronic
Solutions**

The solution to the VME packaging dilemma.

3 Year Limited Warranty

9255 Chesapeake Drive, San Diego, CA 92123 • (619) 292-0242 Telex II (TWX): 910-335-1169

Call Toll Free: (800) 854-7086 In Calif: (800) 772-7086

CIRCLE NO. 1 ON INQUIRY CARD

We just lost Pittsburgh! Where's the datacomm manager?



Don't jump.

Network management.

With it, you're on top of the world. Without it, you're a goner.

Hold on.

We're Infotron. We design, build and install communications networks.



Reliable. Compatible. Sophisticated networks that offer single-point control and real-time monitoring.

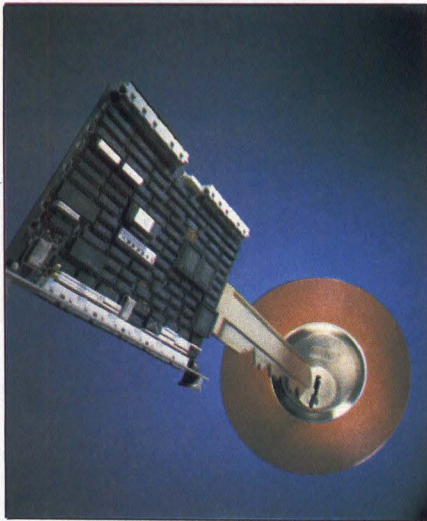
Our ANM Advanced Network Manager, coupled with a 990/992NP Network Processor, can pinpoint real or potential trouble spots,

plus eliminate costly downtime by automatically rerouting data.

Control yourself. Take the first step: Call 1-800-345-4636.



 **INFOTRON** SYSTEMS



p. 25 Xylogics's new 712 controller. Design by Beaupre and Company. Art direction by Vicki Blake. Photography by Stephen Grohe. Courtesy of Xylogics Inc.

NEWS/INTERPRETER

Controller combines VMEbus, ESDI for fast data transfer. 25

Fiber LANs: A market groping toward the light 27

Tolerant Systems justifies the name. 33

Data General's challenge now lies in marketing 34

IBM's Token-Ring finds competition from Europe. 41

VERTICAL MARKET INTEGRATOR

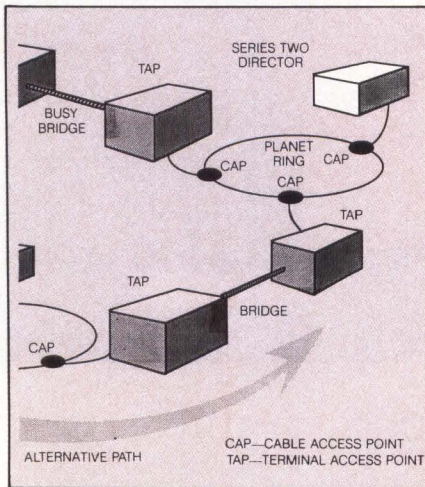
On-line service aids government contractors 49

* DIGITAL DIRECTIONS

(begins opposite Page 110)

DEC supermicros attain VAX storage levels D1
 DEC's 16-bit MicroPDP-11/83 and the 32-bit MicroVAX II accomodate the huge disk capacities of high-end VAXes, thanks largely to Digital Storage Architecture

*Appearing in issues of subscribers who have indicated having DEC computers



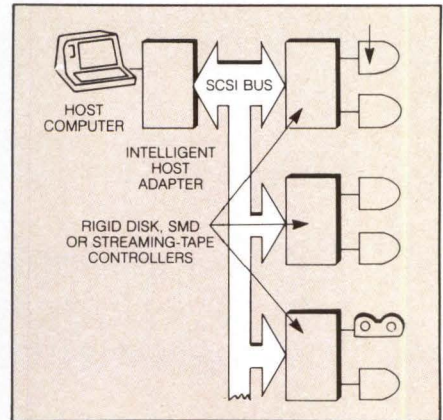
p. 41 European competition

Cahners Publishing Company • Publishers of specialized business magazines in • Building and Construction • Electronics and Computers • Foodservice • Manufacturing • Medical/Health Care.

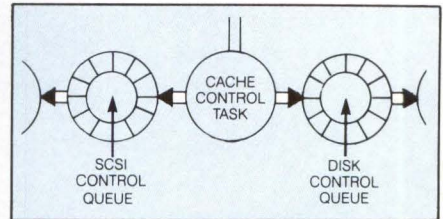
MINI-MICRO SYSTEMS (ISSN 0364-9342) is published monthly with additional issues in February, April, June and November by Cahners Magazine Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158. William M. Platt, President; Terrence M. McDermott, Executive Vice President. Copyright 1986 by Reed Publishing USA, a division of Reed Holdings Inc., Norman L. Cahners, Honorary Chairman; Saul Goldweitz, Chairman; Ronald G. Segel, President; Robert L. Krakoff, Executive Vice President. Circulation records are maintained at Cahners Publishing Co., 270 St. Paul St., Denver, CO 80206. Second class

FEATURES

Feature Highlights	53
Tools speed software integration	55
Increasingly sophisticated software tools facilitate the construction of customized integrated software packages	
SCSI opens integration opportunities	71
The small computer systems interface meshes a broad range of peripherals with a wide variety of architectures	
ESDI joins interface ranks	83
Established peripheral interface standards ST506/ST412 and SMD are holding their own, but latecomer ESDI is penetrating new application areas, particularly those with optical disks and varied peripherals	
Super-SCSI controllers boost I/O performance	95
Need fast access to mass-storage devices for multiuser/multitasking computer systems? Consider controllers with bus disconnect/reconnect, command chaining and queuing capabilities	
Comdex in Japan: 'Share the opportunity'	105
The second annual conference seeks to turn the Asian computer-resale market into a global marketplace	



p. 71 SCSI opens opportunities



p. 95 Speeding integration

DEPARTMENTS

Editorial Staff	4
Editorial	5
Letters	9
Breakpoints	15
New Products	113
Index to Advertisers	131
Classified Advertising	122
Career Opportunities	127
Mini-Micro Marketplace	132



p. 105 . . . See you at Comdex/Japan

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 European-based corporate and technical management, systems engineers and other personnel who meet qualification procedures. Available to others at the rate of \$65 per year in the United States; \$70 in Canada and Mexico; \$95 surface mail in all other countries; air mail surcharge, \$35 (16 issues). Special HANDBOOK issues, \$15. Single issues, \$5 in the United States; \$6 in Canada and Mexico; \$7 in all other countries.



© 1986 by Cahners Publishing Company, Division of Reed Holdings Inc. All rights reserved.

DEC Users

The waiting for disk response is over

- Finally there is a cost-effective way to speed up PDP-11 and VAX computers.
- Waiting time for disk access can be dramatically reduced.
- Caching and disk emulation techniques combined.

With the MegaDSC-11 high performance storage management system.



If your system is I/O bound because of disk intensive applications, the MegaDSC-11 can significantly increase your system's performance.

How?

The MegaDSC-11 intelligent disk caching system anticipates the data most likely to be needed by the CPU and holds that data in high-speed cache memory. Many read responses come directly from the cache memory, thereby eliminating mechanical motion as a factor in disk access time. Extra performance is gained by off-loading storage management functions from the CPU.

Features:

32MBytes of cache • Solid-state disk emulation
• Transparent to existing system software • Provides all UDA 50 functions • Supports MSCP protocol • Multiporting • Automatic error detection and recovery • User selectable caching algorithms • Volume shadowing.



Imperial Technology, Inc.

831 S. Douglas Street • El Segundo, CA 90245
Telephone: (213) 536-0018 • Telex: 664469

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 Projects Editor: **Rick Dalrymple**
Western Editor: **Carl Warren**
Irvine, (714) 851-9422

Senior Associate Editor: **David Simpson**
European Editor: **Keith Jones**
London: (011-441-661-3040)

Associate Editor: **Frances T. Granville**
Associate Editor: **Lynn Haber**

Associate Editor/Research: **Frances C. Michalski**
Associate Western Editor: **Mike Seither**

San Jose, (408) 296-0868

Associate Editor: **Gregory Solman**

Associate Editor: **Michael Tucker**

Associate Editor: **Jesse Victor**

Assistant Editor/New Products: **Megan Nields**

Assistant Editor/Research: **Pamela Gorski**

Contributing Editors

Andrew Allison

Mini/Micro Computer
Product Consultant

Raymond C. Freeman Jr.

Freeman Associates

Washington, D.C.: **Stephen J. Shaw**

(202) 387-8666

Gene R. Talsky

Professional Marketing Management Inc.

Edward Teja

Freehold Corp.

Editorial Production

Senior Copy Editor: **Arsene C. Davignon**

Production Editor: **Mary Anne Weeks**

Editorial Services

Carey Highley, Terri Gellegos

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

Art Staff

Art Director: **Vicki Blake**

Assistant Art Director: **Cynthia McManus**

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

Production Staff

VP Production: **John Sanders**

Supervisor: **William Tomaselli**

Production Manager: **Betsy Cooper**

Composition: **Diane Malone**

Editorial Offices

Boston: 275 Washington St., Newton, MA 02158, (617)964-3030. **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. **London:** PO. Box 37E, Worcester Park, Surrey, KT4 8RQ, 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.

EDITORIAL

U.S. AGENCY ASSESSES DISK STORAGE INDUSTRY



A recent study by the Office of Computers and Business Equipment/Science and Electronics in the U.S. Department of Commerce examines the reasons for the U.S. disk-storage industry's loss of market share and evaluates the major factors that will affect future competitiveness.

In 1981, the U.S. trade surplus for computer equipment and related parts peaked at \$6.9 billion, with \$8.5 billion in exports and \$1.6 billion in imports. Since then, the surplus has declined to about \$5.9 billion in 1984, representing \$13.5 billion in exports and \$7.6 billion in imports. If current trends continue, however, this surplus could turn into a deficit in 1986. Substantial imports of computer peripherals, principally disk-storage devices, printers and display terminals, have originated with foreign suppliers and U.S. overseas subsidiaries.

By bringing their production techniques to bear on high-volume, price-sensitive, disk drive products, companies in Taiwan, Hong Kong and Japan represent serious foreign competition. In an effort to remain price-competitive, most U.S. disk storage suppliers have moved all or a portion of their production offshore.

In addition to price, five other competitive factors determine an industry's position in the world disk-storage market: ready availability of the product in sufficient volume; performance; quality; marketing, including after sales service and support; and socio/political factors, such as government-imposed market restrictions. The U.S. disk-storage industry has advantages over its competitors in marketing and performance. However, its lead in performance is eroding. Likewise, the U.S. disk-storage industry remains even in terms of availability and quality, but suffers from disadvantages in price and socio/political factors.

The following policy options are recommended actions for the U.S. government in order to address the foreign-competition:

- Encourage incentives, such as tax breaks, to expand domestic production.
- Encourage expansion of research and development by establishing a permanent R&D tax credit, by expanding the present tax credit to cover expenses incurred in developing a process or production-equipment technology and by encouraging increased private sector R&D consortia and joint university/private sector R&D programs.
- Encourage automation in manufacturing through tax and financial incentives.
- Work diligently through bilateral and multilateral forums to lower foreign barriers to free trade.
- Ensure that signatory nations adhere to international conventions on intellectual property rights. Combat violations of U.S. patents and trademarks by insisting that countries seeking access to the U.S. market provide protection for U.S. intellectual property in their domestic markets.
- In the development of U.S. export control policy, strike a balance between national security and commercial interests so as not to place U.S. suppliers at a competitive disadvantage.
- Recruit small-to-medium-size companies for participation in export promotion programs and encourage the use of export trading companies to penetrate foreign markets.

In sum, U.S. government efforts could address the sharply declining U.S. share of the global disk storage market by helping to develop an environment that fosters innovation, promotes cost-competitiveness with foreign nations and seeks to lower barriers to international competition.

Copies of the Department of Commerce report can be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, or call (202) 783-3238. Please refer to order number 003-009-00461-6.

A handwritten signature in cursive script that reads "George V. Kotlly".

George V. Kotlly
Editor-in-Chief



Open more doors, and you can sell

It's not a one-problem market out there. And single-solution thinking may get your foot in the door. But no further.

Sperry has not one answer, but many. A range of products and applications to fit not only today's prospect, but the valued customer he'll be tomorrow.

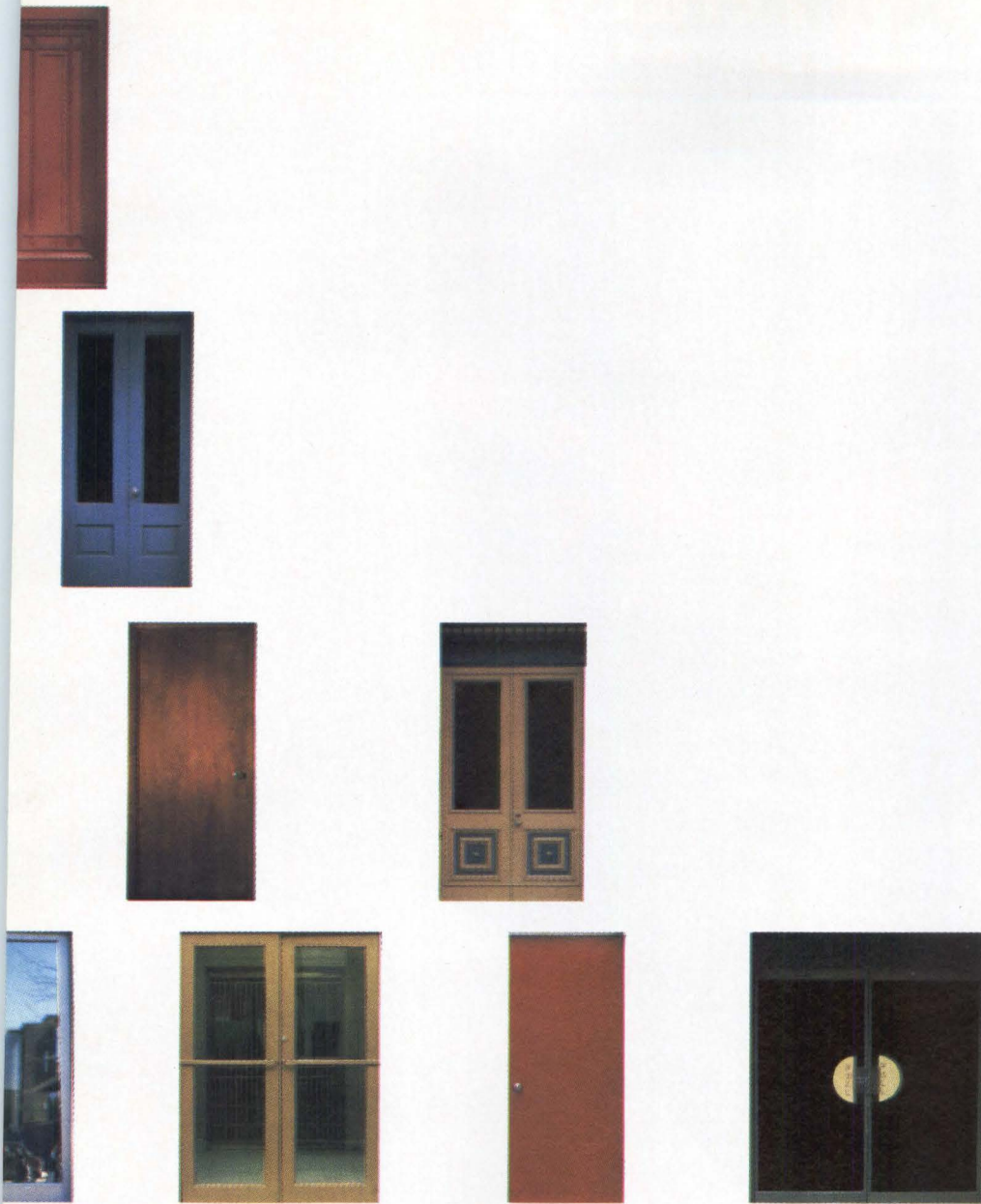
Every product works a little harder. Every application does a little more. Every growth path is so clearly defined, that the reasons are obvious for buying Sperry. And, more importantly, buying it from *you*.

A PC, for example, that's a mini-network, an intelligent workstation, a versatile stand-alone, all

in the same box. A Supermini that brings mainframe power into the office, at mini prices.

And the added investment protection of the most comprehensive product line in the industry based on the Unix™ O/S. So your customer has no software rewrites or costly retraining to worry about as his system expands. And no need to look to anyone but you for products to take his system from one user to 240. And even beyond.

But a good customer relationship is based on more than product alone. So there's the extra assurance for your customers that comes from being a part of the world's 2nd largest installed computer base. Drawing on the worldwide



more systems.

experience, resources and technology of an industry leader.

Unfair advantage? That's just what it takes to open doors these days. After all, one of the keys to success in any business has always been a good opener.

To find out more, contact your local Sperry office or telephone toll-free **1-800-547-8362**, and ask for Information Kit **#86**. Or write Sperry Corporation, Box 500, Blue Bell, PA 19424-0024.

UNIX is a trademark of AT&T, Bell Laboratories. © Copyright Sperry Corporation 1986

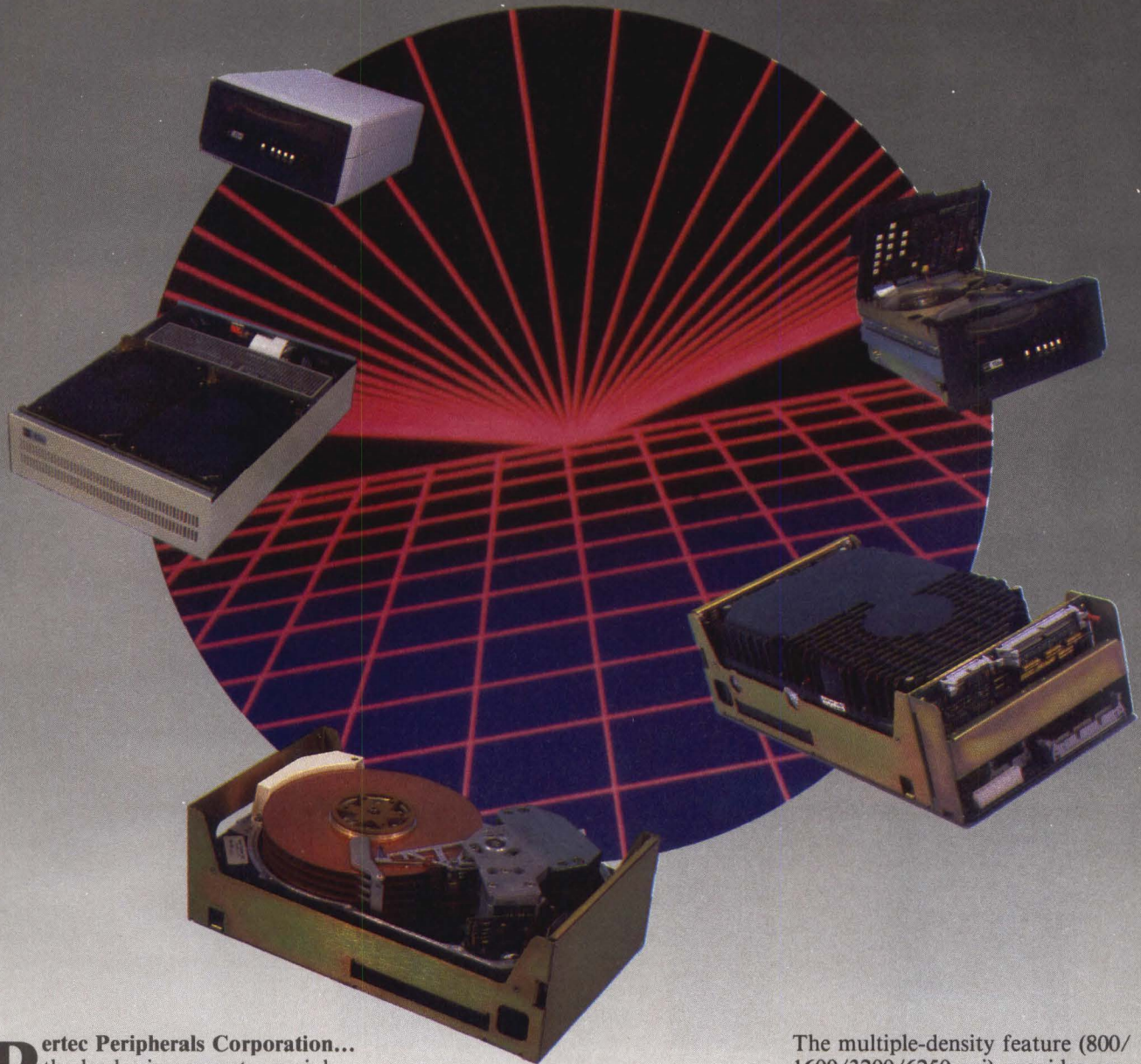


Strengths you can build on.

MINI-MICRO SYSTEMS/February 1986

CIRCLE NO. 4 ON INQUIRY CARD

The World of Pertec® Peripherals



Pertec Peripherals Corporation... the leader in computer peripherals, has served OEMs worldwide since 1967. More than a quarter-million Pertec peripherals are currently in use, backed by PPC's dedicated customer support team.

PPC provides applications consultation, training, product support and a worldwide spares network.

We are providing disk and tape data storage solutions for system builders and integrators ... worldwide, and we are continuing to set new standards for our commitment to excellence.

The new DX548 Winchester disk drives provide storage capacities to 548 megabytes, using the popular SMD interface at the faster data transfer rate of 14.52 MHz. An optional SCSI interface is available, as well as dual-port models. Future enhancements will include the SMD-E

and IPI-2 interfaces. With all its capability and capacity, the DX548 still fits an 8" floppy drive footprint.

The newly-announced DX368 provides systems integrators with 368 megabytes of unformatted data and 18 msec access time. This model also provides data transfer at 14.52 MHz.

PPC's new Data Package comprises either one or two DX332 or DX548 drives and power to supply up to **1.1 gigabytes** of data storage in a compact desk-top or rack-mount package. Data access is 18, 20, or 22 msec with a data transfer rate of 9.67 or 14.52 MHz.

The new FS2000 **quad-density** 1/2" autoloading streaming tape drive is ideally suited for Winchester backup, data interchange and mass storage.

CIRCLE NO. 5 ON INQUIRY CARD

The multiple-density feature (800/1600/3200/6250 cpi) provides capacities of 23 to 270 megabytes (unformatted), in ANSI and IBM format. All of these capabilities are housed in the same size package as the FS1000. It's the smallest GCR package available today, in 19" rack mount or a new desk-top enclosure. PPC is the recognized standard for 1/2" tape storage, and the FS2000's reliability is backed by the expertise that has placed tens of thousands of GCR tape drives in the field, worldwide.

Phone, write or TWX for complete technical data and fast, firm delivery dates.



9600 Irondale Ave., Chatsworth, CA 91311
818-882-0030, Toll Free: 800-821-4126 (CA)
800-443-9577, TWX 910-494-2093

LETTERS

COMPUTER DIGEST UPDATE

The following companies did not appear in the Computer Digest

ITT Information Systems 2350 Qume Dr., San Jose, CA 95131, (408) 945-8950

Single-User Microcomputers

Model	ITT XTRA Model II	ITT XTRA Model III (256K RAM)	ITT XTRA Model IV (640K RAM)	ITT XTRA Model V	ITT XTRA XP Model III	ITT XTRA XP Model V
Display size, color	14-inch; amber, green	14-inch; amber, green	14-inch; amber, green	14-inch; amber, green	14-inch; amber, green	14-inch; amber, green
Screen format (col. x lines)	(80 x 25)	(80 x 25)	(80 x 25)	(80 x 25)	(80 x 25)	(80 x 25)
CPU type	8088	8088	8088	8088	80286	80286
Main memory min.-max. (bytes)	256K-640K	256K-640K	356K-640K	256K-640K	512K-1.6M	512K-1.6M
Operating systems available	ITT DOS 2.11, MS-DOS	ITT DOS 2.11, MS-DOS	ITT DOS 2.11, MS-DOS	ITT DOS 2.11, MS-DOS	ITT DOS 2.11, MS-DOS	ITT DOS 2.11, MS-DOS
Programming languages supported	BASIC, COBOL, FORTRAN, Pascal	BASIC, COBOL, FORTRAN, Pascal	BASIC, COBOL, FORTRAN, Pascal	BASIC, COBOL, FORTRAN, Pascal	BASIC, COBOL, FORTRAN, Pascal	BASIC, COBOL, FORTRAN, Pascal
Unit price \$	1,595	2,595	3,095	3,195	3,995	4,595
Configuration	one parallel, one serial port; two 5¼-inch, 360K-byte flexible drives available	one 5¼-inch, 360K-byte flexible drive, one 10M-byte hard disk drive available	same as Model III	one 5¼-inch, 360K-byte flexible drive, one 20M-byte hard disk drive available	one 5¼-inch, 360K-byte flexible drive, one 10M-byte hard disk drive available	one 5¼-inch, 360K-byte flexible drive, one 20M-byte hard disk drive available

Plessey Microsystems

One Blue Hill Plaza, Pearl River, NY 10965, (914) 735-4661

Single-Board Microcomputers

Model	PME 68-1B	PME 68-2	PME 68-2D
CPU type (Word size)	MC 68000 (8, 16, 32)	MC 68000 (8, 16, 32)	MC 68000 (8, 16, 32)
Bus	VME	VME	VME
Operating system	P-DOS, pSOS	P-DOS, pSOS	P-DOS, pSOS
Software support	debugger, editor	debugger, editor	debugger editor
Programming languages	BASIC, FORTH		
On-board/bytes RAM (ROM)	128K (16K)	256K (32K)	128K (32K)
Notes, features, options	three RS232C ports, SIO, programmable timer, real-time clock with battery support; opt. 10-MHz 68000, 512K-byte DRAM	one RS232C port, SIO, PIO, dual ported RAM, real-time clock, programmable timer, floppy disk controller; opt. 1M-byte DRAM, 10-MHz 68000	one RS232C port, SIO, dual ported RAM; opt. 10-MHz 68000, 8-, 10-MHz 68010, 512K-byte DRAM
Price \$ (quantity)	1,037 (Q1)	1,609 (Q1)	1,188 (Q1)

9-TRACK MAG. TAPE SUBSYSTEM FOR THE IBM PC/XT/AT



For information interchange, backup and archival storage, IBEX offers a 9-track, IBM format-compatible ½" magnetic tape subsystem for the IBM PC, featuring:

- 42 M-Bytes on a single reel.
- IBM format 1600 cpi.
- Software for PC-DOS, MS-DOS.

IBEX

IBEX COMPUTER CORP.
20741 Marilla St.
Chatsworth, CA 91311
(818) 709-8100
TWX: 910-493-2071

Write, phone or TWX for information

CIRCLE NO. 6 ON INQUIRY CARD

The Convergent Principle:

When great ideas converge,

If you've been searching for computer solutions that can turn your great ideas into a great success story, you've come to the right place. Our workstations, minicomputers and software meet OEM and VAR needs for configuration flexibility and continual growth.

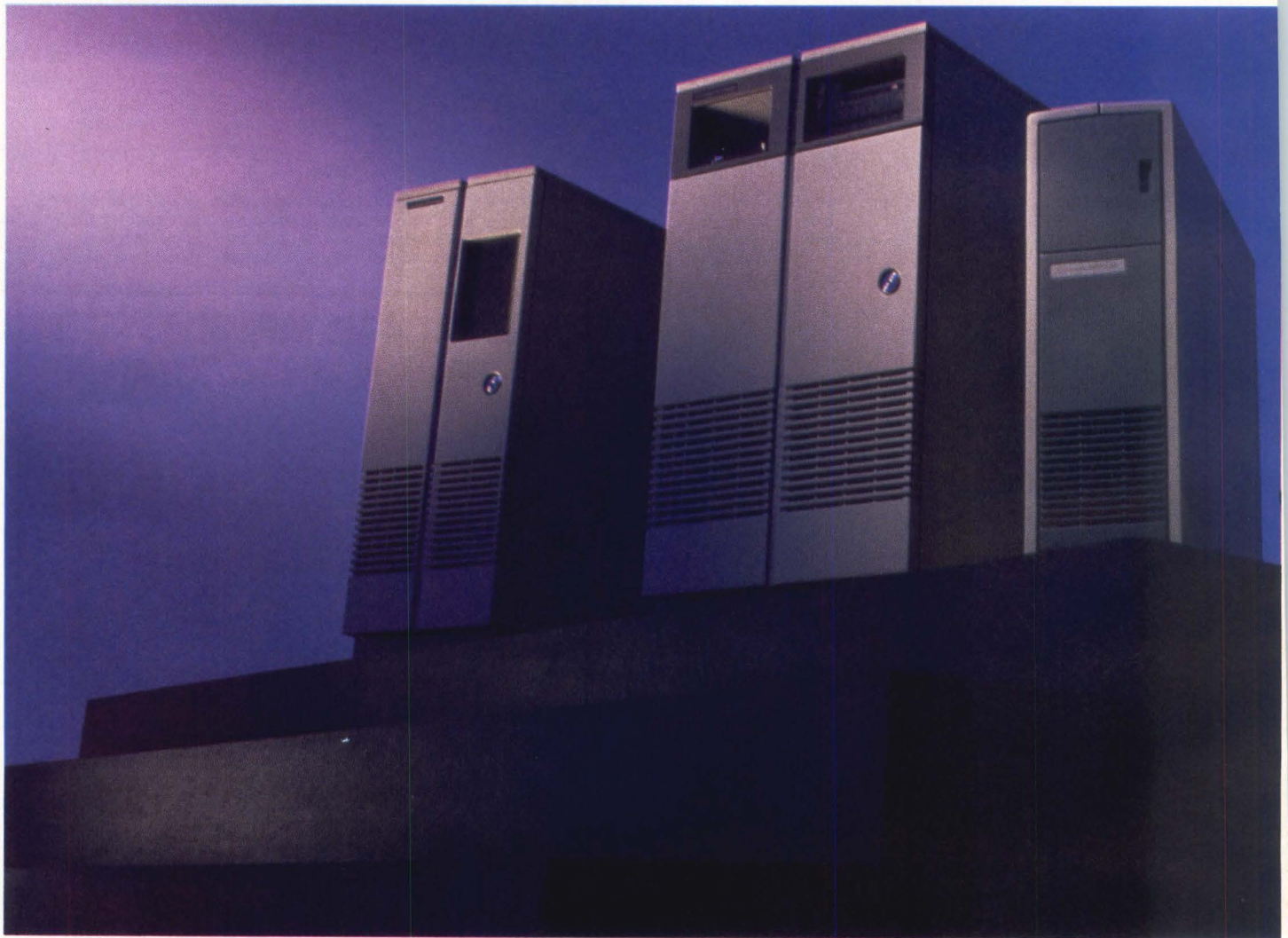
WE'VE MADE OBSOLESCENCE OBSOLETE...

You can put these systems together in the precise way that suits your specific application. And you never have to replace the computers when your needs grow or you want to take advantage of new technologies. Growth potential is built in, so Convergent computers never become obsolete.

For example, Convergent NGEN® workstations expand module by module to make more than a million configurations, which can all be put together by end users without training. When new technologies arrive, you don't replace NGENs — you simply add new modules.

If you need greater computing power, we deliver a range of 32-bit UNIX* minicomputers that adapt to applications in engineering and manufacturing as well as the office.

You can choose from the MiniFrame Plus,[™] which combines low cost and high performance for up to 16 users; the MightyFrame,[™] a 32-user system that's wide open to flexible



great products emerge.

configurations; or the MegaFrame,[™] which gives you incremental expansion for up to 64 users.

These minicomputers are designed to offer all the features you need in flexible arrangements so you don't have to compromise on performance.

That adaptability also applies to our software, which is designed for modular growth. Our OEM licensing and source code agreements allow you to integrate your great ideas with ours.

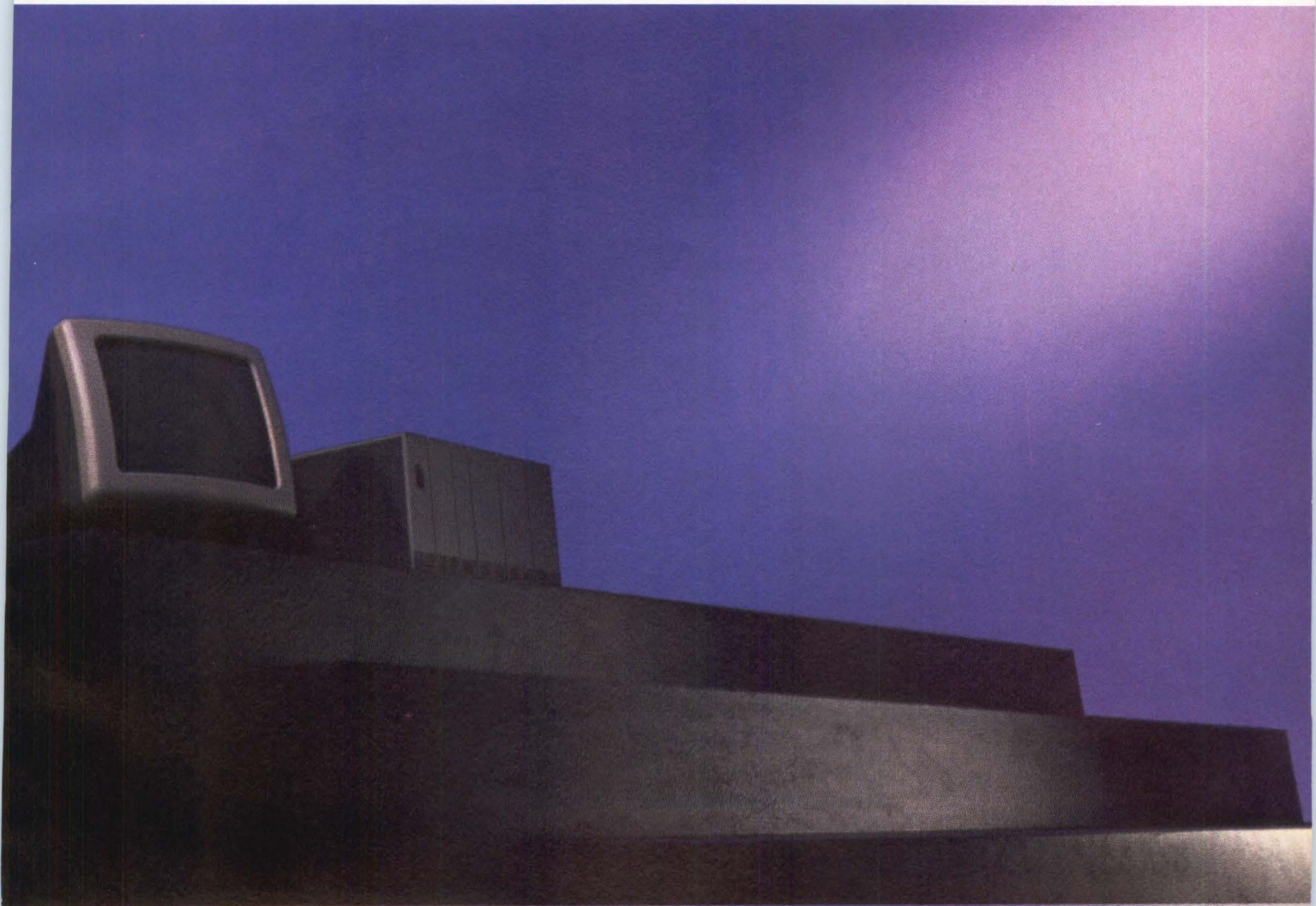
...AND DEPENDABILITY ABSOLUTE.

All our products are backed by Convergent's commit-

ment to excellence in engineering, craftsmanship in manufacturing and fast turn-around in high-volume production.

We'd like to show you how this convergence of thinking can work for you. Call us for more information at 800-538-8157 ext. 951 (in California call 800-672-3470 ext. 951). Or write us: Convergent Technologies, 2700 North First Street, P.O. Box 6685, San Jose, CA 95150-6685, Attention: Mail Stop 10-015.

That is, if creating great computer systems sounds like a good idea to you.



Convergent

CIRCLE NO. 7 ON INQUIRY CARD

The Hewlett-Packard A-Series Automators:
a rugged family of real-time computers with
total software compatibility.

Available as boards, boxes,
systems or microsystems.

256K RAM error-correcting memory.
Up to 24 MB. So flexible, it can manage
large data bases or work as a true
memory-based controller.

4 MB/sec I/O bandwidth
for fast performance.
(DMA per channel).

Virtual code and data for large
program support.

State-of-the-art pipeline
architecture, with cache,
optimized for real-time
performance.

Performance range: 1-3 MIPS.

Why you should consider buying one of our real-time computers.

Low maintenance fees (half the rate of the closest competitor) due to the exceptional reliability of our products.

A profitable Sales Support Program. Direct selling, if you need us. Sales aids, if you don't.

HP's program for system designers, software suppliers and resellers includes discounts from 5 to 39%.

CPU prices start at U.S. list \$2278 (with average quantity discount).


Support beyond the year 2000. Guaranteed.

Local HP support representatives. Datapro has rated our support #1 for four consecutive years.

1-800-556-1234

ext. 160. Call this toll-free number for a brochure on the program and the products. (In California, call 1-800-441-2345, ext. 160.)

Why you should consider buying a lot of our real-time computers.

 **HEWLETT
PACKARD**
CIRCLE NO. 8 ON INQUIRY CARD

Integrate Your Input Strategy



What's the best way to incorporate new input devices and technologies into your OEM products? Ask Key Tronic.

For 16 years, Key Tronic has been answering that question with over 3,000 custom keyboard designs representing over 7 million installed keyboards.

The answer is a vertically integrated manufacturing approach with particular emphasis on product quality, on time delivery and price performance.

The answer is worldwide manufacturing and sales support from a team of dedicated individuals supporting both the OEM and retail markets.

If you have an input requirement, we've got the answer. Put the Key Tronic team to work for you by contacting your representative today. You will discover why Key Tronic is the Responsive Input Company.

Pictured:

- A. **Touch Pad** - a multi-purpose input device usable as a programmable function pad, mouse, fast cursor control device and digitizing tablet.
- B. **Speech Recognition** - natural, language independent command entry for hands free operation.
- C. **Bar Code** - integrated into a keyboard.
- D. **Mouse** - accurate pointing and selecting tool in a maintenance-free design.
- E. **OCR** - optical character recognition capability.

"Feel the Key Tronic Touch"

key tronic
The *Responsive Input Company*

P. O. Box 14687 • Spokane, WA 99214 • USA
(509) 928-8000 TWX 510 773-1885

CIRCLE NO. 9 ON INQUIRY CARD

BREAKPOINTS

SEIKO UNVEILS COLOR THERMAL COPIER

Seiko Instruments U.S.A. Inc. this month takes the wraps off its newest thermal, ink-transfer color copiers, the Series CH-5300. Produced by the company's graphic devices and systems division in Milpitas, Calif., the copiers can be configured with three different 8-bit parallel or two video interfaces. The CH-5301, with a resolution of 152 dots per inch, prints an 8½-by-11-inch image in about 40 seconds and costs \$5,995. The larger CH-5312 prints an 11-by-17-inch image in less than two minutes. It costs \$9,995 and has a resolution of 203 dots per inch. The copiers support a four-port multiplexer that allows system integrators to specify a variety of input devices.

—*Mike Seither*

BRITAIN AND FRANCE COLLABORATE ON PROLOG STANDARD

Standards makers in Britain and France have begun collaborating on a standard for the artificial-intelligence language Prolog through their respective national standards organizations. Both the British Standards Institution (BSI) and the Association Française de Normalisation (Afnor) are also proposing that their activities be adopted as a "work item" by the International Standards Organization as the first step toward a worldwide standard for the language's numerous versions. Prolog vendor Quintus Computer Systems Inc. of Palo Alto, Calif., says it expects any future ANSI standard for the language to closely follow that developed by BSI and Afnor.—*Keith Jones*

CIPHER DATA TO UNVEIL IBM 3480 LOOK-ALIKE

Industry watchers expect Cipher Data Products Inc., San Diego, Calif., to unveil next month at the Hanover Fair in West Germany a deliverable model of an IBM Corp. 3480, half-inch, tape-cartridge drive look-alike. The drive will reportedly use a serpentine recording method to record nine tracks in one direction and the other nine on the way back, rather than record the 18 tracks simultaneously as does the 3480. The drive is said to read tape written on an IBM 3480 but offers no upward compatibility. Operating at a 433K-byte-per-second transfer rate, it will back up its full capacity of 200M bytes in 12½ minutes. Meanwhile, IBM is said to be preparing a higher capacity version of the 3480 for introduction this summer. Code-named Sonoma, it uses 36 tracks arranged in twin pairs of 18 tracks linked in a serpentine fashion. Capacity is expected to be 1G byte.—*Carl Warren*

STANDARDS WORK PROMISES HOTTER AND FASTER TOKEN RINGS

ANSI has given the go-ahead for work on an enhancement to its Fiber Distributed Data Interface standard, FDDI, called FDDI-II, that will support real-time, digitized voice communication around the ring. Work on a data-only version of FDDI, which will provide for token-ring speeds of 100M bits per

second (bps)—compared to IBM Corp.'s 4M bps—is already well advanced. The protocols employed by FDDI and FDDI-II will reportedly be close enough to those established by the IEEE 802 committee to enable the high-speed ring to act as a backbone connecting 802 standard rings and buses.—*Keith Jones*

NEW LAWS MAY LOWER THE BOOM ON NETWORK BYPASSERS

Reports from Capitol Hill indicate that Rep. Edward Markey, D-Mass., will shortly introduce legislation that would require the Federal Communications Commission to take a tougher stance with network bypassers. Preliminary legislation, according to industry trade group North American Telecommunications Association (NATA), would require the FCC to hold hearings and conduct at least five months of investigations before granting tariffs that allow market-dominant carriers to offer switched bypass services. NATA says the bill's aim is to curb recent AT&T Co. service offerings, including Megacom and Software-Defined Networks, that would provide customers with end-to-end switched connections without the need to connect with the local telephone company switches.—*Stephen Shaw*

ATASI SELLS REPAIR SERVICE AS PART OF REORGANIZATION

Winchester disk drive manufacturer Atasi Corp. of San Jose, Calif., has sold its repair facility as part of a plan to reorganize after having filed for protection from creditors under Chapter 11 last August. E.F. Industries, Hawthorne, Calif., bought the repair equipment and now has worldwide rights to work on Atasi drives. E.F. Industries acquires capital equipment, spare parts and inventory from troubled or defunct manufacturers and provides service for their products.—*Mike Seither*

ALTOS GIVES UP STAKE IN WYSE TO PURSUE SOFTWARE INVESTMENTS

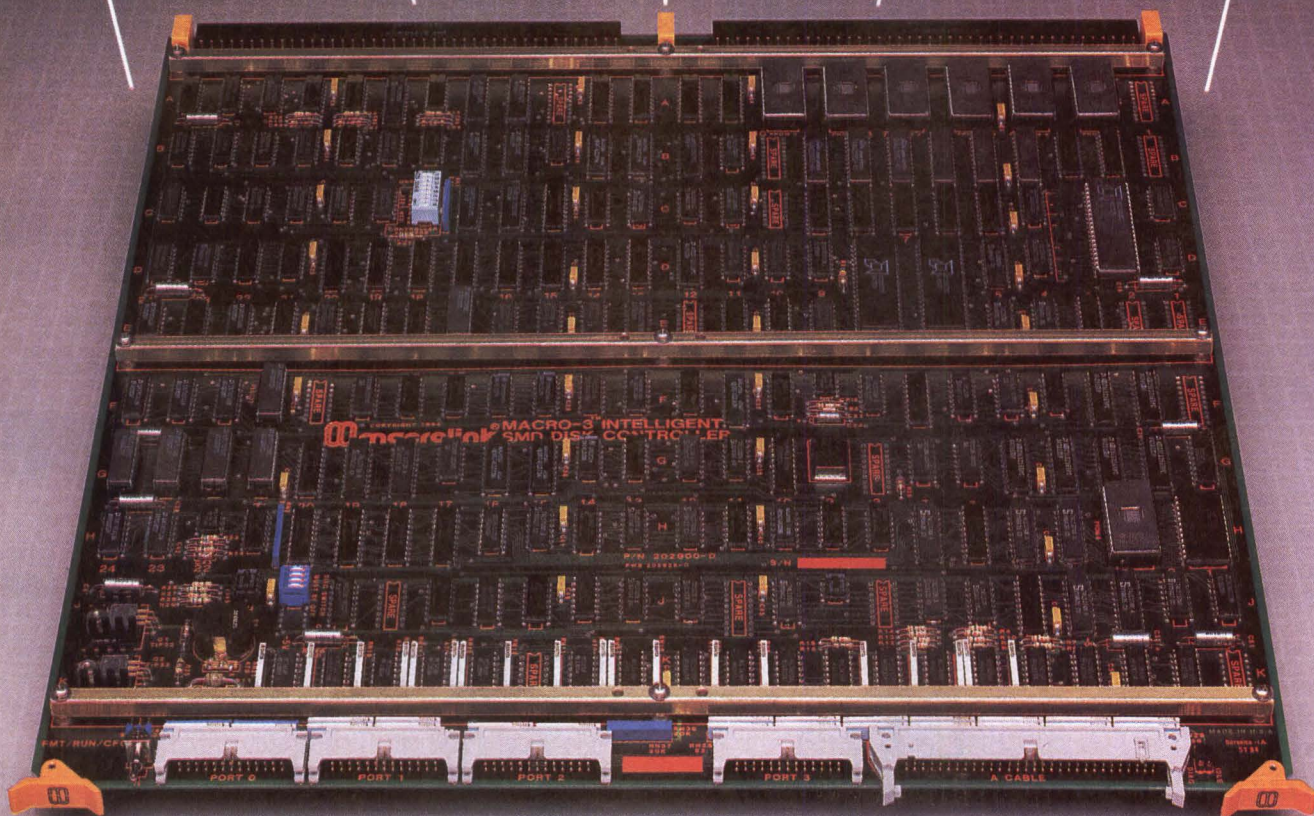
Altos Computer Systems has decided its best investment is in software companies, not hardware concerns. As a result, Altos is selling off 27 percent share of its Wyse Technology stock. Altos and Wyse, both of San Jose, Calif., have had a close relationship since 1981. Altos, which manufactures multiuser systems for vertical markets, first invested in Wyse in 1981. Since then Wyse has become the top independent terminal manufacturer. Altos vice president Philip White indicated that his company will seek equity positions in software firms that specialize in communications, graphics, database and office-automation applications.—*Mike Seither*

IPI TO GET NOD FROM INDUSTRY AT CONFERENCE

After five years of design effort within ANSI, the Intelligent Peripheral Interface (IPI) will finally appear in products to be announced by several vendors at the IPI Forum at the Parker House hotel in Boston from March 12 to 14. Among the numerous chip sets, testers, controllers and subsystems expected to be introduced will be a range of products from Control Data Corp. that includes an OEM disk with a 3M-byte-per-second data rate, the fastest on the market. Digital Equipment Corp. president Kenneth Olsen is the keynote speaker.—*Carl Warren*

The fastest Perkin-Elmer compatible disk controller you can buy.

- Reads and writes P-E's IDC and MSM packs.
- Install any size SMD drive without OS/32 software patches.
- Console configuration supports future SMDs without PROM changes.
- High speed formatting.
- World-wide maintenance available from P-E.



You're ready for the new generation of high performance SMD disk drives with the MACRO-3. High speed drives (over 2MB/Sec) are no problem. Only the MACRO-3 SMD controller offers full emulation of P-E disk systems, and supports advanced drives like the Eagle & CDC's FSD and XMD on any 3200 CPU. It can read

both IDC and MSM packs at the same time, a feature that P-E just can't match. And it's /XELOS/proven.

MACRO-3 is shipped from stock with installation manual, cables and a one year warranty. Of course it comes with the high reliability, tested performance and attractive pricing you'd expect from Macrolink. After all, we

invented the P-E emulating disk controller board.

Find out about the largest family of P-E compatibles going — including memory, COMM, tape and more. Call today for prices and details.

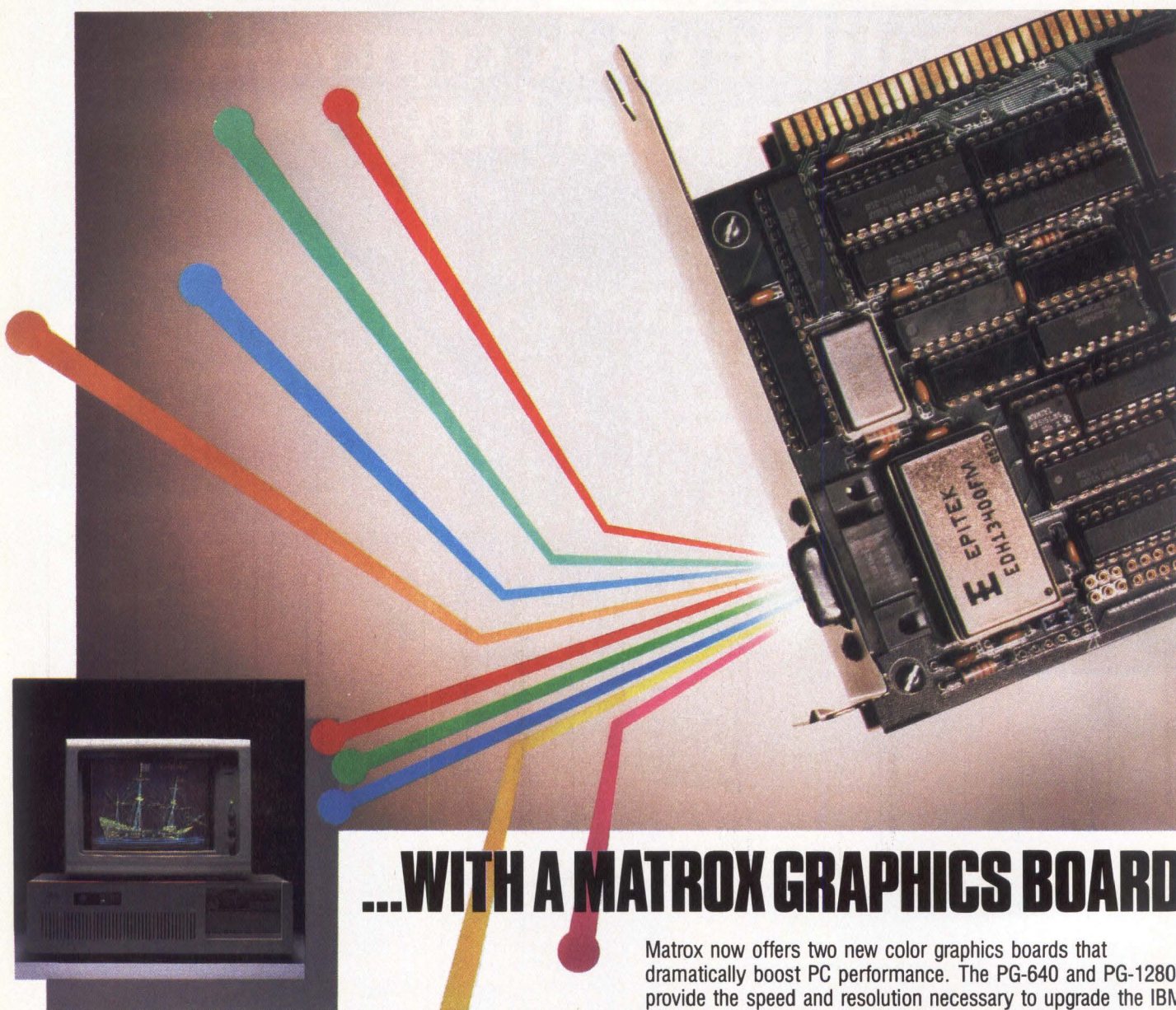
macrolink[®] Inc.

Macrolink Inc. 1500 N. Kellogg Drive, Anaheim, California 92807 Phone (714) 777-8800 TWX 910-591-1671

XELOS and Perkin-Elmer are registered trademarks of Perkin-Elmer.

CIRCLE NO. 10 ON INQUIRY CARD

TURBOCHARGE YOUR PC'S GRAPHICS



...WITH A MATROX GRAPHICS BOARD

- 640 x 480 x 8 display (PG-640)
- 1280 x 1024 x 8 display (PG-1280)
- 40,000 vectors/sec. drawing speed
- 100% IBM PGC compatible
- Full IBM CGA emulation
- 1 million pixels/second image load

Matrox now offers two new color graphics boards that dramatically boost PC performance. The PG-640 and PG-1280 provide the speed and resolution necessary to upgrade the IBM PC XT and AT into Professional Graphics workstations.

The PG-640 has a drawing speed of over 40,000 vectors/second and an image load speed of 1 million pixels/second. This means complex 640 x 480 pictures are drawn in under a second. The PG-1280 provides even faster picture updates, and displays four times the detail, 1280 x 1024 pixels.

Both the PG-640 and PG-1280 are 100% compatible with IBM's Professional Graphics card, and offer full Color Graphics Adapter emulation. All existing software runs without change.

If you are interested in a 10 times performance boost:

CALL TOLL FREE 1-800-361-4903



matrox

1055 St. Regis Blvd.
Dorval, Quebec, Canada
H9P 2T4
Tel: (514) 685-2630
Tlx: 05-822798

TECH FILES: A QUICK LOOK AT NEW PRODUCTS AND TECHNOLOGY

The VAXstation II/GPX from **Digital Equipment Corp.** is the company's first technical workstation for the UNIX marketplace. The system, which also supports VMS, implements a new DEC VLSI graphics subsystem that frees the CPU for application-specific computation. DEC offers four configurations priced between \$33,000 and \$53,800. An entry-level color package for \$35,000 contains the MicroVAX II, a 71M-byte disk drive, a 95M-byte tape drive, 3M bytes of memory, an operating-system license, a four-plane graphics coprocessor and a 19-inch color monitor.—*Lynn Haber*

Softech Inc., Fairborn, Ohio, began distributing the Prototype Ada Compiler Evaluation Test Suite last month. Developed by the Institute for Defense Analysis, the suite is intended to provide users with an organized suite of compiler-performance tests along with support software for executing compiler-evaluation tests and for collecting performance statistics, according to the Ada Joint Program Office. The test suite is contained on a single tape in either VAX-BACKUP or ANSI-STD formats and can be obtained from: The Prototype Test Suite Distribution Office, Softech Inc., 3100 Presidential Drive, Fairborn, Ohio, 45324.—*Stephen Shaw*

Shipments of a 16M-byte add-in memory card for the Digital Equipment Corp. VAX 8600 and 8650 will begin next month from **EMC Corp.**, Natick, Mass. The VX86-16MB will be the first add-in card to use 1M-bit chips. It will enable users to configure up to 128M bytes of physical memory in the adjacent slots of the VAX machines, as the card requires only one slot; DEC's requires two. The quantity-one price is \$58,000.—*Bruce MacDonald*

Pathway Design Inc.'s new FootPath package brings full bidirectional, file-transfer capabilities to the Natick, Mass., company's NetPath local-area-network-to-mainframe product installed on a gateway personal computer. Supporting up to 32 concurrent sessions, the software operates with IBM Corp.'s mainframe-based 3270 PC file-transfer program in CICS, VM/CMS and MVS/TSO environments.—*Jesse Victor*

Last fall, **Sun Microsystems Inc.** introduced three new workstations based on Motorola Inc.'s MC68020 32-bit processor that ranged in price from \$13,000 to \$32,000. Now the Mountain View, Calif., vendor is offering the same 32-bit technology in a \$7,900 diskless workstation that can act as a low-cost network node. The Sun 3/50M, which comes with 4M bytes of memory, an 1152-by-900-pixel monitor and built-in Ethernet transceiver, is being positioned against the DN330 workstation (about \$16,000) from Apollo Computer Inc., Chelmsford, Mass. A standalone version, the Sun 3/52M, has a 71M-byte rigid disk drive and 60M-byte quarter-inch streaming tape. It is priced at \$13,900 and positioned against Digital Equipment Corp.'s \$26,000 VaxStation II.—*Mike Seither*

Using CADKEY software from Micro Control Systems Inc., Vienna, Va., **Gerber Systems Technology Inc.** of Vernon, Conn., has created a 3-D desktop workstation that utilizes the IBM Corp. PC/AT with a 20M-byte rigid

disk and math coprocessor. Priced at approximately \$20,000, the Sabre-PC is compatible with Gerber's UNIX-based Sabre-5000 32-bit CAD/CAM system. It can execute crosshatching and true 3-D mesh generation and mirror imaging. —*Gregory Solman*

AstraNet from **Astra Communications Inc.**, Mountain View, Calif., allows an Ethernet local area network to operate over IBM Corp.'s Cabling System for users requiring support for both Ethernet and IBM's Token-Ring network. AstraNet includes concentrators, transceivers and utility cables and is implemented in a hierarchical star topology, transmitting data at up to 10M bits per second. Installation costs range from \$225 to \$450 per host connection. —*Lynn Haber*

Celerity Computing of San Diego, Calif., is addressing computer aided engineering and scientific research with its new UNIX-based C1260 and C1230 superminicomputers. Incorporating a reduced-instruction-set architecture, the machines feature a proprietary 32-bit processor and floating-point coprocessor, open communications and support for up to 128 users. The C1260 can be configured with a dual processor to achieve throughput of 6.15 million instructions per second. —*Bruce MacDonald*

Recent product introductions from **Xerox Corp.**, Stamford, Conn., include the XC 22, a 1M-bit-per-second network linking MS-DOS microcomputers over standard, twisted-pair phone wires; the Documenter series of workstation/printer systems for electronic publishing; the 4050 50-page-per-minute laser printer; the 7010 Telecopier facsimile machine; an entry-level, electronic-publishing terminal system; and various application software. —*Bruce MacDonald*

NOTES FROM OVERSEAS: Telecommunications equipment manufacturer **Standard Elektrik Lorenz AG**, Stuttgart, West Germany, a subsidiary of **ITT Inc.**, has acquired West German minicomputer maker CTM Computertechnik Müller GmbH, of Konstanz, West Germany. If CTM's products are marketed worldwide by ITT—an ITT spokesman says it's a "little early" to tell if that will happen—look for the 32-bit CTM 9032 system under the ITT label. Based on a proprietary processor and 32-bit bus, the 9032 supports up to 48 interactive display terminals. —*Keith Jones*

Twenty European companies, including **Groupe Bull**, **N.V. Philips** and **Siemens AG.**, are working together on an open systems architecture for computer integrated manufacturing similar to the Manufacturing Automation Protocol and Technical and Office Protocol (MAP/TOP) promoted by General Motors Corp. and Boeing Co. Funded in part by the Common Market, the proposed architecture should not conflict with the upcoming MAP/TOP protocols, says British participant **ICL Ltd.** —*Keith Jones*

HOW FAR DOES YOUR DRIVE SUPPLIER GO TO GIVE YOU AN EDGE?

in greater read/write accuracy.

NEC drives are still going, after others fail.

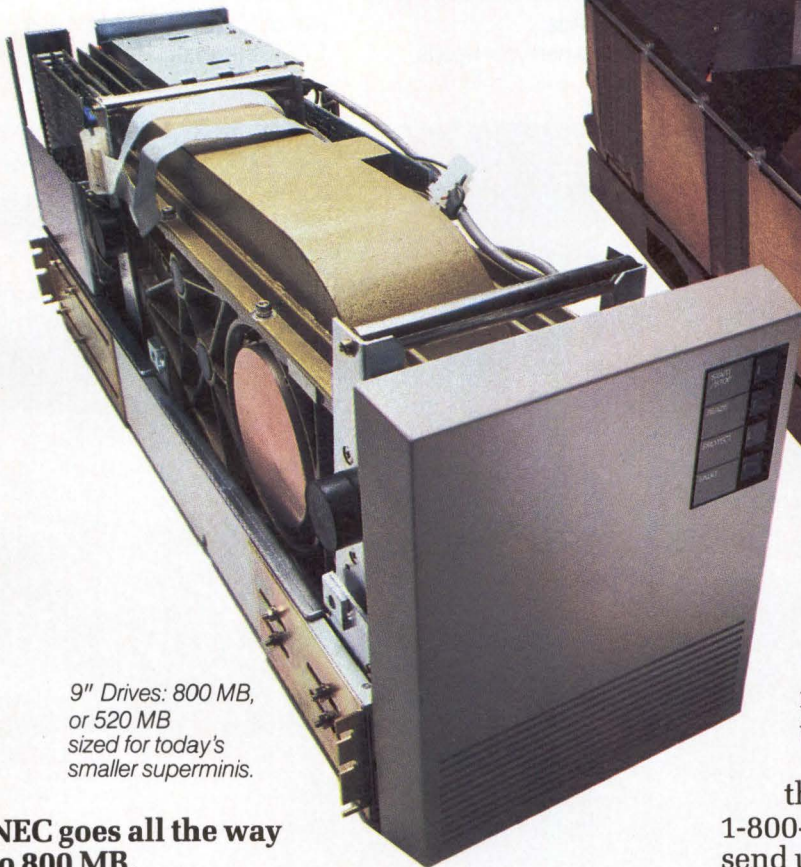
Take our 8" Winchester. It has the longest MTBF in the industry. 24,000 POH. Which makes it two to three times as reliable as anybody else's.

Our 9" drives are also outstanding. With 20,000 POH. And the MTTR of our large drives is less than one hour.

NEC keeps going for more.

NEC offers you one other important thing you need in a disk drive supplier. A solid

future. Our experience in disk drive technology goes all the way back to 1959. And during the past 26 years we've added



9" Drives: 800 MB, or 520 MB sized for today's smaller superminis.



NEC 8" Winchesters have twice the industry standard MTBF.

NEC goes all the way to 800 MB.

NEC continues to expand the edges of disk drive technology farther and farther. So your computer systems can be more competitive.

Again we've edged out every other Winchester drive maker. One of our 9" Winchesters now has a capacity of 800 MB. Our other 9" Winchester has 520 MB. Our newest 8" has a capacity of 337 MB.

We make you faster on your feet.

Capacity is not the only edge our large drives offer. They're also fast. Our 800 MB drive has a 2.4 MB/sec data transfer rate and a 15 ms. seek time.

And our 9" Winchesters use a special design that supports the spindle at both ends resulting

a stream of innovations in both design and manufacturing. So, we have the resources, the talent and the commitment to keep giving you an edge.

If your disk drive supplier doesn't go this far, isn't it time you called NEC. Call 1-800-343-4418 (in MA 617-264-8635). Or send us the coupon.

- Please send me more information on NEC disk drives.
- Please have a salesperson call.

Name _____

Title _____

Company _____

Address _____

City _____

State _____ Zip _____

Tel () _____

NEC Information Systems, Inc.,
1414 Massachusetts Avenue
Department 1610,
Boxborough, MA 01719

C&C Computers and Communications

NEC

NEC Information Systems, Inc.

CIRCLE NO. 12 ON INQUIRY CARD

INTRODUCING THE PRINTER THAT MAKES THE BEST IMPRESSION ON ANY SYSTEM.

Most printers have been designed to work best with just one computing system.

So if you bought different systems for different reasons, you also ended up buying different printers. And matching each printer to its system.

Now there's the LA210™ Letterprinter, compact and flexible enough to do the job of 2 printers. Or 3. Or 4. Because the LA210 gives you a serial interface to match Digital's own complete line of systems, and an available parallel interface for the IBM personal computer and compatibles. You can even order plug-in cartridges that emulate three of the most popular IBM compatible printers.

Which means, quite simply, you can expand your computing capabilities any way you see fit. For word processing, data processing, bit map or mosaic graphics. For VAX™,

PDP-11™ or any other Digital system, as well as the IBM environment, too.

And you don't need to worry about spending a lot of money for a new printer for each system.

**THE LA210 DELIVERS
WHAT YOU NEED
WHERE YOU NEED IT.**

The LA210's system inde-

pendence is rivalled only by its general versatility.

For applications with reams of output, like business accounting or complex scientific programming, the LA210's 9x7 dot matrix printhead will print up to 240 characters per second, or a full double-spaced page every 10 seconds.

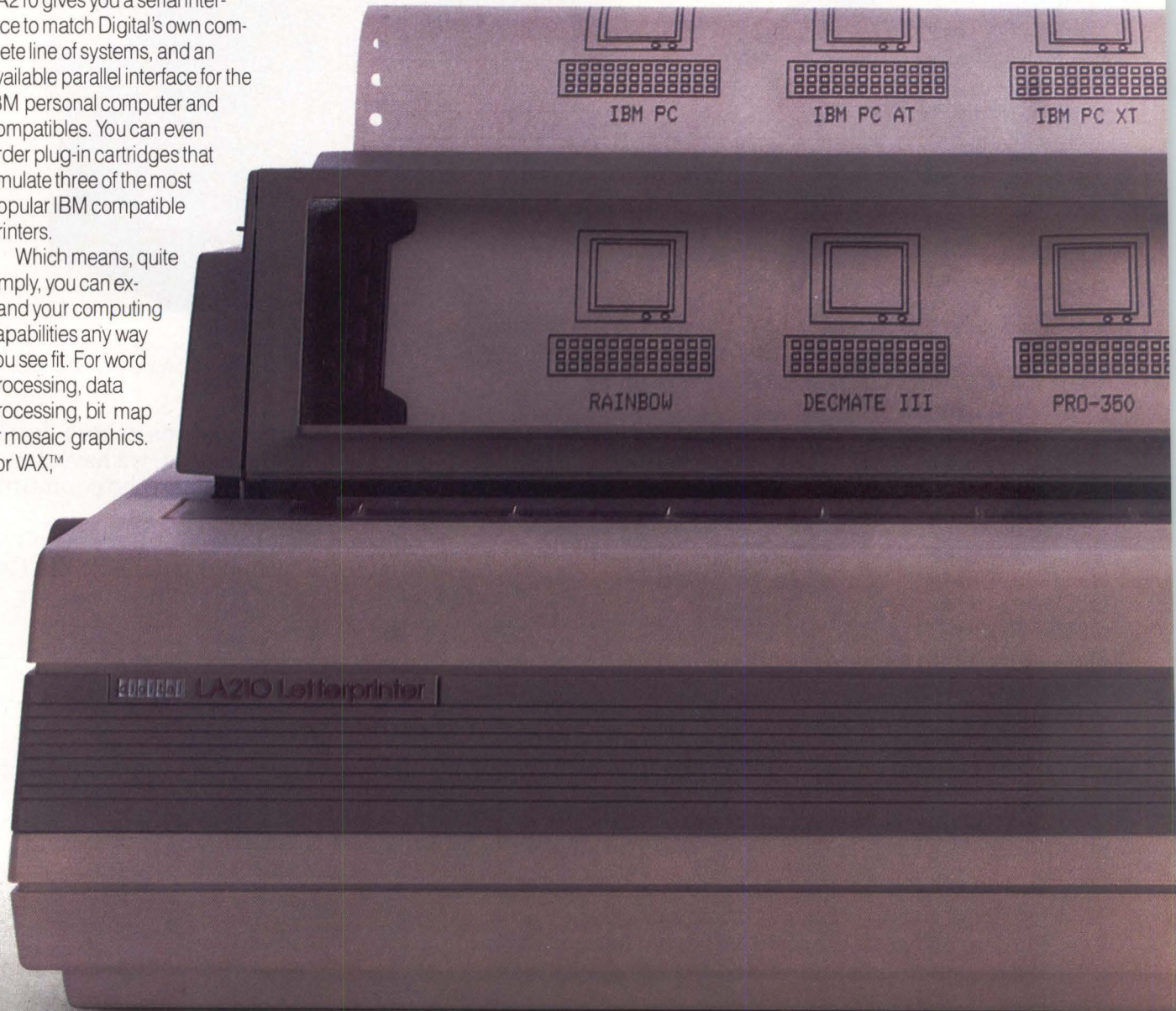
But when your needs

change, so can the LA210.

Flick a switch and the LA210 shifts to an 18x33 matrix for crisp, near-letter quality copy at up to 40 characters per second.

Or let your host computer change modes for you automatically under program control.

There's more, too. With its standard Courier type face, the LA210 can print 11 languages,



plus Digital's VT100™ line drawing set. And it gives you a choice of more than 35 optional faces and fonts – Courier, Orator, Gothic, APL, and italics as well as special custom fonts – through plug-in cartridges that let you vary your type face even more. Finally, the LA210 lets you print bold or condensed and change faces or fonts on a dynamic character-by-character basis. So your output is truly customized to suit just about any presentation you have in mind.

Plug-in cartridges also allow the LA210 to emulate three of the most popular IBM compatible printers – the IBM Graphics Printer, the Epson MX80™ with

mosaic graphics, and the MX80 with Grafrax™ bit map graphics. So you can produce charts and graphs with all the resolution and professional look of bit map graphics. Yet still retain complete compatibility with software that generates mosaics.

All without a hitch. All without compromising a bit of the power of the software you're using.

STANDARD EQUIPMENT THAT OTHERS CALL OPTIONS. AND OPTIONS OTHERS CAN'T MATCH.

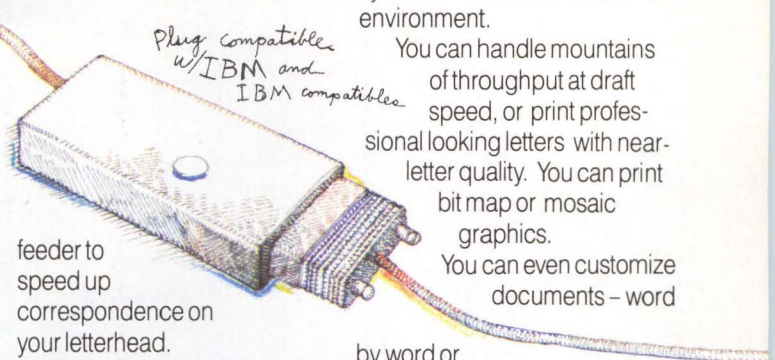
It wouldn't make sense for a printer this versatile to lack any of the features you really need.

So standard equipment includes a 2k buffer and adjustable forms tractor with acoustic cover.

Making the LA210 one of the quietest printers in its class as well as one of the fastest.

Add the optional bi-directional tractor, and you can easily handle superscripting and subscripting and full page reverse for multiple column printing.

There's even a cut sheet



feeder to speed up correspondence on your letterhead.

The LA210 also comes with one more feature no other printer can offer. Digital's exceptional reputation. We've set industry standards with products like VAX and PDP-11 systems. We've done the same in terminals and printers with our VT100, LA36, LA120, and others. In fact, with more than 750,000 printers installed worldwide, we're a recognized leader with a proven record of reliability. And we back every printer we sell with one of the most comprehensive service plans in the business.

ONE SOLUTION FOR AN OFFICE FULL OF NEEDS.

No matter what your office needs may be, Digital has you covered with the new LA210.

You can work with systems within Digital's broad line of personal computers, within any of our larger systems – all the way up to the largest VAXcluster™ systems – or within the IBM PC environment.

You can handle mountains of throughput at draft speed, or print professional looking letters with near-letter quality. You can print bit map or mosaic graphics. You can even customize documents – word

by word or letter by letter if need be – with a broad range of type faces and special effects.

All with a single printer.

So whether you already have a number of different systems in place and want the economies of a single printer that can handle them all, or you just want the added flexibility for future expansion, no single printer handles all your problems like the LA210 from Digital.

BEST ENGINEERED MEANS ENGINEERED TO A PLAN.

The LA210, like every Digital hardware and software product, is engineered to conform to an overall computing strategy. This means our products are engineered to work together easily and expand economically. Only Digital provides you with a single, integrated computing strategy from desktop to data center.

For a detailed brochure or more information, as well as the name of the Authorized Terminals Distributor or Digital Representative near you, write Digital Equipment Corporation, 129 Parker Street, Maynard, MA 01754.

THE BEST ENGINEERED COMPUTERS IN THE WORLD.

digital™



Optotech, Inc.

The 5¼ inch Optical Disk Drive Is Here!

Optical Disk Drive 5984

- 200 megabytes on a removable cartridge.
- Fast access read and write.
- For PCs and minis.
- Extensive interface software.
- Available Now.

The Preferred Solution For:

- Database—large, portable, indelible and updatable
- Online Mass Storage—integral backup
- Imaging—capacity with removability



Optotech, Inc.

770 Wooten Road
Colorado Springs, CO 80915
303 570.7500 Telex 592966

CIRCLE NO. 14 ON INQUIRY CARD

Controller combines VMEbus, ESDI for fast data transfer

Jesse Victor, Associate Editor

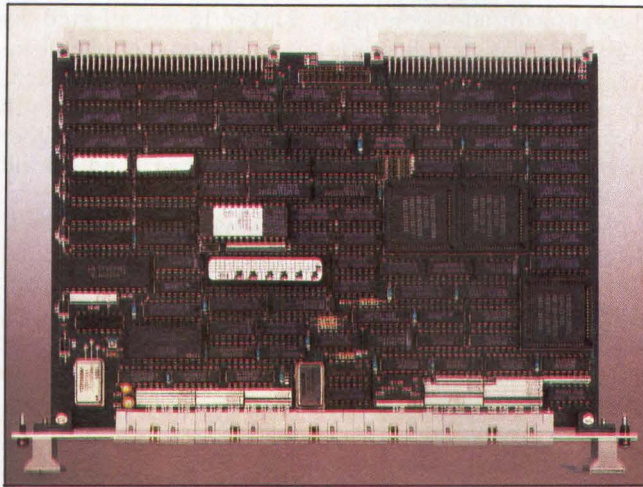
Calling it a winning combination, Xylogics Inc. has merged a VMEbus interface with an enhanced small device interface (ESDI) to create a rigid disk controller with a 2.4M-byte-per-second maximum data-transfer rate and 10M-byte-per-second direct-memory access (DMA).

The Burlington, Mass., company says its new 712 controller allows system integrators to overcome the data-transfer limitations of the older ST506/ST412 rigid disk interface and at the same time meet the high-performance demands of multiuser, UNIX-based computer systems. It also will permit the company to ride the ground swell of ESDI, 5¼-inch, Winchester disk drives expected later this year from drive manufacturers.

Rounding out Xylogics' 700 Series of storage module device (SMD) and half-inch, tape-drive VMEbus controllers—and preserving software-interface compatibility with them—the \$1,995 712 uses custom VLSI chips and an 8K-byte, first-in-first-out (FIFO) buffer to minimize data-transfer times and overcome the I/O bottleneck to fast disk access.

A programmable DMA throttle allows software to optimize controller-access time for maximum performance. Dynamic switching of word size during DMA transfers permits starting on odd-size byte boundaries. Firmware support for features such as elevator seek, scatter/gather reads and writes and command chaining fine-tunes the controller for UNIX-based systems.

"There is a tremendous need for fast-transfer, large storage capacities and the ST506 footprint," asserts Kevin Gonor, Xylogics' vice president



Data-transfer rates to 2.4M bytes per second, fast DMA, UNIX software support and programmable interrupt levels, vectors and address modifiers suit the 712 controller for multiprocessor VMEbus systems.

of sales. "There is a lot of demand in our customer base for ESDI. A typical multiuser system now has a 1.2M-byte-per-second data-transfer rate. They are upgrading to 1.9M bytes per second and looking to 2.4M bytes. Replacing an ST506 interface with ESDI, an integrator can double or triple the transfer rate at about the same price. With ESDI, the same-sized drive can handle 300M bytes or above at SMD speeds."

Indeed, Xylogics sees most of the demand for its ESDI controller coming from integrators dissatisfied with ST506's 1.2M-byte-per-second maximum data-transfer rate. "The majority of high-performance users of 5¼-inch drives will go to ESDI from ST506. This is where 80 percent of our market will come from," predicts Chap Cory, Xylogics' vice president for research and development. "Another 20 percent will come from people who migrate down from SMD."

Gonor sees the ESDI-controller market on a fast-growth track. Xylogics expects 1986 sales of about \$3 million to \$4 million, reflecting a 30 percent annual growth. Gonor predicts

a total ESDI-controller market of \$8 million to \$9 million in 1986 and a 60 percent jump in 1987 sales over 1986. "Once the market gets a solid year, it will really skyrocket," he forecasts.

The way to upgrade

Other analysts are equally optimistic about the ESDI controller market—and especially about the VMEbus-ESDI controller segment. "VMEbus and ESDI will be the way to go for upgrading low- to mid-range computer systems," says Joe Jaworski, president of Peripheral Concepts Inc., Irvine, Calif. "Anybody with ST506 and 40M bytes or less who wants to step up capacity will probably go to ESDI. The VMEbus-ESDI controller market will grow as fast or faster than SMD through 1988. If you track it from 1986 on, you will probably end up with tremendous figures."

Although Jaworski says VMEbus-ESDI controllers for Winchester drives will produce only \$317,000 in revenues this year, they will capture 15.8 percent of the VMEbus-controller market in 1987 and 22.5 percent in 1988 with \$4.27 million in revenues. Meanwhile,

the ST506 market share will decline, from 92.9 percent in 1985 to 40.1 percent in 1988.

"The VMEbus-ESDI controller market will show strong growth because of the increasing number of small disk drives that are offering a better price-per-bit with ESDI on them," asserts consultant I. Dal Allan of ENDL, Saratoga, Calif.

Allan sees the small-form-factor advantages of lower power dissipation and a "more attractive box with sex appeal" winning SMD users over to ESDI. "ESDI will knock out the bottom end of the SMD market. It will eat up the 150M-byte-to-200M-byte SMD drives. They will be replaced with the same-capacity ESDI drives."

Another big plus for ESDI, Allan emphasizes, is its automatic-reconfiguration feature. "The drive tells you what its characteristics are. You don't have to run around setting jumpers and playing 'Mickey Mouse' games."

Supports UNIX systems

Along with the controller, Xylogics provides a model driver for UNIX operating systems that supports overlapped seeks and logical partitions.

Formatting and bad-block-detection utilities furnish sector-slip and cylinder-slip capabilities. The "matched set" of software driver and firmware improves controller performance in multiuser, UNIX-based systems, adds Cory.

"We moved a lot of the functionality for UNIX out of software and into the controller," R&D chief Cory explains. "To utilize features such as elevator seek effectively you have to write the proper driver. A good driver writer could write effective software. But only a few of our customers would put that much time and effort into the driver."

Controller and disk-drive parameters, such as throttle-burst size, dead-band time, interleave factors and sector sizes are software-programmable in electrically erasable, battery-backed-up ROM, Cory emphasizes.

Using custom VLSI silicon and a FIFO buffer instead of a cache, Cory stresses, minimizes bus overhead dur-

ing DMA transfers.

The controller's 8K-byte FIFO buffer can be filled and emptied simultaneously, Goner emphasizes, and users will not encounter the data-overflow or rotational-latency problems that have plagued some FIFO implementations.

IPI won't hurt ESDI

Gonor does not expect the ESDI-controller market to be affected by device-level, intelligent-peripheral-interface controllers—IPI-2—which, when they appear on the market, will offer 3M-byte-per-second and higher data-transfer rates. "ESDI and IPI will be two distinct markets," he contends. "IPI is a natural big brother to SMD. It will pick up where SMD left off. ESDI takes over where ST506 leaves off. Our customers are only now migrating to a 2.4M-byte-per-second transfer rate. They will have to triple that to need IPI."

Allan also sees little short-term impact from IPI-2: "IPI-2 will take years to affect ESDI. It will have to grow down from very-high-performance products. It'll take a lot of silicon and a lot of expense. Users will want a small drive with IPI-2 only after they have it on larger disks."

Neither Gonor nor Allan expect variations in ESDI implementations and the lack of a formal ANSI standard to impair ESDI controller-market growth—or deter potential users. Because 712 controller parameters are microcoded, Gonor says, they can be easily adapted to future ESDI variations.

In any case, Gonor emphasizes, ESDI is already a de facto standard, so standardization is not an issue. "You can't build to a standard," he asserts. "You have to build to a spec. We're taking a spec we've designed our products to and are trying to make it a standard."

VMEBUS ESDI RIGID-DISK CONTROLLERS SQUARE OFF

Model	712	VESDI-32
Manufacturer	Xylogics	Dual Systems
No. of drives supported	four 5¼-inch or larger	four 5¼-inch or larger
Sector sizes (bytes)	any size	512, 1,024, 2,048
Maximum data-transfer rate (M bytes per second)	2.4	2.4
Maximum 32-bit DMA rate (M bytes per second)	10	4
Type of buffer	FIFO	dual-port cache
Size of buffer (K bytes)	8	250
Error detection	32- or 48-bit ECC	CRC-16, ECC to 56-bit
Flaw skipping	to sector level	to sector level
Minimum interleave	1:1	1:1
Board size	dual high, wide; Eurocard; (160 by 233 mm)	dual high, wide; Eurocard; (160 by 233 mm)
VMEbus support	16-, 32-bit data transfers; 16-, 24-, 32-bit addressing	16-, 32-bit data transfers; 24-, 32-bit addressing
Features	elevator seek, scatter/gather, dynamically switched DMA word size, command chaining, zero-latency read	scatter/gather, look-ahead/look-around algorithm, single-command reads to multiple parts of address space, zero-latency read
Price (\$)	1,995 (Qty 1)	1,990 (Qty 1)

Source: Xylogics Inc., Dual Systems Corp.

Fiber LANs: A market groping toward the light

Stephen J. Shaw
Washington Editor

Xylogics is looking ahead, Gonor says, to a version of the 712 controller, the \$1,795 722, that will provide two rigid disk-drive ports and two half-inch, tape-cartridge-drive ports. But, Gonor adds, the company plans a second-quarter introduction of the 722 only if a sufficient number of ESDI tape drives appear on the market.

Xylogics also has a controller for Winchester and optical disks in Multibus and VMEbus versions that it expects to make available in the second half of the year, Gonor says.

Competition in the VMEbus-ESDI controller market will heat up later this year when Ciprico Inc., Plymouth, Minn., and Interphase Corp., Dallas, introduce products to match Xylogics' 712 and the recently released VESDI-32 from Dual Systems Corp., Berkeley, Calif.

Like the 712, Dual's controller supports 16- and 32-bit transfers over the VMEbus and 24- and 32-bit addressing. Meanwhile, Interphase will ship sample quantities of its VMEbus-ESDI controller between June and August, says director of marketing Tom Kent, and the company also plans a Multibus II version. Ciprico intends to produce sample quantities of its product at the end of the third quarter, says marketing director Bill Rost.

Rost adds, "We will offer a VMEbus-ESDI controller because that is what our customers want. They like the size of the ST506 drive but want a higher transfer rate. VMEbus is here now and we have to respond to it."

Although Xylogics is committed to Multibus II as well as VME, says Gonor, it lead off with a VMEbus ESDI product because VMEbus "is here today. A good percentage of Multibus I customers are going to VMEbus. Multibus II right now lacks off-the-shelf peripheral products."

That situation will change later this year, Gonor thinks, when Multibus II picks up steam. But, for now, VMEbus has an edge.

"Technology is not as important as time-to-market these days," he adds. "What's shipping is the best. Both buses will have a place. But whatever the market tells us, that's where we want to be." □

Despite years of high expectations, the use of optical fibers in local area networks has met only limited acceptance among system integrators and end users. However, signs indicate that more vendors are realizing that the lightguides do have a niche, albeit small at present, for specialized LAN applications.

Many LAN vendors now offer a fiber-optic-based implementation of their products, and traditional optical-component suppliers report a tremendous upsurge of customer interest for a new generation of higher speed, fiber-optic LANs. Fiber optics is also starting to play a role in the design of terminal and central processor interfaces. For instance, Wang Laboratories Inc., Lowell, Mass., is expected to announce this month "FiberWay," a commercial version of a fiber-optic port assembly and remote cluster switch for its VS 65 and VS 300 mini-computer systems. The original system was introduced in mid-1985 for government applications demanding TEMPEST standards for secure computer processing and communications.

Fiber-optic-based LANs have never suffered from a lack of technological promise. Compared with conventional coaxial cable or twisted-pair wiring, optical fiber offers amazing advantages. Researchers at Bell Laboratories have demonstrated fiber-optic throughput rates well in excess of 20G bits per second (bps)—the equivalent of more than 300,000 simultaneous telephone conversations or 200 high-resolution television channels. And the massive bandwidth and complete immunity to electromagnetic interference (EMI) make fiber optics an ideal medium for transferring huge amounts of data in environments, such as factories, that would render conventional cable media useless.

Fiber optics offers particular advantages for military applications. The

light-wave cable is highly resistant to covert interception, because the cable cannot be easily tapped without an operator knowing that someone has broken the light beam. Additionally, fiber optics' lack of radio-frequency emissions and its imperviousness to EMI has made it the choice for secure, TEMPEST data and voice communications. TEMPEST refers to the Defense Department's set of standards for secure data processing. Applications range from command and control networks on the battlefield to the communications system at the Air Force Space Command, now under construction in Colorado Springs, Colo.

Commercial applications for fiber optics have traditionally lagged far behind those of the defense establishment, but have begun to make up lost ground during the last few years. Many telephone companies are now in the latter stages of laying thousands of miles of optical fibers for long-distance trunk communications. The first trans-Atlantic fiber-optic cable is expected to carry integrated voice, data and video communications between the United States and Europe by 1989.

For local applications, fiber optics up to now has had a miniscule impact. The reasons, according to industry analysts and fiber-optic vendors, include the technological immaturity of light-beam splitters, which are required for certain LAN topologies; the high relative cost of some fiber-related components, such as transducers that convert light signals to electrical impulses; and the huge installed base of traditional information-management hardware with conventional coaxial or twisted-pair interfaces.

"Fiber certainly is finding a place for LAN interconnection and other trunk-type applications, but it will take time for it to penetrate the LAN market," concedes Adam Namm, an analyst with Kessler Marketing Intelligence Corp., Newport, R.I., a fiber-optic consulting organization.

According to a recent study issued

by Kessler, the value of fiber-optic components within LANs totaled only \$10 million this year, a lilliputian 2.5 percent of an overall \$400 million LAN-component market.

However, Kessler estimates that by 1990 the value of fiber-optic components within LANs will swell to \$360 million, representing 30 percent of a projected \$1.2 billion market for LAN components.

The current market may be pint-size, but market forecasters and vendors alike say that end users in respectable numbers are beginning to request fiber-optic-based LANs. At Proteon Inc., a LAN vendor in Natick, Mass., senior product manager Ed Brohm reports that 70 percent to 80 percent of the company's customers who want high-speed LANs (80M bps) are requesting fiber optics. In response, Proteon last year introduced an 80M-bps, token-ring, fiber-optic LAN. Brohm adds that 15 percent to 20 percent of Proteon's customers specify optical fiber for at least some portion of lower capacity—up to 10M bps—LANs.

This past November, at the Autofact '85 factory-automation conference in Detroit, Codenoll Technology Corp., Yonkers, N.Y., introduced its Codenet 3030S Fiber Optic Ethernet Transceiv-

er. Priced at \$295 in OEM quantities, the unit is switch-selectable to meet the equipment interface standards of IEEE 802.3 and Ethernet versions 1.0 and 2.0.

Codenoll also introduced its 125M-bps Codelink 100B fiber-optic link. The chip set, priced from \$800 to \$1,600, can be mounted on a printed-circuit board and is compatible with the 100M-bps ANSI Fiber Distributed Data Interface (FDDI) ring networks.

According to Kessler's Namm, Codenoll has supplied roughly 40 percent of all fiber-optic components for LANs. Codenoll president Michael Coden says that his company has supplied approximately 2,000 fiber-optic LANs, which represents approximately 20,000 pieces of equipment.

Artel goes Mainstream

Artel Communications Corp., Marlboro, Mass., is expected to unveil this month Mainstream, a 200M-bps fiber-optic LAN. The company says that Mainstream is the first digital broadband LAN using fiber.

The 200M-bps throughput on this token-ring LAN can be split into eight separate 25M-bps channels for independent voice, data or video communications. Each band can be further sub-

divided into separate channels and subchannels for communications among many network devices.

Artel envisions two levels of applications for Mainstream. It can serve as a work-area network connecting clusters of computer aided design equipment, which typically require much higher throughput capabilities than other workstations, or multiple data centers for a single high-speed LAN. It also can be used as a network backbone to carry aggregated voice, data or video traffic for inter-LAN communications. As such, the fiber-optic-based network can be incorporated with other wiring schemes, including twisted-pair or coaxial cable.

Wang's FiberWay is a sign that manufacturers of computers and office-automation equipment are beginning to consider fiber optics in designing systems. Wang's product manager in fiber optics and secure networking, Dennis Careon, describes FiberWay as a 40M-bps multiplexed link that works off the back end of the VS 65 and VS 300 central processors and provides a fiber-optic path to a remote cluster switch. The remote cluster switch translates the light signal into electrical impulses and interconnects up to 16 peripherals per switch via conventional Wang coaxial cable. "In this fashion," explains Careon, "no peripherals will have to be modified."

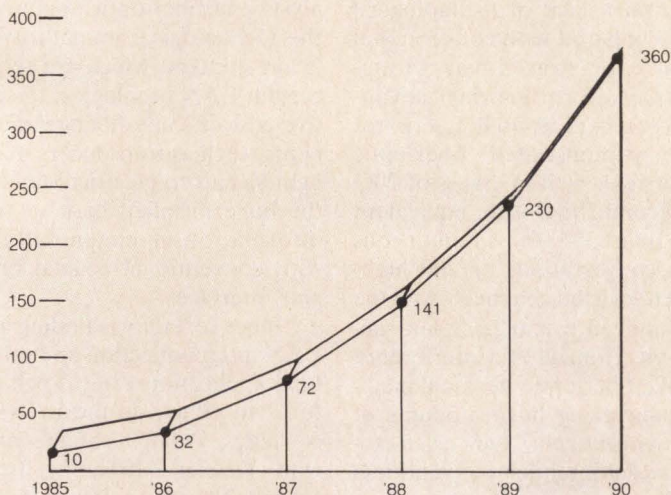
Prices for FiberWay components are \$700 for fiber-optic master converters, \$2,600 for a 16-port TEMPEST-approved remote cluster switch with link alarm, and \$1,550 for a two-port, TEMPEST-approved active port assembly that interconnects with the CPU.

"Fiber is adding another technology layer, and it's going to take time to educate not only users but also vendors' sales and support people that fiber offers a powerful transport medium for integrated communications," Careon says.

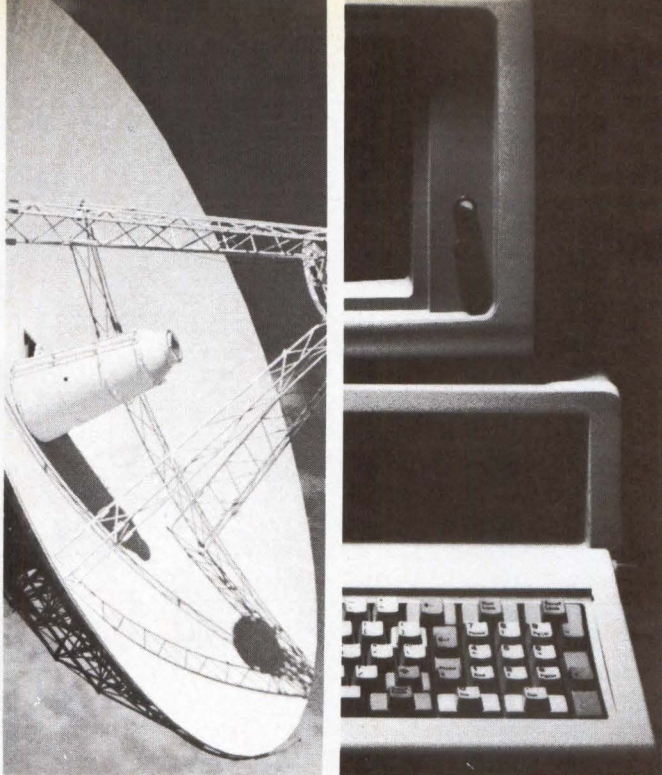
If that education does occur, and if the LAN community settles on some coherent network standards, fiber-optic-based LANs may, finally, be on the verge of living up to their technological promise and the early expectations of both vendors and end users. □

VALUE OF OPTICAL FIBER COMPONENTS IN LANs

(\$ MILLIONS)



SOURCE: KESSLER MARKETING INTELLIGENCE CORP.



JOIN

EXPO- COMM 86 CHINA

The 1986 National
Computer/Communications
Exhibition and Conference
of China

Beijing's New International
Exhibition Center
October 16-22, 1986

IBM
ATT INTERNATIONAL
RCA
MOTOROLA
DIGITAL EQUIPMENT
CORPORATION
XEROX
PRIME COMPUTER
NIXDORF COMPUTER AG
SIEMENS AG
NTT NIPPON TELEGRAPH &
TELEPHONE
KDD KOKUSAI DENSHIN
DENWA CO. LTD.
ALCATEL THOMSON
LM ERICSSON
PHILIPS TELECOMMUNICATIONS
SWISSCOM
HONEYWELL
BURROUGHS CORPORATION
WANG COMPUTER
STANDARD ELEKTRIK
LORENZ AG
GTE
HEWLETT PACKARD
KRONE GmbH
INTEL
TELEPHONY MAGAZINE
AND
NATIONAL PAVILIONS FROM
GERMANY, FRANCE, JAPAN,
ITALY, SWITZERLAND,
BRITAIN, USA

Join these leaders in
China's national computer/
communications event.



Produced and Organized by:

E.J. Krause & Associates, Inc.
P.O. Box 70356
Washington, DC 20088 U.S.A.
tel. (301) 986-7800
tlx. 4944944 EJK EXPO
Contact: Ron Akins

Yes, add my company's name to the list. Please send an
exhibition prospectus to:

Company _____

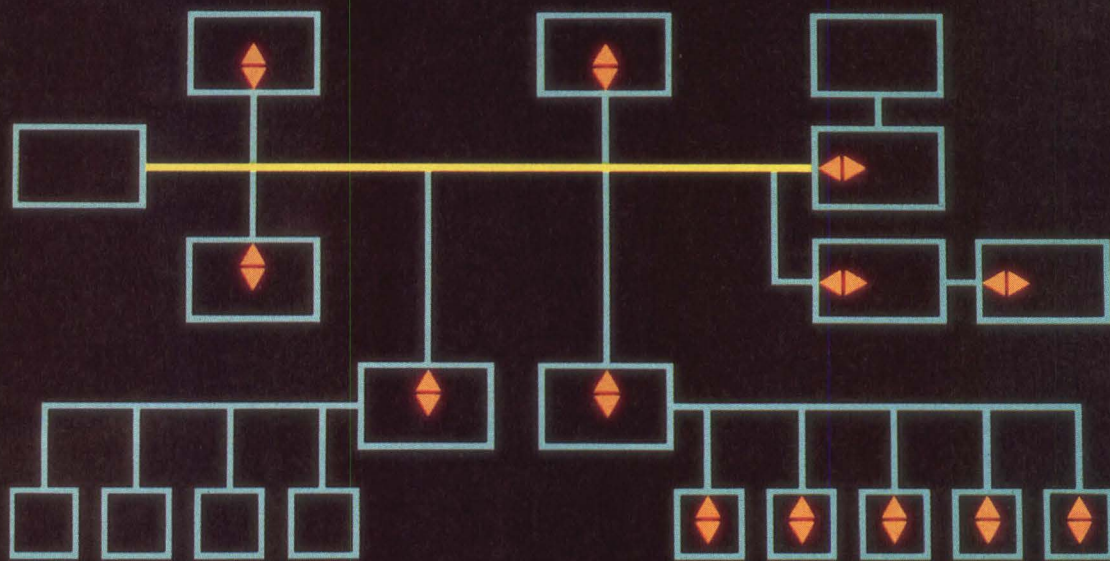
Address _____

Contact _____ Title _____

Telephone _____ Telex _____



MOTOROLA



MOTOROLA INC.
Microprocessor Division
MicroMAP™



First in MAP solutions.

VME boards and VLSI chips available now put you ahead in factory networking.

The MC68020, the new MC68824 Token Bus Controller, and VME board-level products are the cost-effective solutions for MAP (Manufacturing Automation Protocol), the new standard for industrial communications.

They're available today to help you beat the challenge of integrating factory data communications.

Integrating IEEE 802.4 Media Access Control.

Motorola's new MC68824 Token Bus Controller (TBC) is the first single-chip VLSI device to implement the IEEE 802.4 Media Access Control sublayer. This intelligent HCMOS communications controller has serial data rates to 10 million bits per second... 10 Mbps. The TBC relieves the host processor of frame formatting and token management functions, and simplifies the interface between framed data and higher levels of software. It also provides efficient memory management.

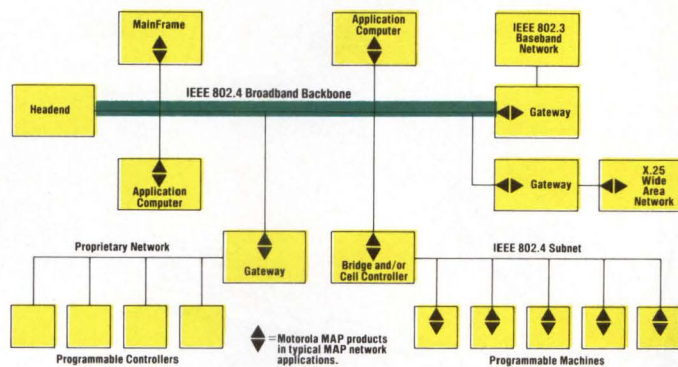
For fast transfer of data frames to and from memory, the MC68824 features on-chip, four-channel DMA, a full 32-bit address range, 8- or 16-bit data bus operation and a 40-byte FIFO. It can implement token bus network bridges to other LANs by using IBM-defined source-routing options, and also provides byte-swapping capability for alternate memory organizations.

Another Motorola high-performance chip product particularly well suited to communications and networking applications under MAP is the MC68020 MPU. Available at 12.5, 16.67 and 20 MHz, it has three-stage pipelining, and executes at 3.0 to 4.0 MIPS. Its 256-byte on-chip instruction cache supports tight-loop execution burst rates to 10 MIPS.

VMEmodule, SYSTEM V/68, VME/10 are trademarks of Motorola, Inc. UNIX is a trademark of AT&T Bell Laboratories.

MAP solutions with 10 Mbps VMEmodule™ network interface.

Motorola is the best source today for state-of-the-art modular solutions for MAP implementations, as well as for new ICs. Our VMEbus-compatible board set incorporates both MAP Interface Con-



troller and Broadband Modem modules.

The MVME370 MAP Interface Controller features gate array technology. It utilizes a ROM-based kernel, and implements the MAP 2.1 specification through Layer 4 with software downloadable to the MAP interface from the system host. The companion MVME371 Broadband Modem module operates in conjunction with the MAP Interface Controller. It contains all the modem control logic and RF circuitry required to interface to the MAP 2.1 broadband media.

An even higher-performance network interface module to be available in mid-1986, the MVME372, will apply our

MC68824 TBC and implement all seven layers of the MAP 2.1 protocol on board.

Complete development support.

The development environment for MAP applications is SYSTEM V/68™—the AT&T-validated equivalent of UNIX™ System V for the M68000 MPU family. Motorola MAP software is available on SYSTEM V/68-formatted disks in Common Object File Format, to run on our VME/10™ development host or on a MC68010-based VMEsystem package.

One-on-one design-in help.

Get an engineer-to-engineer update on all the latest MAP products and technologies for your unique designs.

1-800-521-6274

Call toll-free any weekday, 8:00 a.m. to 4:30 p.m., MST. If the phone call can't cover your needs, we'll have a local field application engineer contact you and help you get to market. Faster. For additional information on our MAP products, fill out the coupon and send it to Motorola Semiconductor Products, Inc., P.O. Box 20912, Phoenix, AZ 85036.

We're on your design-in team.



MOTOROLA

To: Motorola Semiconductor Products, Inc. P.O. Box 20912, Phoenix, AZ 85036

Please send me data on Motorola MAP products.

266MMS020086



Name _____

Title _____

Company _____

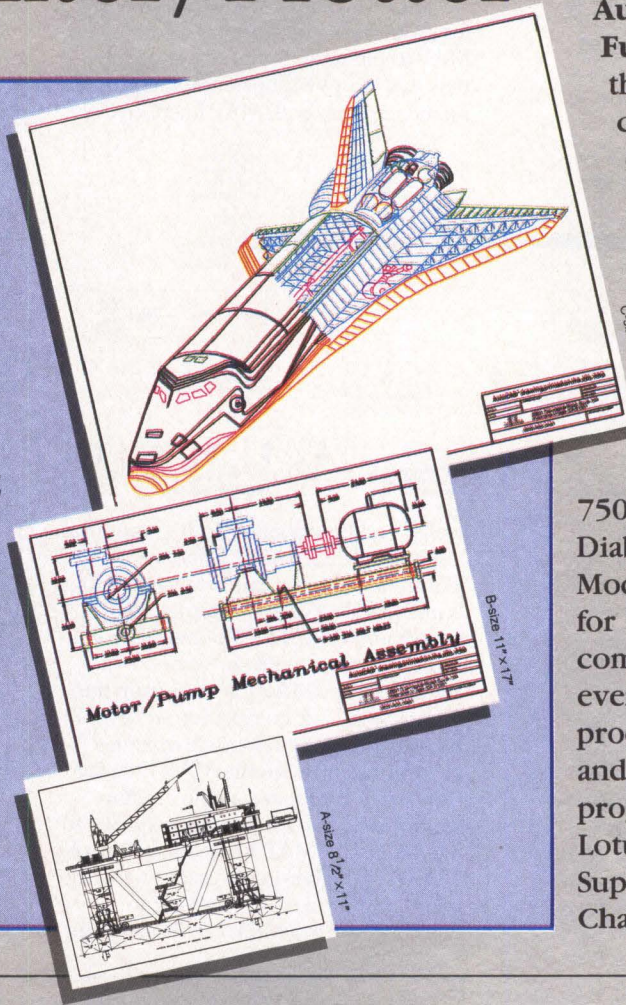
Address _____

City _____ State _____ Zip _____

Call me (_____) _____

AutoCAD™ plotting as easy as A-B-C with the JDL-750e Color Matrix Printer/Plotter

- ACCEPTS UP TO 17" WIDE MEDIA (C-SIZE)
- PRINTS ON STANDARD PAPER AND VELLUM
- 15.1" PRINT WIDTH IN GRAPHICS
- 14 COLORS SELECTABLE
- 180 × 180 DPI RESOLUTION
- .01" MINIMUM LINE WIDTH
- SEMI-AUTOMATIC A THROUGH C-SIZE SHEET INSERTION



The new JDL-750e prints A through C-size drawings yet costs less than the best-selling A/B size plotter. Producing high quality plots at speeds that rival a pen plotter, the 750e delivers superior line quality, highly accurate position repeatability, and no end-of-line pen drift or blotting.

Compatible with AutoCAD™ and FutureNet Dash™ II, the 750e gives you the choice of high speed draft plots, or high resolution plots, in black and white or full color.

For PC engineering workstation versatility, the 750e emulates the Diablo 630 and the IBM Model 5182 Color Printer for text and graphics compatibility with nearly every popular word processing, spreadsheet, and business graphics program, including Lotus 1-2-3, Symphony, SuperCalc III, Chart and Chart-Master.

For more information and an AutoCAD™ plot sample contact the JDL, Inc. office nearest you.

WESTERN REGION:
1333 Camino Del Rio South
Suite 303
San Diego, CA 92108
(619) 291-8330

CENTRAL REGION:
14683 Midway Road
Suite 202
Dallas, TX 75244
(214) 934-0535

EASTERN REGION:
7301 Carmel Executive Park
Suite 206
Charlotte, NC 28226
(704) 541-6352

JDL
INCORPORATED

2801 Townsgate Rd., Suite #104
Westlake Village, CA 91361

(805) 495-3451

AutoCAD is a registered trademark of Autodesk, Inc. FutureNet Dash is registered trademark of FutureNet Corporation. IBM is a registered trademark of International Business Machines Corp. Lotus 1-2-3 and Symphony are trademarks of Lotus Development Corporation. SuperCalc III is a registered trademark of Sorcim IUS. Microsoft Chart is a registered trademark of Microsoft Corporation. Chart-Master is a registered trademark of Decision Resources Inc. Diablo is a registered trademark of Xerox Corporation. Specifications subject to change without notice.

Nationwide on-site
service provided by NCR

NCR

CIRCLE NO. 15 ON INQUIRY CARD

Tolerant Systems justifies the name

Mike Seither

Associate Western Editor

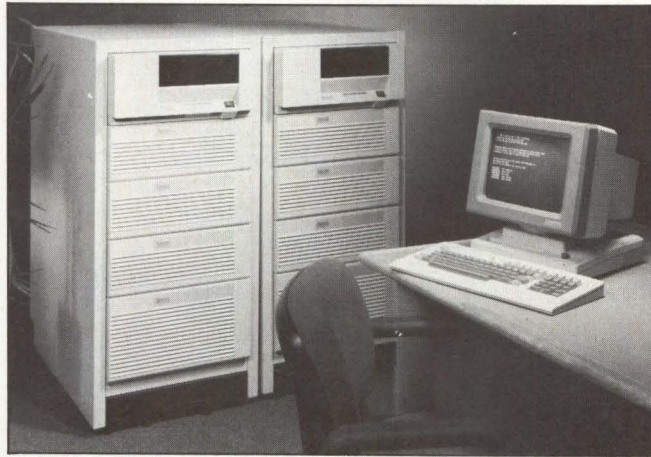
Other contenders have had little success in taking on the two leading manufacturers of on-line transaction processing computers with built-in fault tolerance. Today, Tandem Computers Inc., Cupertino, Calif., and Stratus Computer Inc., Marlboro, Mass., still dominate the market with their disparate shares of 88 percent and 7 percent, respectively.

A handful of other companies vie for the remaining 5 percent of the market. One of them, Tolerant Systems Inc., San Jose, Calif., believes it can become a significant "other." Tolerant Systems claims that both its machines and marketing strategy directly address the needs of OEMs and system integrators looking for fault tolerance—that ability of a computer system to operate despite failures in either hardware or software.

Specifically, Tolerant says its Eternity system, introduced in January, has a 2-1 price/performance ratio over anything Tandem or Stratus offer. Moreover, Eternity operates, not on a proprietary operating system as do its competitors, but on Tolerant's modified version of UNIX. And later this year, Eternity should be able to use the Ada programming language, a requirement laid down by the Pentagon for defense computing.

With that list of attributes, Tolerant hopes to woo, among others, those system integrators and resellers that are bidding on government contracts. "It's true that more and more federal RFPs [requests for proposals] are stipulating UNIX and fault tolerance," says Richard Mikita, an analyst with International Data Corp., Framingham, Mass. "The push is also on to make Ada a standard programming language," he adds.

Also included in Tolerant's marketing strategy are computer manufacturers who do not offer fault tolerance. Only last year did IBM Corp., the leading vendor of on-line transaction-processing systems, begin to offer fault



Tolerant's Eternity series for on-line transaction processing features fault tolerance and accommodates up to 2,500 users.

tolerance. But IBM had to go outside to get it; the IBM System/88 is the result of an OEM arrangement with Stratus. Big Blue just recently announced the general availability of the System/88.

"Other computer manufacturers, especially the BUNCH companies [Burroughs Corp., Sperry Corp. (Univac), NCR Corp., Control Data Corp. and Honeywell Inc.], are faced with the prospect that IBM now has a fault-tolerant computer," says Shirley Henry, Tolerant's director of marketing. "They'll have to be prepared to sell around that hole in their line."

IBM-Stratus set pattern

Some industry analysts believe that situation may bode well for Tolerant. It's unlikely that many companies could bring their own fault-tolerant architecture to market quickly enough to offset IBM's advantage. OEM systems are generally not available from Tandem because, for the most part, it sells to end users. On the other hand, Stratus has indicated it is willing to sell to other buyers as well as to IBM. But would Honeywell, for example, want a product in its line that's essentially the same as the one IBM gets from Stratus? Most analysts agree that's unlikely.

"It's not impossible that someone from BUNCH might pull a similar trick with Tolerant like IBM did with Stratus," says Omri Serlin, president of

Itom International Co., a Los Altos, Calif., research concern that follows the transaction-processing market.

Tolerant's Eternity series does not mark the introduction of a new product so much as it does a method of connecting multiples of its System Building Blocks (SBB) into a fault-tolerant system. Tolerant has been shipping its SBB computer, built with National Semiconductor Corp. 32016 processors, for more than a year.

Eternity reflects Tolerant's technique of connecting a maximum of 15 SBBs, each capable of performing four transactions per second, with a dual-channel Ethernet connection. A minimal fault-tolerant system consists of a pair of SBBs, which could accommodate a total of 288 terminals. That configuration costs about \$190,000. A 15-SBB system can handle up to 2,500 terminals, the company says. With savings gained in volume buying, Tolerant estimates a 15-unit system would cost between \$1 million to \$1.5 million.

Tolerant claims that it has invested more than \$10 million in refining UNIX to handle on-line transaction processing. The reconstituted operating system, called TX, "gives users the functionality they see in large-scale database management systems without the overhead that makes those systems unusable in large-scale, on-line transaction-processing applications," says Tolerant's Henry.

The way the operating system dy-

COMPARING TOLERANT AND THE COMPETITION

Product name	Tandem			Stratus			Tolerant
	EXT	NS II	TXP	FT250	XA400	XA600	Eternity
TPS per CPU	1.9	1.9	4.7	1.7	3.4	5	4
CPUs in FT system	2	2	2	1	1	1	2*
Total TPS in FT system	3.8	3.8	3.4	1.7	3.4	5	8
Entry price (\$000)	160.3	224.5	331.1	122.5	233.5	335.8	190
Cost per TPS (\$000)	42.2	59.1	40.5	72	68.7	67.2	23.8
Tolerant P/P advantage (%)	43.7	59.8	50.1	67	65.4	64.6	

*System building blocks (SBBs)

TPS = transactions per second

NS II = NonStop II

P/P = price/performance

FT = fault tolerant

Source: Tolerant Systems Inc., ITOM International Co., Datapro Corp.

natically allocates database work among the SBBs' multiple processors gives Eternity a transaction-processing power that can grow linearly. That is, a single SBB is capable of four transactions per second (tps). A four-SBB system operates at 16 tps; a full 15-SBB system at 60 tps.

A major part of Tolerant's marketing campaign revolves around the expandability of Eternity. System integrators can expand a customer's system as needed by adding modules. Tolerant doesn't see this happening with the competition.

"People don't tend to buy Stratus modules for growth. Stratus has a small [FT250], medium [XA400] and large [XA600] system," says Henry. "Customers upgrade by going to a larger Stratus system."

How much a Tolerant system can be upgraded is now limited by the bandwidth of the dual-channel bus, which can move 2.5 bytes of data per second. IDC analyst Mikita says that a fiber-optic link that one of Tolerant's OEM customers is expected to announce soon will allow Eternity to grow to 50 times the 2,500 terminals the system can now handle.

It's conceivable that Tolerant will be able to get into the high ground of transactions, much like what is now done with IBM's mainframes and Information Management System, says Mikita.

"Conceivable" is the key word. Most observers agree that Tolerant has its work cut out for it, trying to under-

cut the competition on the basis of cost.

"They [Tolerant] are certainly not the first to claim a tremendous price/performance edge over Tandem or Stratus," says Itom's Serlin. "When customers agree with those claims, that's when you can safely say they are correct."

Serlin adds that what's most significant about Tolerant's announcement is Eternity's ability to recover and maintain the integrity of a database should a system failure occur. "It's probably the lowest priced system you can get with that feature," says Serlin. "That's clearly a claim they can make if it proves to work in the market." □

Data General's challenge lies in marketing

Lynn Haber, Associate Editor

Data General Corp. fleshed out its product line recently with the announcement of a high-end supermini-computer—the Eclipse MV/20000, available in single- or dual-processor models that range from 5.5 million instructions per second (MIPS) to 10 MIPS—and a low-end, three- to 24-user minicomputer called the MV/2000 DC. The Westboro, Mass., company also announced the DS/7500 and DS/7700 workstation series, based on the same hardware as the MV/2000 DC for engineering and manufacturing markets.

DG's strategy in offering these integrated-computing solutions to office-automation and technical environments received praise from industry analysts as being both timely and impressive. Yet the strategy alone does not guarantee market recognition. "Data General demonstrated that the company is capable of staying up with DEC [Digital Equipment Corp.], their primary competitor, in applying the latest technology in both low- and high-end systems," says Myron Kerstetter, program director for small-computer-system service at the Gart-

ner Group Inc., Stamford, Conn. "Now the issue for DG is not a product problem but, rather, a marketing problem."

Kerstetter says that DG's direct-sales staff of less than 1,000 people has a tough task ahead in competing with the larger forces of its chief rivals. DEC has more than 3,000 direct-sales people and IBM Corp. has more than 8,000. "This means that DG must be very astute as to where they go and how they go about marketing their products," contends Kerstetter. Analysts concur that DG must attract a new customer base and not simply rely on existing DG users.

A DG spokesman says criticism of the company's marketing practices dates to the late 1970s when, he admits, DG did not have an end-user marketing force.

Last November, however, DG overhauled its business division to increase emphasis on industry-marketing programs and product marketing, and to consolidate channels of distribution. The company's current marketing approach is to sell what it calls "complete computing solutions"—both hardware and software—to targeted industries such as finance, manufacturing and

We've added something to our Prime™-compatible memory that Prime seems to have forgotten.

EMC delivers the only Prime ECL-based memory with an unconditional lifetime warranty.

EMC has become the largest independent supplier of add-in memory boards for Prime minicomputers for two very good reasons.

We make a better board.

And we offer a better warranty.

For instance, all our boards are designed with an online-offline switch for easy diagnostics.

And every EMC board undergoes 100 hours of rigorous testing and burn-in—with 24 straight hours of CPU qualification in our own Prime computers.

That's why we're the only company with *both* the boards and the confidence to offer you an *unconditional lifetime warranty* on every board we sell. Including our new ECL-based 2MB, 4MB and 8MB memory for the Prime 9750, 9950 and 9955.

No monthly maintenance charges. Ever.

Unlike Prime's memory expansion boards, ours have no maintenance charges of any kind. Which lowers your cost of ownership dramatically.

If you even *suspect* a problem, simply call our special toll-free hotline and we'll deliver a new board to you in *less than 24 hours*—absolutely free. Even before you return your old board.

But while we build more reliability into our boards, you don't have to pay more to get it. In fact, EMC prices start at *40% less* than comparable memory boards from Prime. And we offer immediate delivery.

EMC boards are so easy to install, it takes only 10 to 15 minutes (you can even do it yourself) without affecting your Prime maintenance agreement in any way.

Something else worth remembering. If you're moving up to a Prime ECL-based system, we'll give you generous trade-up credits for your older EMC memory.

And we also offer you a complete family of communications and disk drive products to maximize the performance of your Prime system while minimizing upgrade costs.

More IBM™, DEC™, HP™ and Wang™ users have our name committed to memory than any other.

EMC is the world's largest independent supplier of add-in memory for IBM System/38, DEC VAX™, HP 3000, and Wang VS minicomputers.

And every memory board we sell for every make of computer comes with our same unconditional lifetime warranty.

You'll also find EMC memory keeping company with some of America's best-known companies. Such as Citibank International, Ford Motor Company, Xerox Corporation, Floating Point Systems, University of California, Shell Oil and many other leading Fortune 500 companies.

Prove how good our memory is before you buy.

EMC memory expansion boards will give your Prime system an immediate boost in speed, power and productivity. With no increase in your software or other hardware costs.

But don't take our word for it. Take advantage of our special evaluation board offer to qualified Prime system owners.

Simply call today, and we'll install an EMC memory board for you without charge or obligation.

Then evaluate it on your own system, running your own applications, for *two full weeks* absolutely free.

Once you do, remembering our name will be a snap.

EMC Corporation, 12 Mercer Road, Natick, MA 01760.

For your free two-week evaluation, call today:

1-800-222-EMC2

(In MA, call 617-655-6600)

European Headquarters: In London (088385) 2434;
International Number 44 88 385 2434
U.S. TELEX 948615.

PRIME is a registered trademark of Prime Computer, Inc.
9750, 9950 and 9955 are trademarks of Prime Computer, Inc.
IBM is a registered trademark of International Business Machines Corporation.
DEC and VAX are trademarks of Digital Equipment Corporation.
HP is a registered trademark of Hewlett-Packard Company.
WANG is a registered trademark of Wang Laboratories, Inc.

EMC²

No one is more committed to memory.

CIRCLE NO. 16 ON INQUIRY CARD





Several years ago, we had a rough idea where systems technology was headed.

And we were right.

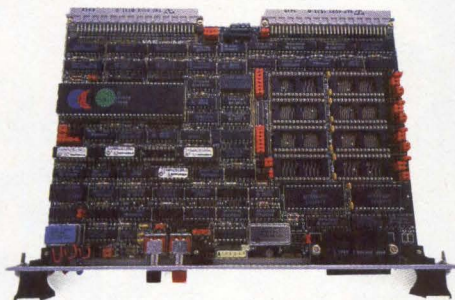
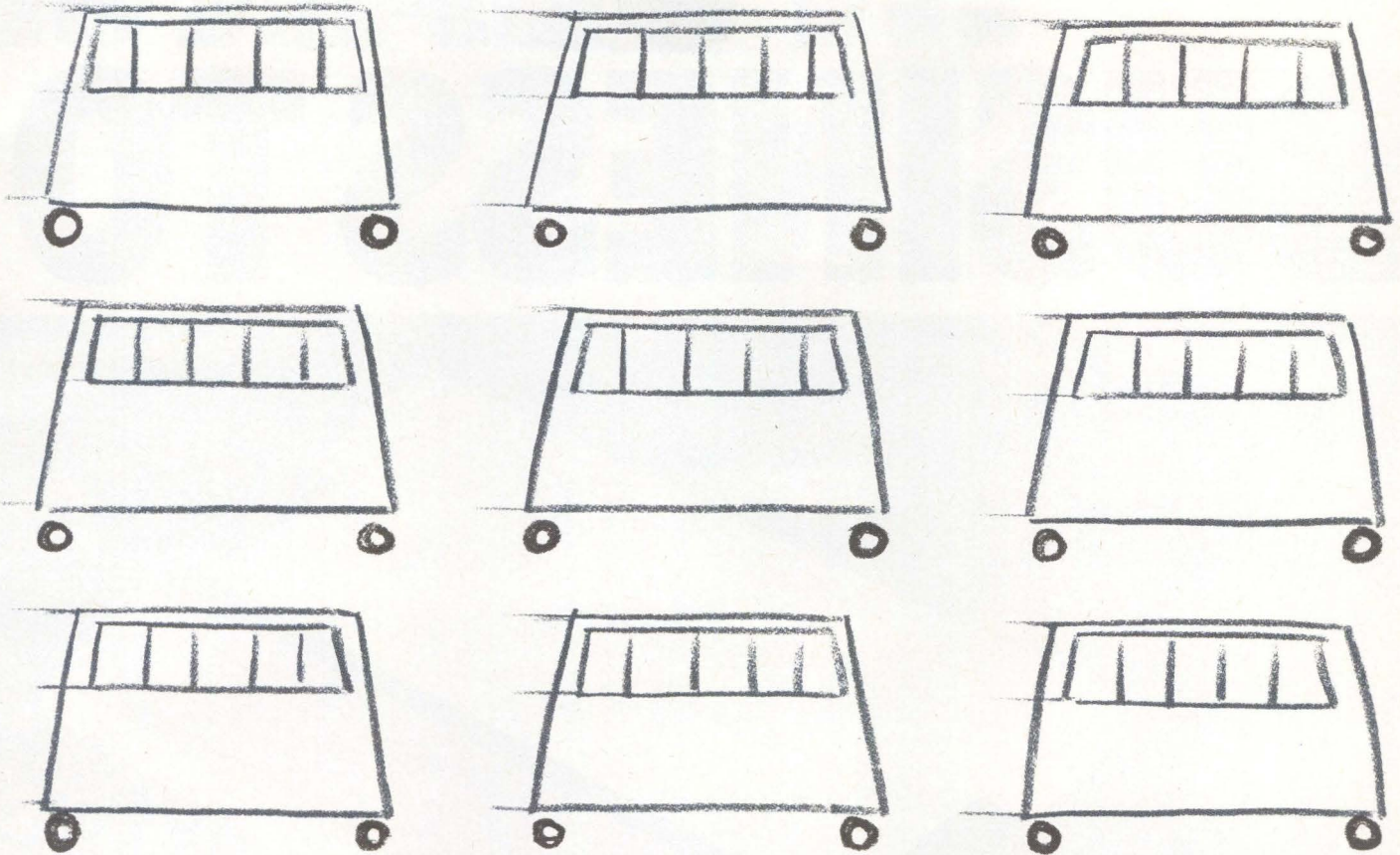
You see, several years ago we co-founded the STD BUS and VMEbus architectures.

We're Hamilton Standard Digital Systems, Inc. And today, we offer one of the broadest choices of fully compatible STD and VME systems and subsystems. As well as SIPs, add-in, mass memory systems and custom design and manufacturing.

So as the needs and applications for systems technology continue to change, wouldn't it be a good idea to rely on a systems company that stays ahead of it all? That's Hamilton Standard Digital Systems. For more information, call 1-800-635-0200. Or write 1419 Dunn Dr., Carrollton, Texas 75006.



This bus won't make you wait.



The Motorola VMEbus Microprocessor Modules from Hall-Mark.

You won't fall behind schedule with Motorola's line of VME Microprocessor Modules from Hall-Mark Electronics.

The MVME line is a family of versatile, VMEbus-compatible board-level computers that offer the performance required for data processing, data management and industrial control. Applications for these products range from high-speed single processor systems through systems of complex multi-

processor architecture.

- M68000-based
- Open architecture
- No fees
- Flexible
- 1000+ compatible products
- In stock now

Hall-Mark won't make you wait, either, with 32 stocking locations nationwide and a real-time, on-line computer system. So don't wait. Call Hall-Mark today.



Alabama
Huntsville (205) 837-8700

Arizona
Phoenix (602) 437-1200

California
Bay Area (408) 946-0000
Orange County (714) 669-4700
Sacramento (916) 722-8600
San Diego (619) 268-1200
San Francisco Valley (818) 716-7300
West Los Angeles (213) 217-8400

Colorado
Denver (303) 790-6602

Connecticut
Connecticut (203) 269-0100

Florida
FL Lauderdale (305) 971-9280
Orlando (305) 855-4420
Tampa Bay (813) 530-4543

Georgia
Atlanta (404) 447-8000

Illinois
Chicago (312) 860-3800

Indiana
Indianapolis (317) 872-8875

Kansas
Kansas City (913) 888-4747

Maryland
Baltimore (301) 988-9800

Massachusetts
Boston (617) 935-9777

Minnesota
Minneapolis (612) 854-3223

Missouri
St. Louis (314) 291-5350

New Jersey
Fairfield (201) 575-4415

New York
Long Island (516) 737-0000

North Carolina
Raleigh (919) 872-0712

Ohio
Cleveland (216) 349-4632
Southern Ohio (614) 888-3313

Oklahoma
Tulsa (918) 665-3200

Pennsylvania
Philadelphia (215) 355-7300

Texas
Austin (512) 258-8848
Dallas (214) 553-4300
Houston (713) 781-6100

Utah
Salt Lake City (801) 268-3779

Wisconsin
Milwaukee (414) 797-7844

HALL-MARK

Hall-Mark Electronics Corp. • Dallas, Texas • Subsidiary of Tyler Corp.

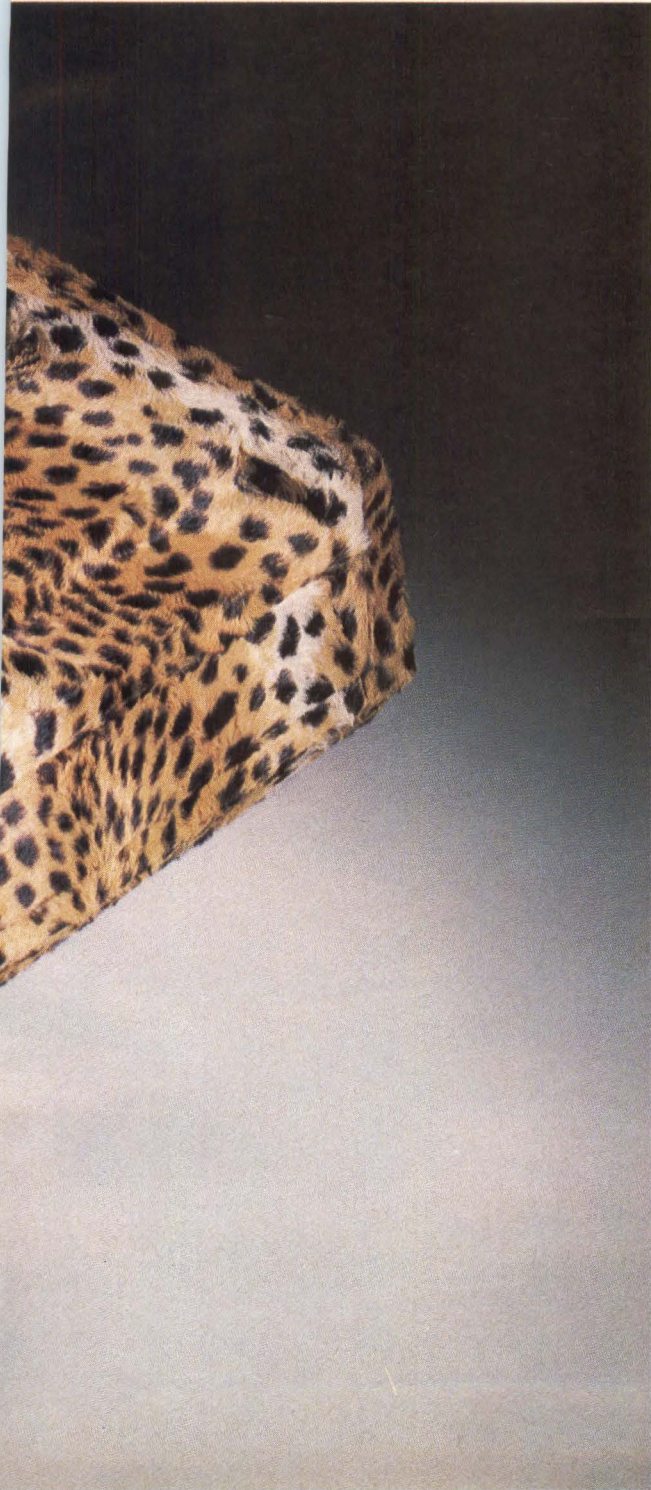
CIRCLE NO. 18 ON INQUIRY CARD

© 1985 Hall-Mark Electronics Corp. 0235-1007

IN SEARCH BUSINESS TO



I OF YOUR BUSINESS I.D.



Fulfilling your idea of the perfect peripheral involves an evaluation that goes deeper than what first meets the eye.

In effect, it entails a peripheral that is right in terms of technology, price and performance. A product that guarantees integration and function, while also adding to the value of your own system.

Getting everything right also involves evaluating your supplier's ability to deal with the special demands imposed by your operations and system solution.

When evaluating a Facit Peripheral you should also look closely at the company behind the product. At our organization, production capacity, quality control, support and service. And – not least – assessing whether our technical expertise and vision matches your business concept.

Then, our joint business-to-business operations can really take shape. We impose the most stringent demands on ourselves to earn and keep your confidence. In the long run, too.

Our frank approach is aimed at establishing lasting relationships. And our open-door R&D policy offers you all the possibilities to influence the development of tomorrow's products.

Nice words! But they are not just shallow promises. Our printers, plotters and video terminals already carry many Datamation 100 I.Ds.

We would be proud to carry yours, too.



FACIT

Your original peripheral equipment supplier

Head Office: *Facit AB, S-172 91 Sundbyberg, Sweden. Phone: (8) 764 3000.*
USA: *Facit Inc. P.O. Box 334, Merrimack, NH 03054. Phone: (603) 424-8000.*

CIRCLE NO. 19 ON INQUIRY CARD

ASCII and you shall receive.

Just tell us what you want. Price? The WY-30, right out front, makes your system look and feel like a million bucks for \$399. Flat screen, crisp 80-column display, Touch-Tilt, 41 programmable functions.

Heavy duty applications? The WY-50, at \$599, is the industry's favorite for a lot of good reasons. 132 columns, tilt/swivel, 16 dedicated function keys.

Even more sophistication? The WY-50+, at \$699, packs top-end functionality: multi-page memory, variable length function keys, bidirectional auxiliary port, and so on.

Color? The WY-350 gives you full WY-50 emulation plus 64 colors, 16 palettes for \$1195.

All our ASCII terminals share the exclusive Wyse keyboard layout, 26-line screen, and across-the-board software compatibility, so you have complete design flexibility. Users can move from one Wyse terminal to another without relearning or reprogramming.

No matter what you ASCII for, your answer is Wyse. Call us today.

WYSE

Call 800-GET-WYSE



engineering.

From a product perspective, DG has maintained its competitive position in terms of price/performance and technological leadership—despite DEC's recent announcement of a new high-end superminicomputer, the VAX 8650, capable of processing information at 6.3 MIPS.

The MV/20000, for example, ranges in price from \$200,000 to \$400,000, whereas DEC's VAX 8650 carries a base price of \$475,000. A DG spokesman concedes that DEC's 8650 is 16 percent faster on a uniprocessor-model basis, but, he adds, it's 73 percent more expensive. DG's MV/20000 dual-processor machine is reportedly much faster than DEC's uniprocessor model and still less than half as expensive as the 8650 on a price-per-MIPS basis.

For existing DG customers, the new product range is reassuring in that it offers both low-cost, entry-level systems for work-group expansion and room to grow into more powerful systems. According to DG, the MV/20000 is fully compatible with software and peripherals for earlier MV systems. Additionally, the MV/2000 DC runs Advanced Operating System/Virtual Storage (AOS/VS), the company's proprietary operating system; DG/UX, DG's native UNIX; MV/UX, hosted UNIX; and DG's recently introduced distributed system, AOS/DVS (Distributed Virtual Storage).

An entry-level MV/2000 DC system, designed for departmental computing and small-business users, is priced at \$19,000, according to DG. It includes the operating system, 2M bytes of main memory, four-terminal capability, a 38M-byte rigid disk and a 24M-byte tape-cartridge drive.

Industry analysts believe that DG's MV/2000 DC will compete most directly with DEC's MicroVAX II supermicrocomputer, although DG contends that its entry-level system is geared toward the office-automation market. In the OA marketplace, the MV/2000 DC will likely compete with IBM's System/36 minicomputer.

The high-end MV/20000 reportedly offers users more than twice the processing power of the company's previous high-end processor, the MV/

10000. The MV/20000 is available in three models.

According to the company, DG's DS/7000 family of engineering workstations, the DS/7500 and DS/7700 series, "incorporates the foundation for integrating all of an engineer's daily functions—engineering or scientific, managerial and administrative, into one system."

The DS/7000 family system is based on a single system board featuring a full 32-bit, 25-MHz CPU, a floating-point unit, 2M bytes of main memory,

four RS232C/422 ports, one parallel printer port, interfaces and controllers for system peripherals, an I/O processor for control of magnetic peripherals, output devices and the system console processor.

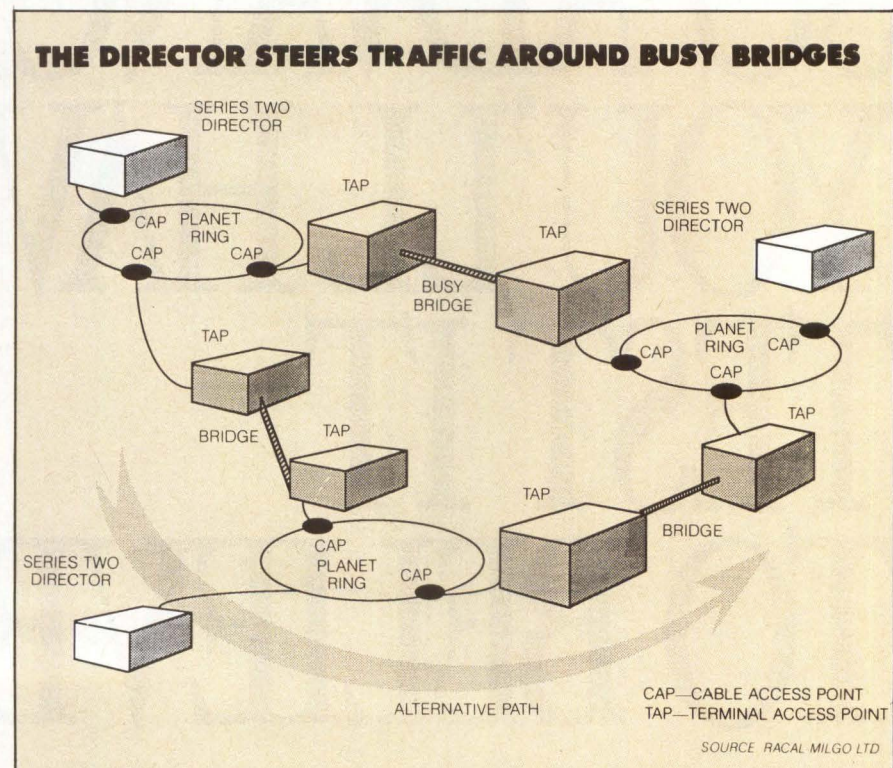
DG's new Technical Electronic Office (TEO) software combines DG's CEO software with DG/Stage (Data General/Standard Applications and Graphics Environment). DG/Stage is a software environment that integrates an engineer's analysis and design-automation processes. □

IBM's Token-Ring finds competition from Europe

Keith Jones, European Editor

In the wake of IBM Corp.'s Token-Ring Network, Racal-Milgo Ltd.,

Hook, England, a seller of token-passing-ring technology for nearly four years, has substantially enhanced its Private Local Area Network (Planet)



The Series Two Director for the Racal-Milgo Planet enables up to 2,000 computers and terminals, including IBM PC compatibles, to communicate with each other on up to four Planet rings. Series Two Directors find an alternative path between rings when the bridge providing the shortest path is busy.

LASERDRIVE™ 1200.



DIGITAL OPTICAL
STORAGE
SO ADVANCED
YOU'LL HAVE TO
TEST IT
TO BELIEVE IT.

Vital information is piling up faster than your customers can store it. They desperately need permanent storage that is vast, safe, and has a low cost per megabyte.

Now you can provide computerized random access to your customers data with the Laser-Drive 1200. It's the digital optical disk drive capable of



storing an infinite amount of information permanently on removal cartridges.

Just to prove it to you, Optical Storage International is making the LaserDrive 1200 available free to qualified OEMS for a 30-day evaluation.

Optical Technology. The advanced technology in the LaserDrive 1200 is a 12" optical disk drive that can store and retrieve 2 billion bytes on a single removable cartridge. Slightly bigger than a 1" thick 3-ring binder. To store the same data on paper, you'd need a pile 60 feet high. Or 100 reels of tape. Or 3000 floppies.

LaserDrive 1200 comes totally self-contained in one package—with SCSI or ISI intelligent interface, ECC, power supply and extensive diagnostics built-in. You're also assured of unmatched reliability because the LaserDrive 1200 has built-in diagnostics and requires no preventative maintenance.

The Media. We develop and manufacture our own media. Our media is more stable and offers greater data integrity because we use a heavy sandwich of tempered glass, and encase it in a removable cartridge. We also have commercial quantities of inventory available, now, on an OEM basis.

A Joint Venture. Optical Storage International is a joint venture of N.V. Philips and Control Data. N.V. Philips, inventors of the compact digital audio and video disk technology, has vast experience in optics and electronics. Control Data is a leading worldwide OEM supplier of storage peripherals. From these two superpowers comes OSI—a company totally dedicated to the development, manufacturing and marketing of the best digital optical storage products available anywhere.

So Test Our Memory. Put LaserDrive 1200 to the test with no obligation. If you're an OEM, we'll ship you the drive and media for 30-day evaluation at no charge whatsoever. Call the Control Data OEM Sales Office worldwide or **1-800-828-8001, ext. 1727.**

In Minnesota 612-921-4400, ext. 1727.



to achieve greater compatibility with IBM PCs and compatibles. Meanwhile, leading European vendors of PC compatibles are considering the introduction of their own local-area-network products for Token-Ring compatibility.

Geoffrey Norman, industry consultant with Xephon Ltd., Newbury, En-

gland, believes that IBM's endorsement of token-ring technology will give Racal-Milgo's Planet a boost. "Planet is much more flexible than the IBM Token-Ring Network," asserts Norman. "It is 2½ times faster, covers greater distances and can support any kind of attachment, including mini-computers and terminals, as well as

PCs."

Novell Inc. of Orem, Utah, customizes its PC DOS-compatible NetWare file-server software to enable up to 30 PCs on a Planet ring to use the same server. Up to five clusters of 30 PCs will be able to operate concurrently over one ring. David Pinnell, Racal-Milgo's office networks marketing manager, adds that the file-server software, called Sonata, will enhance NetWare with features such as the ability to transmit videotex and electronic mail between PCs.

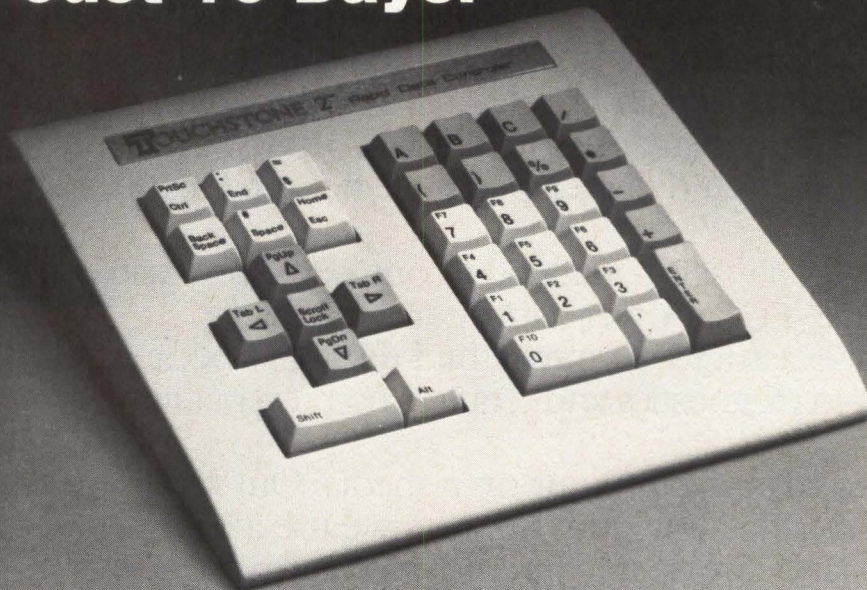
Racal-Milgo is currently readying a plug-in card for PCs and compatibles that is equivalent to the PC Adapter card offered by IBM for use with the Token-Ring Network. The Racal-Milgo card will be sold by the company as an alternative to Racal-Milgo's current device for linking a computer or terminal to a Planet ring, the Terminal Access Point, TAP. TAP is offered as a separate box costing \$1,035. The IBM PC Adapter card costs \$840, while Racal-Milgo's new card will be priced at \$740.

Pinnell believes that most application programs that can run on a PC attached to an IBM Token-Ring Network will be able to run on a PC linked to Planet. But he stresses that Racal-Milgo has no plans to move toward total IBM compatibility. "It would be a retrograde step to modify Planet in line with the IEEE 802.5 standard employed by the IBM Token-Ring Network," he declares.

Pointing to the 4M-bit-per-second speed of IEEE 802.5 and its support for just one token per ring, Pinnell says Planet runs at 10M bits per second and can handle multiple tokens so that more than one device can transmit at the same time. He adds that one Planet ring can handle 500 devices of all kinds, including PCs, while the IBM ring is limited to 260 PCs. That number is reduced to 72 on the IBM ring if unshielded, voice-grade, twisted-pair cabling is used instead of shielded, twisted-pair.

Planet uses coaxial cable, which permits a 300-meter maximum distance between TAPs. Fiber-optic cable will soon be added to allow for distances of up to 2,000 meters between TAPs and

Custom Keypads in Just 10 Days!



Touchstone Keypads

The choice of thousands of serious PC users, the TOUCHSTONE 2 keypad is the premier auxiliary keypad for the IBM PC, XT, AT and many compatibles. Its solid construction, careful design and software transparency make it well worth its \$200.00 retail price.

8-inch Square Footprint

The compact design of the Touchstone keypad makes it ideal for applications where workspace is limited. However, this size makes it impossible to include every key, so we did the next best thing. We designed it for quick and economical reconfiguration.

Use Your Imagination

Specialized applications of the Touchstone keypad are unlimited: Public access systems, control systems, point-of-sale; wherever you need controlled access, simplified entry, space savings, or other custom features.

Fully Supported

Custom keypads from Touchstone have a one-year warranty. They can have macros or other multi-key combinations embedded; even high-quality custom keycaps within two weeks of order.

Call for our Designer's Kit

Find out how easy it can be to get Touchstone keypads custom configured to your exact requirements. Write or call today, with no obligation.

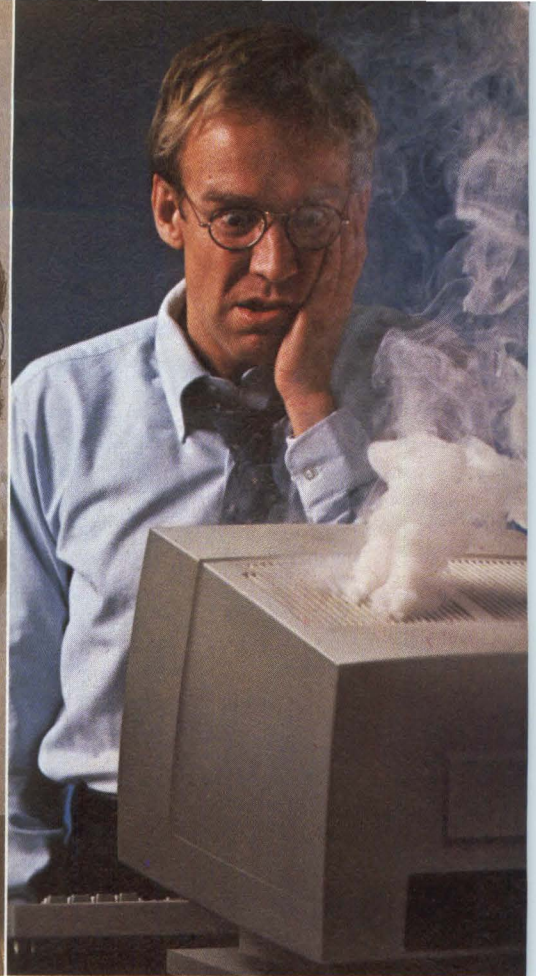
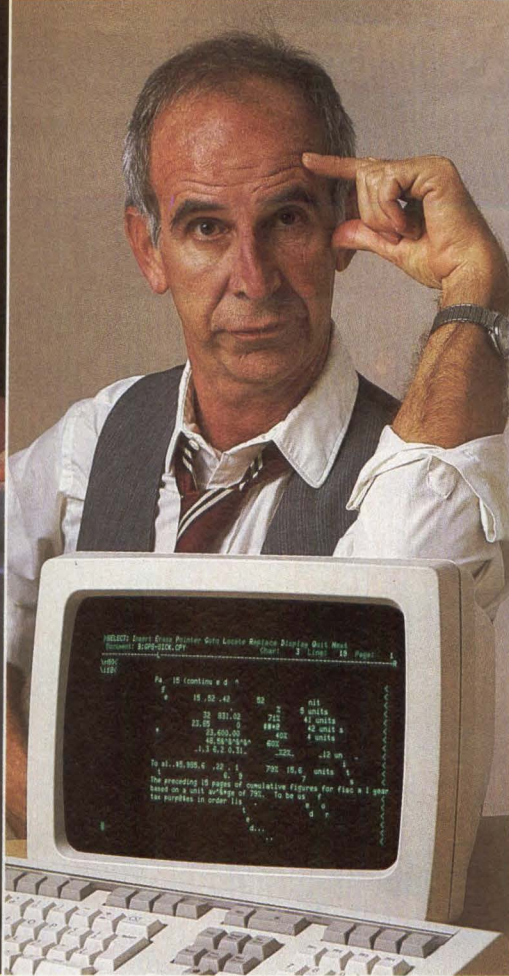
Call Toll Free
1-800-828-6968

In New York: 1-800-462-4891

International calls: 1-716-235-8358



TOUCHSTONE
TECHNOLOGY INC.
955 Buffalo Road
Rochester, NY 14624



A. Once you're in the dark? **B.** During a total memory loss? **C.** After the smoke clears?

When is the right time to buy a UPS?

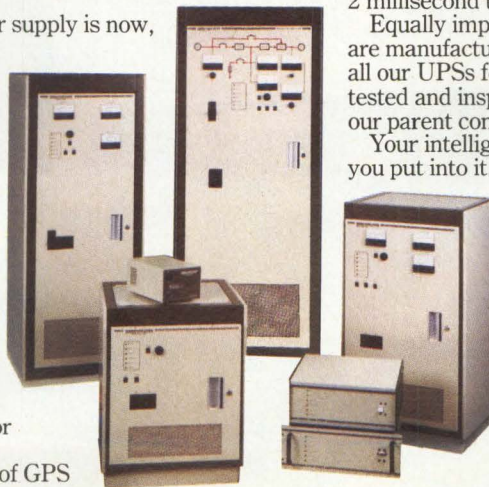
D. None of the above.

Don't wait for a power outage to blackout your vital system data—or high frequency noise to scramble your memory—or high line voltage or a sudden spike to blow your fuses or melt your wires!

The time to buy an uninterruptible power supply is now, before power problems cause inefficient, even catastrophic damage to your microprocessor-based installation. And the high-quality source for UPSs is General Power Systems, manufacturer of the industry's most complete line of uninterruptible power supplies.

GPS has the exact UPS you need to protect your data, your system and your production. On-line units range from 500VA to 50KVA and standby models from 100VA to 2KVA. Many features like battery backup, usually sold as extras, are standard on GPS models. Plus a wide range of options allows you to specify a virtually custom unit at an off-the-shelf price. In addition, GPS will tailor designs for OEM applications.

State-of-the-art operating characteristics of GPS systems give you the most for your money.



All-transistor technology, pioneered by GPS, means optimum reliability, control and ease of operation. Our on-line models are noted for their unusually fast transient response and excellent efficiency while standby units have set the industry standard with fast 2 millisecond transition time.

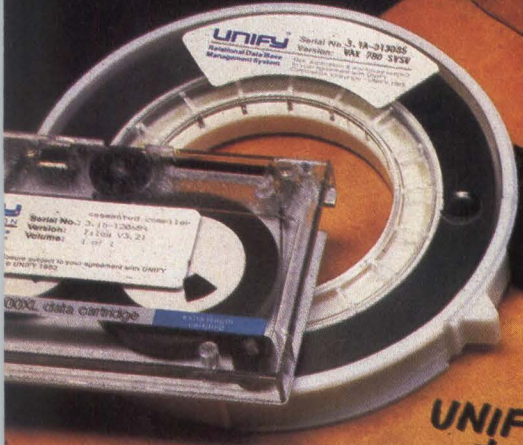
Equally important, UPSs from General Power Systems are manufactured to unmatched quality standards. In fact, all our UPSs for commercial users are designed, produced, tested and inspected to the same stringent standards as our parent company's line of defense products.

Your intelligent system is only as reliable as the power you put into it. Don't wait for a catastrophe. This is the time to call or write for full information. General Power Systems, 1400 N. Baxter St., Anaheim, CA 92806-1201, (714) 956-9321, (800)854-3469, in California (800) 824-8912, TELEX 182283.

GENERAL POWER SYSTEMS

A Division of ALS Corporation

CIRCLE NO. 22 ON INQUIRY CARD



Serial No. 3, 1A-013055
Version: VAR 200 2FSV
Volume: 1 of 1

UNIFY + ZILOG
UNIFY + UNIFY
UNIFY + HONEYWELL
UNIFY + TANDY
UNIFY + GM
UNIFY + ALTOS
UNIFY + PLEXUS
UNIFY + QANTAS
UNIFY + PURDUE
UNIFY + PIZZA HUT
UNIFY + NCR
UNIFY + NASA
UNIFY + BELL LABS
UNIFY + MICROSOFT
UNIFY + STANDARD OIL
UNIFY + DEC
UNIFY + IBM
UNIFY + AT&T

UNIFY CORPORATION
Serial No.: 3, 1A-013055
Version: Intel 386 Mod
Volume: 1 of 1
UNIFY RELATIONAL DATA BASE MANAGEMENT SYSTEM
DEMO DISKETTE



*UNIX is a trademark of AT&T Bell Laboratories. UNIFY is a trademark of Unify Corporation. Names shown are registered trademarks of their respective companies. Copyright © 1985, Unify Corporation, Lake Oswego, OR 97034.

DEMO UNIFY: THE MOST POPULAR DBMS IN ITS CLASS.

Order the UNIFY Demo Kit, and you'll learn why UNIFY is the DBMS selected by the most demanding students of applications development, plus every major manufacturer of UNIX*-based computers.

Looking for speed? Interactive demonstrations will show you why UNIFY's unique, automatic selection of four access methods achieves the fastest response times in one benchmark after another.

Want simplicity? The demos will let you step through UNIFY's menu-based design and on-line HELP... test its easy Query-by-Forms... and see how effortlessly screens can be

formatted, reports designed and menus customized to each user.

Need versatility? Then demo UNIFY's SQL query language. Examine its fourth-generation report writer. Its unmatched host language interface. And learn why UNIFY is singularly equipped to keep pace with your needs.

Test it yourself. The Demo Kit includes disk or tape, demo handbook, plus tutorial and reference manuals that show how to build virtually any application—all for \$150. To order, contact UNIFY, 4000 Kruse Way Place, Lake Oswego, OR 97034. Or call 503/635-6265.

UNIFY
THE PREFERRED DBMS.

CIRCLE NO. 23 ON INQUIRY CARD

for electrically noisy areas.

Racal-Milgo attaches devices to Planet with Cable Access Point, CAP, which measures 87 mm by 87 mm by 23 mm, fits onto the cable ducting and connects the cable to the TAP. IBM offers the Multi Station Access Unit, which fits into a 19-inch rack and incorporates connections for up to eight

personal computers, forming a physical star but appearing to any station like a ring.

One Planet hardware item for which there is no IBM equivalent is a special station called the Director, which contains its own TAP and interfaces to the ring via a CAP. Each Planet ring must have one Director—at a price of

\$4,440. The Director collects traffic information and controls all transmissions around the ring. An enhanced version, Series Two Director, makes possible communication between as many as 2,000 stations on four Planet rings. The rings can be installed in the same building or dispersed over a wide area, being separated by hundreds of miles. One Planet ring can be linked to any of the others by one or more connections called bridges. A single bridge connects two TAPs. Alternatively, groups of up to 128 bridges can link a nest of TAPs at each end, each nest with one CAP. One major function of the Series Two Director, priced at \$8,880, is to find an alternative path between two rings, possibly via a third ring, if a bridge is busy.

Racal-Milgo has reportedly sold 300 Planet networks in Europe to date. Most existing customers are large end users of computers, although Racal-Milgo is now also seeking OEM deals.

Olivetti SpA, Ivrea, Italy, the leading vendor of IBM-compatible machines in Europe, is "looking with great interest" at the IBM Token-Ring Network, according to a company spokeswoman. But she cannot say yet if Olivetti will introduce a product similar to IBM's. She adds that Olivetti is also studying the possibility of introducing the Starlan LAN technology promoted in the United States by AT&T Co., which owns 25 percent of Olivetti (MMS, January 1985, Page 74).

Meanwhile, Ericsson Information Systems, Sundbyberg, Sweden, is assessing the feasibility of a Token-Ring-Network-compatible product. It would employ the same Texas Instruments chip set used by IBM, according to Hendrik Abramowicz, a member of the communications planning section of Ericsson's technology staff. Ericsson already offers Ethernet-based networking products to users of its machines.

Abramowicz believes that token-ring networking is technically superior to Ethernet. He cites token ring's ability to use fiber-optic cabling and to determine precisely the maximum time a station needs to wait before being able to transmit. □

RIP OFF THIS PRINTER.



Stop wasting forms. Get the new Datasouth 180DD—the high performance printer for true-to-form printing. It's fast, it's rugged, it's sophisticated and it prints legibly through six-part forms with 1/2 inch tear-off capability.

This makes the DS 180DD the ideal printer for hotels, motels, airlines, travel agencies—for any job that requires quality multipart form printing on demand.

Call your nearest Datasouth distributor today and ask about the new DS 180DD. When you consider all the money-saving advantages, it's really quite a steal.

datasouth

HIGH PERFORMANCE MATRIX PRINTERS
CALL TOLL FREE:
1-800-222-4528

Datasouth Computer Corporation
Box 240947 • Charlotte, NC 28224
704/523-8500 • Tlx 6843018 DASOU UW

VERTICAL MARKET INTEGRATOR

Applying integrated systems
in industry, engineering and commerce

ON-LINE SERVICE AIDS GOVERNMENT CONTRACTORS

Electronic bulletin board saves contractors time and money through quick access to the latest federal regulations

Robert A. Sehr

Until 1983, government purchasing agents drew up their own product descriptions, and no two descriptions were alike. For example, equipment for the Army differed from that specified for the Navy. As a result, purchasing agents could not realize any cost savings by buying in volume. Government contractors, in turn, increased prices to meet the costs of the extra design, production and paperwork involved in meeting the various specifications.

In 1983, the Reagan administration attempted to solve this problem by compiling the regulations of individual government departments into one volume called the Federal Acquisitions Regulations (FAR). However, the FAR is lengthy and includes a separate supplement for each branch of the military and for the National Aeronautics and Space Administration. As a result, searching through the FAR is time-consuming. What's more, because the regulations are not updated frequently enough, the contractors must ensure that those they track are still current.

To help government contractors through the regulations maze, Compusearch Corp., Falls Church, Va., uses an on-line bulletin board called Compusearch to reduce the time it takes to search through the FAR and to ensure that a regulation is up-to-date. According to company president James Benson, Compusearch reduces to an average of 20 minutes or less a search that would take two researchers two days to make manually.

The key difference between Compusearch and other on-line information services, such as Nexis from Mead Data Center, is that other databases are typically stored on mainframes or minicom-



Compusearch president James Benson uses an IBM PC-compatible microcomputer to search through the FAR database.

puters. In contrast, the Compusearch database employs a local area network of three 16-bit Personal Mini/16 (PM/16) multiuser microcomputers from TeleVideo Systems Inc., San Jose, Calif. The LAN also includes eight IBM Corp.-PC-compatible TeleCom 1600 remote communications processors from J&L Information Systems, Chatsworth, Calif., two Paradyne Corp. Uninet modems, a TeleVideo tape-cartridge drive, a Micom/Interlan Inc. packet assembler/disassembler multiplexer and a line conditioner. Users access the network from an IBM PC-compatible personal computer by phone with the Uninet public packet-switched network system from Uninet Inc.

The PM/16 network employs a dedicated file server connected to the workstations via a star topology. Using baseband communications, the system transmits data at 800K bits per second.

The file-server unit contains two microprocessors—a 16-bit Intel Corp. 80186 for file management and an 8-bit Zilog Inc. Z80A for communication—and supports as many as 16 workstations.

The Telecom 1600 processor uses proprietary software called Redi-Program, written in Mega-BASIC from American Planning Corp., and boots up with Compusearch's FAR database. The PM/16 includes a built-in 45M-byte Winchester disk drive. Storage of FAR, not including the user interface, the communications software and the supplements, requires 5M bytes. The PM/16 allows as many as eight users to search through the Compusearch database at once.

Because Compusearch employs microcomputers, it is less expensive than a mainframe- or minicomputer-based database installation, which could cost as much as \$1 million. The PM/16 sells for \$8,995, and each port at Compusearch costs about \$1,000 to install. This enables the company to charge clients connect-time fees of \$48 per hour compared to as much as \$150 per hour for a minicomputer-based on-line service.

Compusearch tested the performance of its system against competing multiuser microcomputers by loading all systems to full capacity and rating them for performance degradation as users were added. In testing with three users, the

PM/16 needed 4 minutes to search through the FAR database, compared with 3½ minutes for the nearest competitor. With eight users, the PM/16 took only 6 minutes, whereas the nearest competitor took 30 minutes.

The PM/16 can support as many as 16 IBM PC-compatible workstations. Each TeleCom 1600 handles four telephone lines and contains an Intel 8088 microprocessor, 256K bytes of RAM and a network card that interfaces with the PM/16. According to J&L president George Lazik, the TeleCom 1600 will eventually allow an unlimited number of phone lines to access each processor. The processor in each cluster runs on TeleVideo's InfoShare operating system, a custom version of Novell Inc.'s NetWare. The processors act as diskless workstations, allowing dial-up customers to access and manipulate the database using a remote dumb terminal.

System operates unattended

After logging onto a Telenet system by phone, a user gains access to the database. The TeleCom 1600 activates Redi-Program, and users can then proceed to a menu for a specific regulation in the database. Then, users can either read through the database, which can be expensive and time-consuming, or search for the appropriate regulation using key words.

InfoShare provides several security features, including file-level read- and write-access permission, file and record locking and log-on passwords. What's more, the TeleCom 1600 provides another security level: If a user becomes disconnected from Compusearch during a search, one of the TeleCom 1600s automatically reboots the system. A user must then redial into the database and restart the log-in procedure.

Because the TeleVideo hardware is modular, Compusearch maintains an extra PM/16 as a redundant unit and additional communications processors and modems for fail-safe operation. If a hardware unit fails, Compusearch can immediately replace it.

As the Compusearch client list grows, the company expects to be able to offer several hundred ports. Clients currently include IBM, TRW and other large defense contractors. □

The Compusearch installation includes (clockwise from top right) a line conditioner, two Uninet modems from Paradyne, a TeleVideo tape-cartridge drive, a TeleVideo PM/16 micro-computer, two J&L Information Systems communications processors, a TeleVideo terminal, a Micom/Interlan packet assembler/disassembler multiplexer, two more J&L processors, another PM/16, another J&L processor and a third PM/16.



Robert A. Sehr, a former associate editor at *Mini-Micro Systems* magazine, is now a free-lance writer based in Bothel, Wash.

Interest Quotient (Circle One)
High 451 Medium 452 Low 453

NEW SCO RELEASES!
XENIX SYSTEM V
FOR PC XT - AND PC AT - NOW!

"A UNIX™ TO BE PROUD OF!"

—Kaare Christian, PC Magazine



Mankind searched the world over
for the multiuser operating system of the future.

Then IBM® chose XENIX® for the PC AT. And the future was *now*.

THE SANTA CRUZ OPERATION PRESENTS

XENIX NOW!

AN SCO PRODUCTION IN EXCLUSIVE ASSOCIATION WITH MICROSOFT CORPORATION
THE MULTIUSER, MULTITASKING PC BLOCKBUSTER "XENIX NOW!"
STARRING VISUAL SHELL • MULTISCREEN™ • MICNET • THE BERKELEY ENHANCEMENTS

AND INTRODUCING **C-MERGE** AS THE MS-DOS DEVELOPMENT ENVIRONMENT

FEATURING WORLD FAMOUS SCO TRAINING AND SUPPORT FOR DEALERS • END USERS • ISVs • OEMs
AND AN INTERNATIONAL CAST OF HUNDREDS OF XENIX APPLICATIONS

INCLUDING **LYRIX™** AS THE UNIX/XENIX WORD PROCESSING SYSTEM

PRODUCED AND DIRECTED BY THE SANTA CRUZ OPERATION

SCREENPLAY ADAPTED BY THE SANTA CRUZ OPERATION FROM ORIGINAL STORIES BY MICROSOFT AND AT&T
IN BREATHTAKING SELECTABLE COLOR

NOMINATED FOR ★ BEST DOCUMENTATION! ★ BEST SUPPORT! ★ BEST TRAINING!
★ BEST ELECTRONIC MAIL AND NETWORKING! ★ MOST APPLICATIONS!
★ MOST COMPLETE UNIX SYSTEM!



RELEASED FOR MOST POPULAR PERSONAL COMPUTERS.
APPLICATIONS ALSO AVAILABLE: LYRIX, MULTIPLAN®, INFORMIX®,
LEVEL II COBOL™, 3270 MAINFRAME COMMUNICATIONS.

(408) 425-7222
TWX: 910-598-4510 SCO SACZ

M MULTIUSER OPERATION SUGGESTED
XENIX WILL TURN YOUR PC INTO A REAL COMPUTER

©MCLXXXIV The Santa Cruz Operation, Inc.
The Santa Cruz Operation, Inc., 500 Chestnut Street, P.O. Box 1900, Santa Cruz, CA 95061 (408) 425-7222

UNIX is a trademark of AT&T Bell Laboratories • Lyrix and Multiscreen are trademarks of The Santa Cruz Operation, Inc. • IBM is a registered trademark of International Business Machines Corporation • XENIX and Multiplan are registered trademarks of Microsoft Corporation • Informix is a registered trademark of Relational Database Systems, Inc. • LEVEL II COBOL is a trademark of Micro Focus, Ltd.

CIRCLE NO. 25 ON INQUIRY CARD



THE GREAT ESCAPE!

**FROM IVORY TOWERS AND
COLD COMPUTER ROOMS TO
THE WARMTH OF YOUR OFFICE.**

**Artificial intelligence for business
has arrived in a revolutionary new
product . . . Guru.**

At last, artificial intelligence designed especially for business! Guru brings together expert system capabilities of artificial intelligence, the productivity of familiar business computing tools and the ease of communicating with your computer using menus, commands or plain English. All available in a single, integrated program.

Guru works like human experts, considering uncertainties, reasoning through forward and backward chaining, asking for more information when needed, and explaining its recommendations.

Guru's expert system works hand-in-hand with all the familiar business computing tools like spreadsheets, statistical analysis, business graphics and a programming language, always available for both expert consultation and your everyday business computing needs.

Best of all, you won't need to learn LISP or PROLOG or buy fancy computers . . . Guru runs on your PC and communicates in plain English! Guru is artificial intelligence that means business.

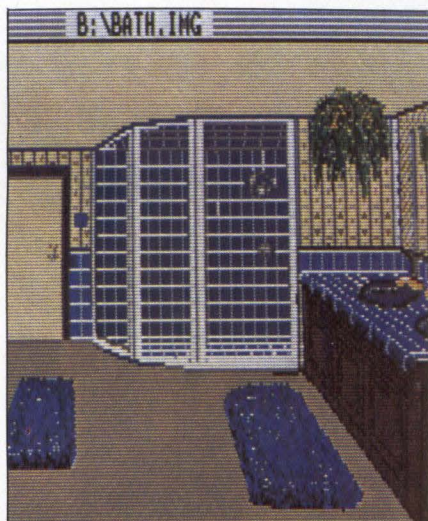
For more information, call or write Micro Data Base Systems, Inc./Marketing & Sales, P.O. Box 248, Lafayette, IN, 47902, 317/463-2581, Telex 209147 ISE UR.

CIRCLE NO. 26 ON INQUIRY CARD

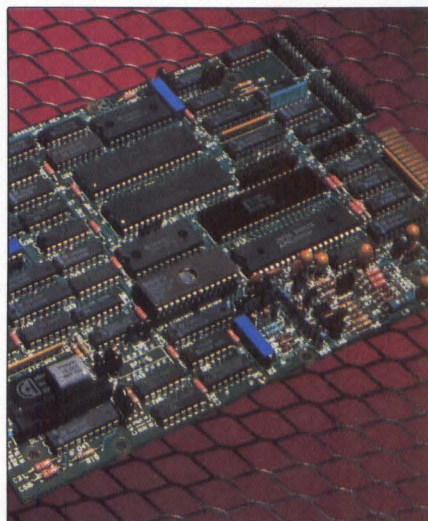
GURU™

ARTIFICIAL INTELLIGENCE THAT MEANS BUSINESS.

FEATURE HIGHLIGHTS



p. 55 *Sophisticated software*



p. 95 *Boosting performance*

TOOLS SPEED SOFTWARE INTEGRATION55

Software developers who want to sell custom, integrated-software packages, rather than off-the-shelf offerings, have two alternatives: purchase software components and link them, or laboriously write code from the ground up. Fortunately, a variety of software tools exist to facilitate the construction of unique, integrated-software packages.

SCSI OPENS INTEGRATION OPPORTUNITIES71

The movement toward the small computer systems interface (SCSI) is no longer a trickle, or a trend touted in the trade press. The majority of systems and peripherals vendors are backing SCSI with plenty of products. The key to SCSI's success lies in its performance advantages and the flexibility it offers system integrators and OEMs.

ESDI JOINS INTERFACE RANKS.83

The enhanced small device interface (ESDI) takes advantage of the installed base of ST506/ST412-based peripherals by combining the electrical characteristics of ST412 with some of the advantages of the storage module device (SMD) interface. It's a sure bet that ESDI will find wide acceptance in applications involving varied peripherals because it offers system integrators superior "mix 'n match" capabilities. And, finally, there are products to back up the hype.

SUPER-SCSI CONTROLLERS BOOST I/O PERFORMANCE .95

As good at I/O as the small computer systems interface is, super-SCSI is better, according to a major controller manufacturer. The reasons include bus disconnect/reconnect, command chaining with relative addressing, command queuing and bus arbitration, all of which are specifically tuned for multiuser, multitasking computer systems.

COMDEX IN JAPAN: 'SHARE THE OPPORTUNITY'105

This year's Comdex in Japan show, to be held March 3 to 6 at the Harumi Exhibition Center in Tokyo, is an important forum for U.S. and European manufacturers trying to gain a foothold in the Asian market.

Mix or Match on a DTC Multifunction Controller Board



Off-the-Shelf Controllers

BUS	PC/XT	PC AT	MULTI-BUS	SASI/SCSI
	HOST RESIDENT			
WINCHESTER DRIVE	5150	5190	5186	510
WINCHESTER & FLOPPY	5250	5290	5286	520
WINCHESTER & TAPE	5350	N/A	5386	530
WINCHESTER FLOPPY & TAPE	N/A	N/A	5486	540
TAPE ONLY	5051	5091	N/A	N/A

Here's unmatched performance in any combination: DTC's multifunction boards. They handle any combination of Winchester, Tape, or Floppy configurations. Better yet, you benefit from the finest SASI/SCSI technology. Because DTC was a pioneer in that interface. And we still are today.

You can also get the finest IBM PC, IBM AT, and Multibus host resident multifunction boards. Products so good, we've already sold hundreds of thousands of them. What else could you want? How about a whole host of host adaptors. Like DEC LSI-11 Q Bus, Motorola VERSAbus 68000, Multibus, and many more. So no matter how you mix and match, you'll always get the best with DTC.



Data Technology Corporation

2775 Northwestern Parkway
 Santa Clara, California 95051
 Telephone: (408) 496-0434
 Telex: 4745044 DTCSC
 TWX: 910-338-2044

Eastern Regional Sales
 Telephone: (617) 275-4044
European Sales Office
 Telephone: (089) 918047/48
 Telex: (841) 897213

CIRCLE NO. 27 ON INQUIRY CARD

TOOLS SPEED SOFTWARE INTEGRATION

Increasingly sophisticated software tools facilitate the construction of customized integrated software packages

Michael Tucker, Associate Editor

Integrated software, combining several different applications into one package, has long been a mainstay of the microcomputer industry. Despite early criticism from many market analysts who insisted that users would eventually prefer powerful, standalone, single-function packages, integrated software has steadily increased in market share.

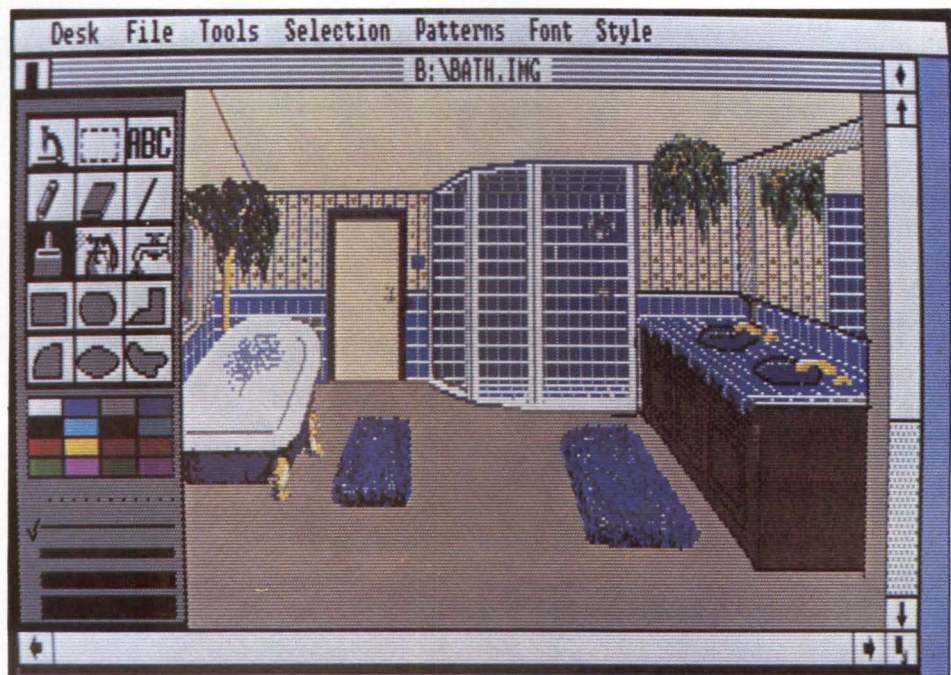
Naturally, then, value-added resellers have become eager to bring integration to their own software products. Unfortunately, that hasn't been easy—either in terms of technology or marketing. Now, however, sophisticated software tools are making software integration more like system integration. VARs generally follow

two approaches to integration: They purchase software components and configure them almost as they do hardware, or they write code from the ground up.

Ultimately, the single most important consideration VARs face in creating integrated software is deciding how much of the work they want to do themselves. The answer to that lies in how unique the final product has to be. When Ashton-Tate put together Framework II, for instance, the company used essentially no third-party software tools, preferring to write everything to ensure maximum efficiency.

Explains Robert M. Carr, chairman of Forefront Corp., the Ashton-Tate subsidiary that actually wrote Framework, "There are excellent libraries out there, full of subroutines, that are

This screen photo from Digital Research's GEM Paint package illustrates the competition the software developers using generic operating environments faces.



very good for lots of developers, but when you're developing a product for the mass market, you have to pull out all the stops. You've got to have the best possible performance or your product will get lost in the crowd."

Yet, even where VARs want to debut products in a particularly crowded field and must write applications from scratch, help is available. In fact, an entire industry exists to serve programmers with editors, linkers, debuggers and other integration tools. Perhaps the most useful of these to integrated-software developers are tools that link together individual modules of code.

Phoenix Computer Corp., for instance, markets Plink, a powerful linkage editor for MS-DOS. Reflecting the restrictions of early 8- and 16-bit microcomputers, MS-DOS has a somewhat-limited linking capacity on its own. With Plink, however, MS-DOS applications link almost as seamlessly as they would under much more powerful operating systems.

Tools take the weight

Most VARs don't write entire applications. Instead, most write for markets where elegant software design is far less important than bringing a program to market under budget in a reasonably short time. The less code VARs need to write the better their products are, because they can then afford to spend more time investing in the software with their vertical-market expertise. "Tool kits are great," says Robert Dezmelyk, president of the software-development company LCS/Telegraphics. "If you're

doing a specialized application, something for a vertical market, then you want to use them as much as possible."

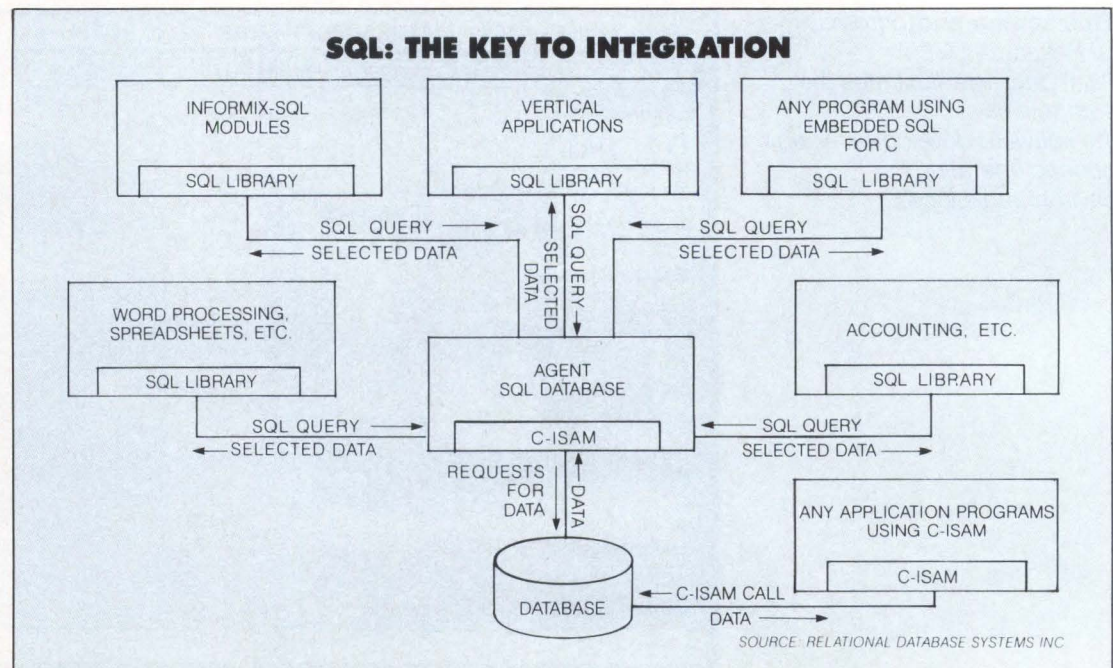
Developers who want to use traditional programming languages—such as COBOL, C or BASIC—and want to control much of the coding, but still want to reduce their own effort, can exploit the libraries of subroutines already on the market. These subroutines involve window managers, terminal emulators, report generators, string manipulators, communications functions, database-search software; and device, printer, screen, mouse and terminal drivers. Some require payment of royalties, but many—particularly in the MS-DOS world—do not.

These types of tools are often available from mail-order supply houses. For example, The Programmer's Shop, a software-supply house that specializes in tools, carries over 100 versions in the MS-DOS environment alone.

Whether developers can benefit from such tools depends on the nature of their target markets. "If I wanted to build an integrated-software package for, say, a law office," says Bruce Lynch, president of The Programmer's Shop, "I'd ask myself if I wanted to address their day-to-day, bean-counting needs, or something more exotic, like client services."

If the application is "bean counting," such as record keeping, billing and accounts payable, says Lynch, then tools are an absolute must. "Those sort of applications could be easily addressed by these [tool] packages," he says. On the other hand, he adds, "For doing particular

On the argument that, "The database is the lowest common denominator," RDI designed Informix-SQL to be the foundation of integrated-software products. Using SQL and C-ISAM, a library of C-routines, virtually any application can access the database.



SPEC



TACULAR.

Presenting the Falco 500.

The spectacular
productivity machine.

You're looking at a model that's about to reshape your image of a computer terminal.

Sure, it's got eye-catching looks. But more than that, it combines some of the most dazzling specs you've ever seen.

The kind that can make your operators—and your system—more effective than ever.

Screen

- 14" Flat-profile CRT with exceptionally high resolution.
- Crystal-clear soft white, green or amber display.
- Multiple screen sizes up to 38 lines by 132 columns.
- Real-time clock/calendar.

Keyboard

- 108-key, fully re-configurable keyboard.
- Designed for efficient data entry/retrieval.
- Styled for operator comfort.

Software

- Up to 6 windows for multi-tasking environments.
- Extra pages of local text storage.
- Compatible with industry-standard VDT protocols.
- Down-loadable character sets.

Enclosure

- Soft color tone, elegantly styled.
- Engineered for cool operation.
- Uses minimal desk space.

Communications

- Selectable RS232C/RS422 bi-directional ports.
- True 8-bit data capability.
- Baud rates up to 38.4 Kbps.

To screen test one of our attractive new models, call your local distributor today. Or contact Falco Data Products, 1294 Hammerwood Avenue, Sunnyvale, California 94089. (408) 745-7123.

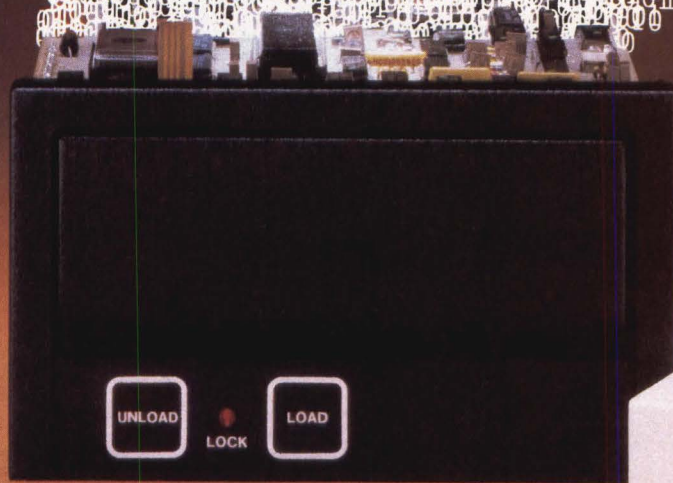
Toll-free **(800) 835-8765**.

The Falco 500. We think you're going to admire its body. But we know you're going to fall in love with its mind.



FALCO 500

CIRCLE NO. 28 ON INQUIRY CARD



The STR[®]-STREAM II 1/2" Tape Drive.

130 million bytes can't be wrong.

If you've got a lot of data to backup off your system hard disk (up to 130 Mbytes) and can't afford a lot of time to make sure it's done accurately, then you should take note of the new EPI STR-STREAM II 1/2" cartridge tape drive. It features 130 Mbyte capacity in a single 1/2" tape cartridge, one of the lowest cost-per-megabyte figures of any competing mass storage device, and the proven accuracy of reel-to-reel technology.

The screamin' streamer.

You get an almost unbelievable 225 kbytes/sec transfer rate. That coupled with an EPI controller means it can operate continuously in streaming mode to backup a full 130 Mbytes in under 12 minutes. And deliver a guaranteed bit error rate of less than one hard error in 10¹¹ bits.

Compatibility, innovation, and reliability complete the story.

Tape guide accuracy of $\pm .001$ inch means that tapes can be freely interchanged between any STR-STREAM II drives. And our proprietary multi-bump, constant-curvature head assures accurate and repeatable head-to-tape contact. The drive fits in the same space as a standard 5 1/4" disk drive, operates off the same supply voltages, and features a superior MTBF of 15,000 power-on hours.

For more information on the STR-STREAM II 1/2" cartridge tape drive, call us today at (303) 761-8540, or write Electronic Processors, Inc., 1265 W. Dartmouth Ave., Englewood, CO 80110.

 **ELECTRONIC PROCESSORS
INCORPORATED**

"Let EPI remember for you."

CIRCLE NO. 29 ON INQUIRY CARD

client services, I'd be more likely to have a number of unique calculations that just wouldn't be included in these packages."

If VARs want to reduce their development time still further, they can buy, not just subroutines, but entire programs and integrate them. Where once it was virtually impossible to integrate software from different sources, now it's merely difficult.

For some years, programmers have speculated on the possibility of software that vendors could use as some sort of a "superglue" with different applications. So far, that's remained just an aspiration. Muses software consultant Andrew Allison, Los Altos Hills, Calif.: "An integrated-software compiler? No, it's pretty unlikely anyone will write one of those for quite a while. It's a difficult problem...and it shouldn't be, but all the different interfaces between different popular products make it so. The problem is that the popular products...simply don't have the facilities to link together."

Even without a "superglue" solution, system integrators can use operating environments to combine disparate applications. In the PC-DOS/MS-DOS world, for example, some operating environments provide both a user interface and an easy means of integrating software. Battling for market share at the moment are Microsoft Corp.'s Windows, IBM Corp.'s TopView and Digital Research Inc.'s (DRI) GEM.

Essentially, all three work as extensions of the operating system to provide a graphically oriented user interface—windowing—and data-passing capabilities for most MS-DOS applica-

EDITING CRITERIA			
ACTION IN CAPTION		CHECK-DATE	FILE CHEK FIELD DATE
Y N	EDIT TYPE	EDIT VALUE	
-	MINIMUM VALUE	0	
-	MAXIMUM VALUE	0	
Y	MINIMUM LENGTH	06	
Y	MAXIMUM LENGTH	06	
-	SHORT TABLE	----- (UP TO TEN 2-BYTE COMPARE VALUES)	
-	LONG TABLE	--- (TABLE NAME)	
-	KEY PRESENT	--- (FILE/FIELD NAME OF KEY)	
-	KEY ABSENT	--- (FILE/FIELD NAME OF KEY)	
-	DATE FORMAT	(M-MM/DD/YY; Y=YY/MM/DD; D=DD/MM/YY)	
-	TIME FORMAT	(Y HH:MM:SS; M=HH:MM)	
-	ALPHABETIC		
-	DEFAULT VALUE	-----	
Y	USER EXIT ROUTINE	DATE-000	*** PFS TO SCROLL THRU FILE
MESSAGES: *** INQUIRY ACTION COMPLETED ***			

Machine-specific 4GLs, like Tominy's Mach 1, employ an English-like structure, user-friendly menus and forms-based visual programming. Mach 1 produces code for the entire spectrum of IBM machines.

tions. Explains Richard Dill, Windows marketing manager for Microsoft: "Windows has two means of allowing different applications to share data. For short pieces of data, it has what is literally a messaging facility. For longer pieces we have what we call—for want of a better name—a clipboard facility. This allows you to 'cut' data from one application, store it on the clipboard and then 'paste' it in another application."

One benefit of products like Windows, Top-

New sheep in the integrated fold

Integrated software's continued viability as a product is indicated by the fact that it continues to evolve. Developers are eagerly including more and more functions in their integrated products—like artificial intelligence and synthetic speech.

In October of 1985, for instance, Micro Data Base Systems Inc. (MDBS), Lafayette, Ind., introduced "Guru" for the IBM Corp. PC and compatibles. Guru combines familiar, business-related functions—a relational database manager, assorted spreadsheets, a text processor and a business-graphics generator—with an unfamiliar AI-twist: an expert-system generator.

With Guru, value-added resellers or in-house integrators can produce packages that not only codify company wisdom regarding some task but also provide the tools for performing that task. Developers

could produce, for example, a package for an investment company that would allow even a relatively inexperienced agent to evaluate a complex security setup. The agent could consult the expert system as to its possible value, use a spreadsheet to calculate growth in equity and then write a memo suggesting purchase or sale, all with Guru's text processor. Somewhat disconcertingly, though, MDBS refers to Guru as "the software with a mind of its own."

Meanwhile, Paladin Software Corp., Santa Clara, Calif., announced that its new integrated spreadsheet for the Apple Computer Inc. Macintosh would include, not only graphics software and a limited text processor, but also the spoken word. With a feature known as "Say It," the program will read aloud text and numbers the user inputs. In addition, notes the company, it will "verbally explain an error message."

View and GEM is that developers can either purchase and resell them as part of their own packages, or they can leave the actual integration to their clients. "While vendors may certainly opt to build a complete, integrated package," says Dill, "they may also write their products piecemeal. They can write and sell it in sections, knowing that it can be integrated later." That way, vendors could be making a profit from their first efforts—say, a word-processing package—while their complete product lines are still in development.

From a VAR's point of view, the disadvantage of Windows, TopView and GEM is, of course, that Microsoft, IBM and DRI are themselves producing strong packages to run under their operating environments. It remains to be seen whether a third party can successfully compete with the word-processing packages, graphics programs and spreadsheets presently coming from those powerful companies and their associated developers.

One alternative that developers can consider is building a graphically oriented, integrating operating environment of their own. Several kits are now available that allow a vendor to do that. Metagraphics Software Corp., for example, markets "MetaWindow," a graphics library for the IBM PC and compatibles that has a graphics-adaptor card. With it, developers can produce menus, windows, icons, unique test fonts and

custom graphics. MetaWindow can also act as a link between individual applications.

Multiusers multi-integrate

The single-user, MS-DOS market is not alone in having strong tool kits for integrated-software development. VARs addressing the multiuser market can take advantage of what appear to be complete tool kits. As a matter of fact, it's in this market that software integration is most like hardware-system integration, with developers buying massive chunks of code and reconfiguring them.

Most developers building a product for a vertical market start with a database management system. There are dozens, if not hundreds, of DBMSes vying for the VARs' business. Three representative products within the UNIX market are Informix-SQL from Relational Database Systems Inc. (RDS), Unify from Unify Corp. and Ingres from Relational Technology Inc.

Each of these companies has taken significant steps to make certain their DBMS can be easily integrated with other software. As the name suggests, RDS' Informix-SQL, for example, is based on the structured query language (SQL), a de facto-standard database language. This means that anyone capable of writing in SQL is also capable of giving their product an interface to Informix-SQL.

"The database is the lowest common denomi-

Companies mentioned in this article

Ashton-Tate

20101 Hamilton Ave.
Torrance, Calif. 90502-1319
(213) 204-5570
Circle 407

Digital Equipment Corp.

146 Main St.
Maynard, Mass. 93427
(617) 897-5111
Circle 408

Digital Research Inc.

60 Garden Court
Monterey, Calif. 93942
(408) 646-6218
Circle 409

Forefront Corp.

150 West Iowa St.
Sunnyvale, Calif. 94086
(408) 735-0740
Circle 410

IBM Corp.

P.O. Box 1328
Boca Raton, Fla. 33432
(305) 998-2000
Circle 411

Lotus Development Corp.

161 First St.
Cambridge, Mass. 02142
(617) 492-7171
Circle 412

Metagraphics Software Corp.

Suite 440
444 Castro St.
Mountain View, Calif. 94041
(415) 964-1334
Circle 413

Microsoft Corp.

10700 Northup Way
Box 97200
Bellevue, Wash. 98009
(206) 828-8080
Circle 414

Phoenix Computer Products Corp.

320 Norwood Park S.
Norwood, Mass. 02062
(617) 762-5030
Circle 415

Relational Database Systems Inc.

4100 Bohannon Drive
Menlo Park, Calif. 94025
(415) 322-4100
Circle 416

Relational Technology Inc.

1080 Marina Village Parkway
Alameda, Calif. 94501
(415) 769-1400
Circle 417

Signal Technologies Inc.

5951 Encina Road
Goleta, Calif. 93117
(803) 683-3771
Circle 418

Syntactics Corp.

Suite 145
3333 Bowers Ave.
Santa Clara, Calif. 95051
(408) 727-6400
Circle 419

The Programmer's Shop

128-DC Rockland St.
Hanover, Mass. 02339
(617) 826-7531
Circle 420

Tominy Inc.

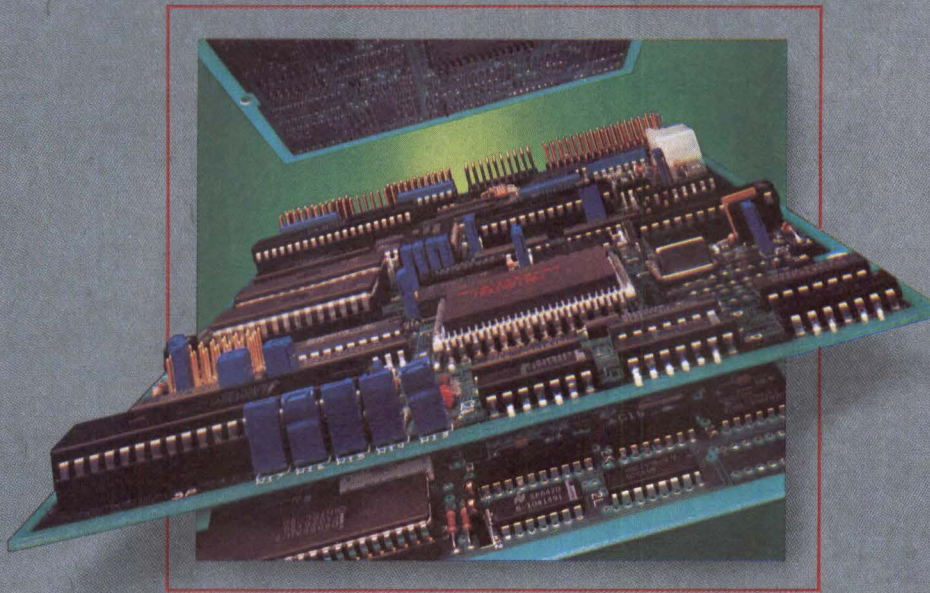
4221 Malsbary Road
Cincinnati, Ohio 45242
(513) 984-6605
Circle 421

Unify Corp.

4000 Kruse Way Place
Lake Oswego, Ore. 97034
(503) 635-6265
Circle 422

SCSI.

A secret weapon in the battle against obsolescence.



**It's the interface that lets you
design systems people can grow
with — not grow out of.**

SCSI. Small Computer Systems Interface. A major advance in systems integration — because, unlike today's less intelligent I/O architectures, it gives you the flexibility to put systems together the way you want. Using virtually any peripherals — in both single- and multiple-host systems. And at the same time, it ensures that the system you design will remain open to future peripheral expansion.

SCSI offers other advantages as well. Including advanced high performance features like arbitration, seek overlap and off-line copying, which free the host for other tasks.

NCR helped develop SCSI. And we've been the undisputed leader in designing and manufacturing SCSI components — and in

making them smaller, better and less expensive.

The freedom to use the best and know that the system can grow. Let us show you how SCSI can help you. Call NCR at 1-800-325-SCSI.

SCSI Products from NCR

Host Adapters

IBM PC to SCSI Adapter
Multibus to SCSI Adapter

Disk Controllers

SCSI/ST506 Controller for 5¼" Disks
SCSI/SMD-O Controller for Large Disks
Disk Controller Module

Tape Controllers

SCSI/PERTEC Controller for ½" Tape
SCSI/QIC-36 Controller for ¼" Tape

IBM PC is a registered trademark of International Business Corp. Multibus is a registered trademark of Intel Corp.



OEM Products Wichita, KS 67226 1-800-325-SCSI

CIRCLE NO. 30 ON INQUIRY CARD

SILICON SYSTEMS OFFERS THE ONE-CHIP MODEM THAT'S READY FOR DELIVERY NOW!



More Functions Integrated on a Single Chip

The race to deliver a true single chip 212A modem was won in November, 1985 when Silicon Systems released samples of its K212. The new SSI K212 is a full-featured, 1200 BPS modem in a single 28-pin DIP. It incorporates all the primary functions needed to construct a modem which exceeds Bell 212A performance requirements.

Included on the single chip are complete Bell 103 and 212A operating modes, a call progress monitor, and a DTMF dialer. The device also has an 8-bit parallel bus for the control of modem functions and will directly

interface with the 8048/8051 family of low-cost micro-controllers. Its high functionality, low-power CMOS operation, and efficient packaging facilitate design usage and increase system reliability.

Simplifies Modem Design and Manufacturing

The one-chip K212 represents a new level of integration for modem IC's. It provides functions on a single chip which were previously only possible using many separate components. This new single-chip modem simplifies designs for users who are building intelligent modems, or who wish to incorporate datacommunications capability

into specialized systems. A complete modem requires only the addition of the phone line interface and a control microprocessor. The K212 is ideal for use with any self-contained or integral modem system that incorporates a dedicated microprocessor for control and command interpretation.

Pricing and Availability

The Silicon System K212 one-chip modem is available from stock now. For prices or more product information, contact us today.

Silicon Systems, Telecom Products Division, 14351 Myford Road, Tustin, CA 92680 (714) 731-7110, Ext. 595.

**silicon systems**
INNOVATORS IN INTEGRATION

CIRCLE NO. 31 ON INQUIRY CARD

nator in an integrated application. That's the place where integration should occur," explains Laura King, vice president of RDS. "We've set up an open architecture so that you can write a whole bunch of front ends to Informix-SQL—like a word processor, perhaps—and all of them can have a common interface to the database. In effect, if you can build something with SQL, you can get it into Informix-SQL." Developers can also link their products to Informix via a library of C routines that RDS markets as "C-ISAM."

Unify takes a similar approach. It too uses SQL, plus what the company calls "host-interface" software that is compatible with C and some COBOL programs. One company that took advantage of these tools is Syntactics Corp. It gave its UNIX-based word processor, Crystal Writer, a DBMS interface to create a new product, Document Manager, planned for release early this year. "It's a natural fit," explains Russell Salisbury, vice president of engineering for Syntactics. "Document Manager will actually be able to compose queries to the database. A user needs that sort of facility for doing things like mass mailings."

These products also incorporate links to the MS-DOS world and to the IBM PC, raising the interesting possibility that integrated software might someday include modules of code running on separate machines and different operating systems. For example, Relational Technology introduced last year a product known as Ingres/PCLink, software that connects the Ingres mainframe database with personal computer products—specifically, Lotus Development Corp.'s 1-2-3. Ingres/PCLink reformats Ingres data from a host multiuser machine so that it can be used by MS-DOS software.

4GLs ease the way

Finally, if developers want to minimize coding—or even do no coding at all—they can exploit a host of fourth-generation languages (4GL) and application generators that have recently come on the scene. Many of these spring directly from the DBMS products and may become the new "lowest common denominator" of integration. In 1985, for example, RDS and Unify introduced, respectively, Informix-4GL and Accell. They are 4GLs that make it extremely easy either to link their UNIX-based DBMS with other applications or to build new products on top of them (MMS, November 1985, Page 93).

One new wrinkle in the 4GL market is machine-specific 4GLs. Integrated-software developers working in the IBM arena, for example, can take advantage of such languages as Mach 1 from Tominy Inc. Capable of producing code for

the entire spectrum of IBM machines from mainframes to microcomputers, Mach 1 uses an English-like structure, menus, and forms-based visual programming.

A similar product in the Digital Equipment Corp. sphere is SmartStar from Signal Technologies Inc. In addition to performing some office-automation functions, SmartStar contains a 4GL that allows developers to link code in third-generation languages (3GL), such as COBOL and C, with SmartStar applications into one integrated product. "You will find many fourth-generation products that will say they can call upon a third-generation language," notes Dr. John Markel, president of Signal Technologies. "What they don't say is that they can't be called back from a 3GL, as they can with SmartStar. And that's dangerous, because a customer is certainly not going to throw away their thousands of lines of COBOL code to rewrite their applications in a 4GL."

DEC apparently concurs and has recently announced that it has an agreement to resell SmartStar under its own label.

Once again, whether VARs can benefit from 4GLs and application generators depends on how much time they can afford to spend on development and on how much control they wish to retain over their products. A 4GL can cut programming time by upwards of 90 percent but requires the developer to buy into somebody else's product. And the product may not meet the unique requirements of a vertical application. Lynch, of The Programmer's Shop, refers to that kind of integrated software with a bit of scorn: "I assume a software house is working with a real, honest-to-goodness programming language, like C or FORTRAN...[but] I know a lot of companies that do nothing more than buy somebody's product, diddle with the source code, and then resell it for a vertical market."

Still, most VARs are driven as much by market forces as by a love of programming. For them, tools make sense, particularly if they're working in integrated software. Whether as subroutines available from resellers like The Programmer's Shop or as 4GLs from DBMS companies, tools can vastly reduce programming time and even make for better products by allowing developers to incorporate other vendors' standalone applications into their packages. It's sometimes simply wiser to remarket somebody else's thoroughly debugged spreadsheet or word-processing package than to write one from scratch. □

If developers want to minimize coding—or even do no coding at all—they can exploit 4GLs.

Interest Quotient (Circle One)
High 454 Medium 455 Low 456

Your back-up shouldn't leave you behind.

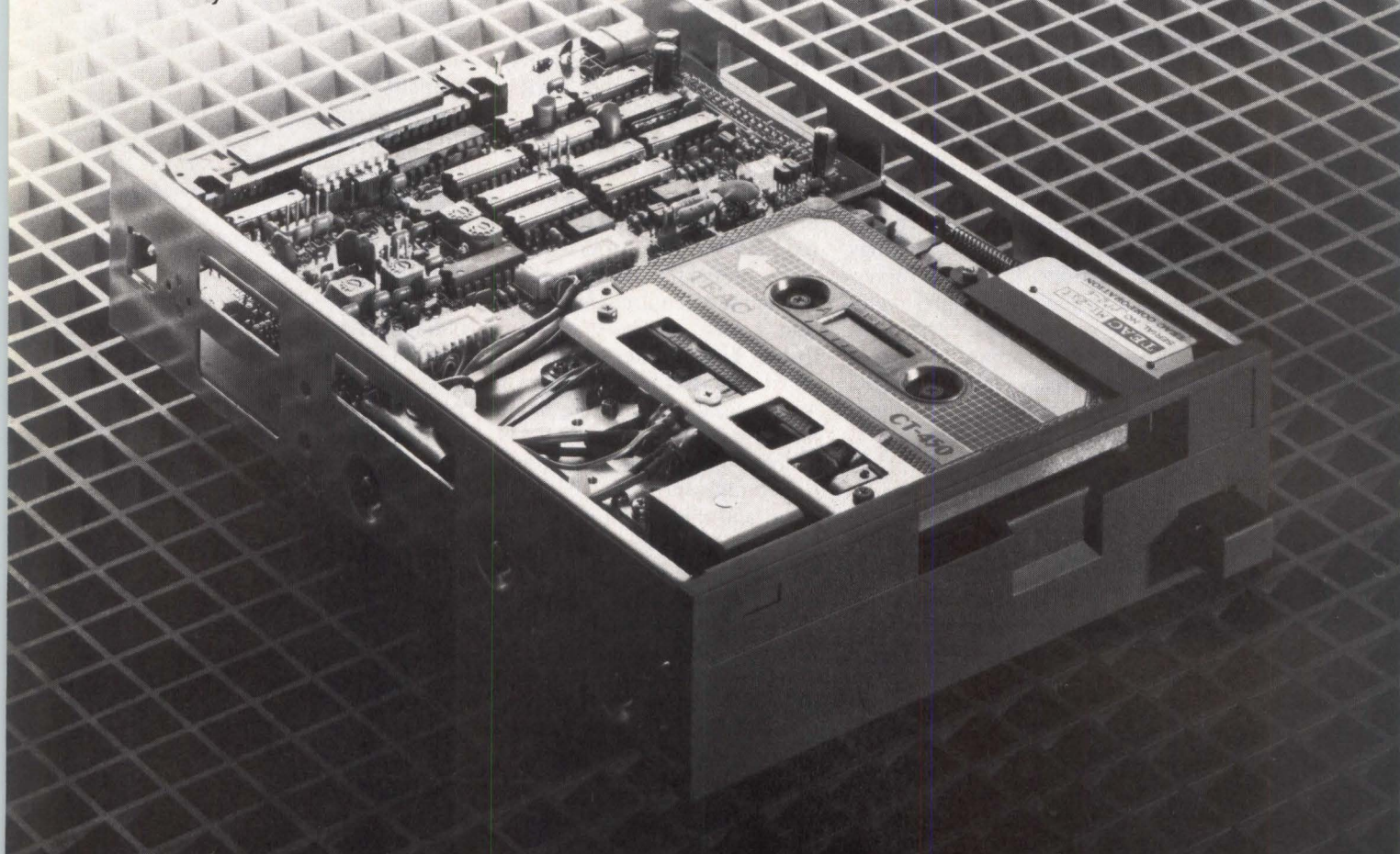
Meet the MT-2st. Teac's breakthrough half-height digital cassette tape streamer—based on the Philips cassette format. With its 90 ips performance you can store twenty megabytes of back-up in an incredibly quick four minutes.

And all at a breakthrough price/performance ratio.

How do we get so much out of a cassette format that's been around so long? Maybe because we've got over three decades of experience building precision tape transports. Or, maybe because we pioneered cobalt amorphous heads, auto reverse and direct drive DC motors in cassettes.

Or, just maybe because we're simply fanatical.

So, if getting your data backed-up on tape is keeping you up nights, call Teac and get a back-up that's pushing the industry forward.



Built To Fanatical Standards. **TEAC**

INSTRUMENTATION AND COMPUTER PRODUCTS DIVISION, 7733 TELEGRAPH ROAD, MONTEBELLO, CA 90640

East (617) 475-7311 South/Midwest (312) 351-9124 Rocky Mountain (602) 242-4025 (303) 337-6329 (801) 532-2111

Northwest (408) 727-1427 Southern California (213) 726-0303

Comdex Booth #464

© 1985

CIRCLE NO. 32 ON INQUIRY CARD

TELEVIDEO 955

(Photo actual size)

PRODUCTS INC.

PERIOD: 03, 1985

NUMBER	ITEM	SHIPDATE	WAREHOUSE	SHIPDEST	CARRIER	CUST.TOTAL
87654	200	10/02/85	NYPHILIDE	NEW YORK	ACMETRS	250.21
50987	007	12/01/85	CENTRALLA	BOSTON	AJAXAIR	150.77
90867	999	ONHOLD	WOODLAWN	CHICAGO	DUMAIR	100.32
99999	808	11/19/85	ATLANTANW	AUGUSTA	EMFRT	500.11
85748	922	12/07/85	MINNSTPAUL	MINNIAP	TRUCKER	12.51
54970	905	09/28/86	SANJOSESE	SANMATED	SHORTAIR	500.55
88759	894	11/08/85	SACRAMENTO	SANJOSE	EZHAULER	50.34
99220	955	12/18/87	IRVINECA	WESTLAWN	LATRUCK	500.12
57463	888	10/26/86	GRTFALLS	GRTFALLS	FALLSTR	750.04
58473	543	12/24/85	DALLASFW	AUSTIN	LONSTAR	855.55
90795	666	04/01/86	NEWYORK	FARGO	TRUCKIN	905.55
95767	332	09/17/86	FLORIDAKEY	MELBORNE	SHIPWAY	888.31
58574	777	07/10/86	LASVEGAS	RENO	TRATN	777.00
58764	923	12/15/85	PORTLAND	CORVALIS	TR	
54746	345	12/17/86	GREENBAY	UPPERPEN	UP	
85767	111	11/11/85	HAMBURG	FRNKFURT	FR	
58607	456	04/27/86	CHICAGONW	HAKENSAK	M	
79585	666	05/09/86	LONDONSW	BRIGHTON	L	

As you can clearly see, at TeleVideo® we've found a better way to put 132 columns on a 14" screen. By redesigning the proportion of our characters and putting more space between them, we've given the TeleVideo 955 the most readable 132 column display available. And that's just the beginning. We've also given it the most complete set of features ever built into a mid-range terminal. Just turn to the last page of this ad, and you'll see what we mean.

 TeleVideo

An
eye-opening
comparison
between
two
\$600 terminals.

WYSE WY-50

(Photo actual size)

CAPS BLK

SALES ANALYSIS

LATEX SPECIALITY

SALES PERSON	ID NUMBER	TERRITORY	CUSTOMER	CUST. NUMBER	PART
ABBOTT	101000000	NEW YORK	APEXINC	33333888899	KL234
ABRAMSON	102277754	BOSTON	ZINCINC	33388990044	KL234
BACH	100000456	CHICAGO	AASEWER	98750372378	KL230
BENSON	109957363	ATLANTA	TUSINC	77493887549	KL239
CAGNEY	107584948	MINNIAP	XYZCORP	34857683999	KL239
DEWITT	108958488	SANFRAN	JAKINC	82746532363	KL235
ELLIOTT	108674637	SANJOSE	ACDCORP	40874573839	KL230
FINEGOLD	107563848	LOSANGEL	LYNINC	94837394873	KL238
GOODMAN	106574647	MONTANA	CONSINC	93848473848	KL238
HILLMAN	109458574	DALLASFW	TEXACAN	75893738567	KL236
JACKSON	103546455	NDAKOTA	EXFARM	85737395473	KL230
KINGSTON	104958363	JAMAICA	DARKRUM	85736384938	KL239
		NEVADA	CASINO	91274937348	KL238
		OREGON	TIMBINC	02784503748	KL238
		WISCONS	NEWMINE	84874638459	KL238
		GERMANY	RUHRINC	85743648474	KL234
		NEWJERSY	MAPLEINC	85904874949	KL238
		LONDON	JAXCORP	85905737383	KL238

As you can more or less see, a typical \$600 terminal manages to fit 132 columns on a 14" screen. By crunching them together a lot tighter than normal. Which can lead to eyestrain, headaches, and just plain mistakes. All of which tend to be on the expensive side.

Most
132 column
terminals are
designed
to crunch a lot
of numbers.

The
TeleVideo 955
is designed
to actually
let you
read them.

Besides making the TeleVideo 955 a lot more readable, we gave it a whole list of features you won't find on any other 132 column terminal. Like 64 non-volatile programmable function keys. With 512 bytes of dynamically allocated variable memory. Your choice of green or amber screen. And ergonomics that, unlike Wyse's, meet the human factors standards recommended for adoption by the American National Standards Institute. And you get all this for only \$629.

Available options include WY-50/50+ compatibility, graphics add-in board, and up to three additional pages of screen memory.

To see exactly how we compare feature for feature with the Wyse WY-50/50+, just look at the chart on this page.

Of course, there's an easy way to see how much more the TeleVideo 955 gives you. Get your hands on one and check it out from top to

bottom. If you're a computer professional, MIS manager, or VAR, you've got until February 28, 1986 to order an evaluation unit for the special price of \$400, including shipping. (U.S. and Canada only.) One per company, please. Just call 800-227-6703 and ask for Department 50. (In California, 800-632-7979.)

TELEVIDEO 955 VS. WYSE WY-50 AND WY-50+			
FEATURES	TVI 955	WY-50	WY-50+
Keyswitches tested to	100 million strokes	10 million strokes	10 million strokes
Screen color	Green or amber	Green only	Amber only
High contrast dark screen	Yes	No	No
Programmable function keys	16/64	16/32	16/32
Dynamically allocated function key memory	512 Bytes	128 Bytes	128 Bytes
Maximum bytes per function key	Unlimited	4	4
Graphics upgrade	Yes	No	No
User ROM Slot	Yes	No	No
List Price	\$629	\$599	\$699

The high-performance TeleVideo 955. It's a real eye-opener.



 **TeleVideo**

TeleVideo Systems, Inc., 550 East Brokaw Road, San Jose, CA 95150-6602, (408) 971-0255
 REGIONAL OFFICES: WEST (408) 971-0255, SOUTHWEST (714) 476-0244, SOUTH CENTRAL (214) 258-6776,
 SOUTHEAST (404) 447-1231, MIDWEST (312) 397-5400, EAST (516) 496-4777, NORTHEAST (617) 890-3282,
 AMSTERDAM: 31.2503.35444, PARIS: 33.1.687.34.40, LONDON: 44.9905.6464.
 WYSE is a trademark of Wyse Technology. ©1985 TeleVideo Systems, Inc.

SCSI OPENS INTEGRATION OPPORTUNITIES

The small computer systems interface meshes a broad range of peripherals with a wide variety of architectures

Carl Warren, Western Editor

System integrators look for both flexibility and high performance in peripherals to meet the needs of today's demanding computer systems. But there are trade-offs to consider. Specifically, although plug-compatible peripherals might provide higher performance than general-purpose devices, they aren't flexible enough to permit integration into a broad range of system architectures. And although general-purpose products permit connection to a wider range of computers, they tend to suffer from performance limitations.

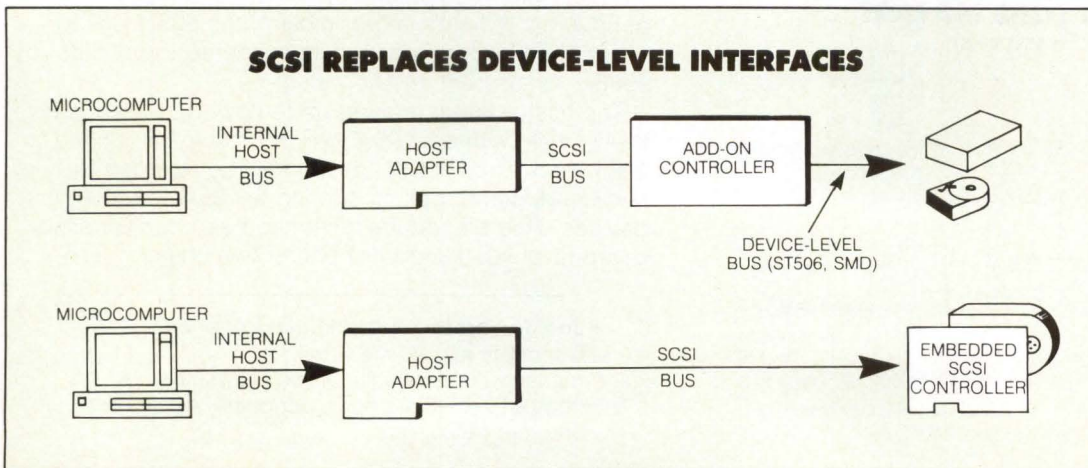
The small computer systems interface (SCSI) offers a way out of this dilemma. It combines performance where it counts, with flexibility where it's needed.

As currently defined, SCSI supports a maximum of eight logical units. These may include disk drives, tape drives, printers, communica-

tions and optical-storage devices or other host computers.

The eight logical units can be configured as one host computer and seven peripherals, or seven hosts and one peripheral. Even more devices can be connected using a gateway to a local area network. In addition, each of the eight logical units can support an additional seven units with one device serving as the bus master. (However, a system fully loaded in this manner suffers performance degradation.)

A key advantage of the SCSI bus is its ability to serve a wide range of performance requirements. Most SCSI configurations are single-initiator, single-target systems, usually with one host computer as the initiator and a disk drive as the target. A single-initiator, multiple-target configuration with arbitration increases the number of devices you can hang off the bus. But under arbitration's master/slave relationship, one target must relinquish the bus before trans-



An embedded SCSI controller replaces the add-on controller and device-level interfaces normally found on today's peripherals.

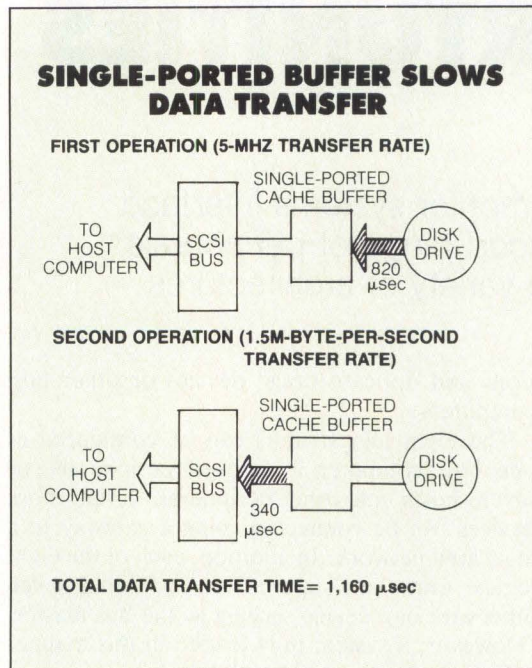
fers to others can take place. However, multiple-initiator, multiple-target systems with multiple host computers fully utilize SCSI capabilities by allowing the full complement of eight units to be attached to the bus. In this mode, SCSI acts as a clustered LAN.

The SCSI bus' ability to control seven periph-

erals through one backplane slot is a system integrator's dream come true. And because SCSI serves as its own "traffic cop"—arbitrating bus access—system integrators need only be concerned with data management at the point of access to the SCSI bus, the host-computer adapter—the vital link between the system bus and SCSI.

A single-ported cache buffer

doesn't allow for overlapped operations, thus increasing the transfer time for a 512-byte sector from disk drive to SCSI bus to 1,160 μ SEC.



Use a smarter interface

The use of the SCSI bus with disk drives and other devices establishes a trend away from the add-on controllers and device-level interfaces normally found on today's peripherals.

A typical device-level interface, such as an ST506/412, a storage module device (SMD) or an enhanced small device interface (ESDI), comprises many signal lines, each dedicated to performing one primitive drive function (e.g., seek cylinder or drive ready). In a typical configuration a controller, installed between the computer and the peripheral, converts device-level signals to parallel data/control signals.

Instructing a disk drive to read a file, for example, requires a series of commands. The controller first directs the drive's read/write head to the appropriate cylinder (a task that often requires several stepping signals), locates the appropriate sectors making up the file, checks for errors in the read data and, if necessary, performs correction or a retry. The controller

The SCSI market comes of age

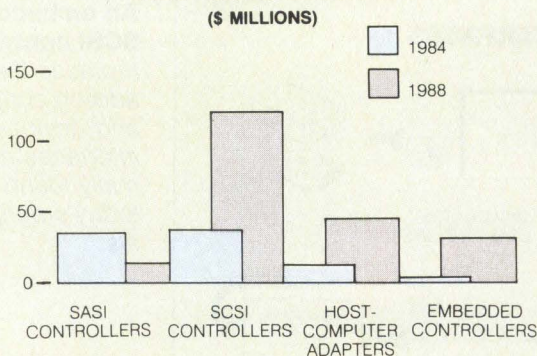
Joe Jaworski
Peripheral Concepts Inc.

The growing demand for higher performance versions of small computer systems interface (SCSI) bus

controllers will cause a strong shift away from the older Shugart Associates system interface (SASI) controllers. In fact, the market for SASI controllers is expected to decline from \$34 million in 1984 to just over \$10 million in 1988. Sales of embedded controllers will further erode SASI's sales. Drive manufacturers that require chips and chip sets to create SCSI peripherals will account for most of the \$33.1 million worth of embedded controllers expected to be sold in 1988.

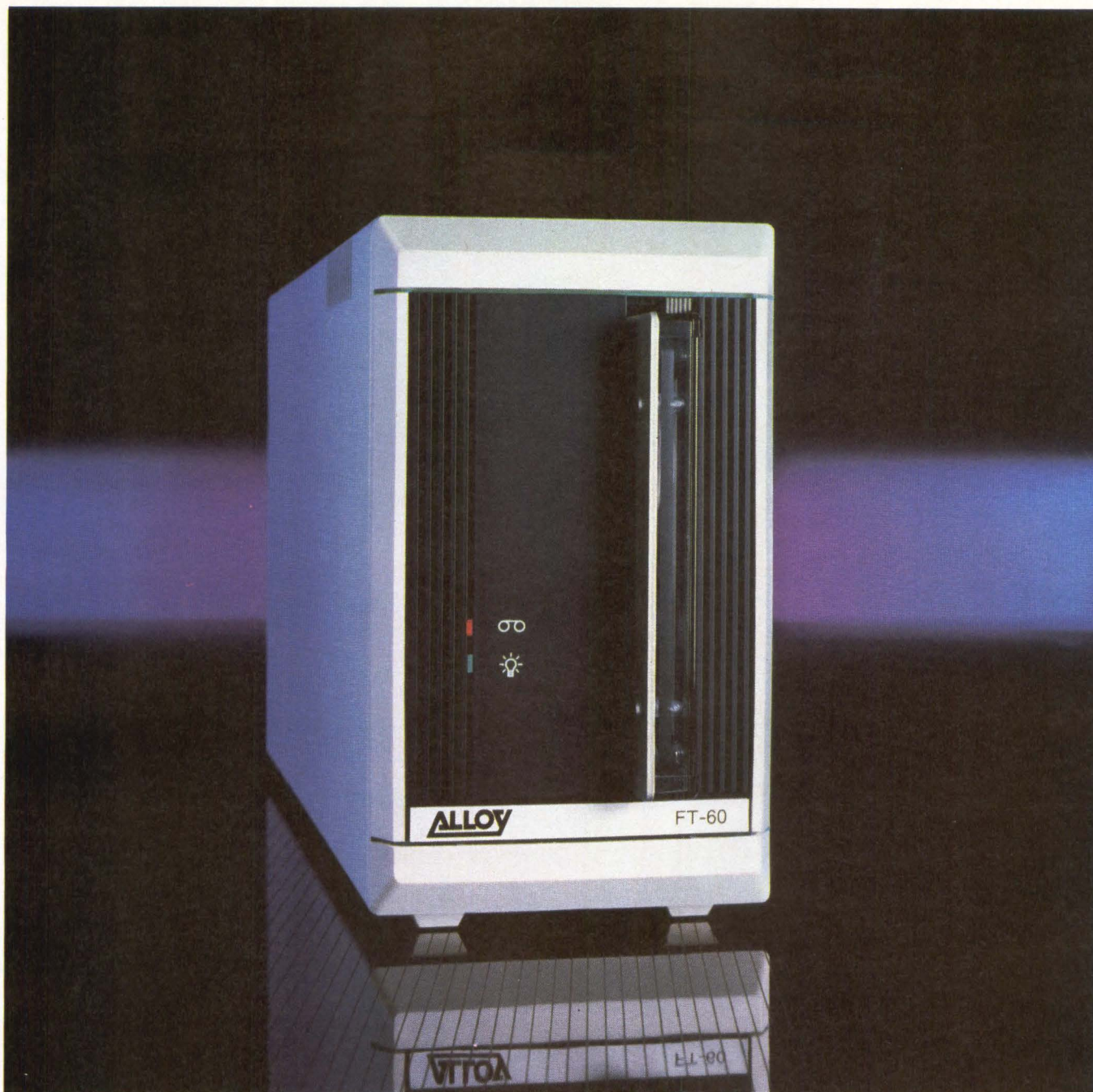
The host-adaptor market, up to now, has been relatively small, with only \$5.1 million in revenues during 1984. And future market growth will be retarded by semiconductor suppliers offering full-SCSI-protocol devices. This will reduce what has been traditionally a board-level function to just one or two chips.

SCSI TOPS MARKET



SOURCE: PERIPHERAL CONCEPTS INC.

Joe Jaworski is president of Peripheral Concepts Inc., Irvine, Calif., a management-consulting and publishing company specializing in peripheral controllers and interfaces.



Alloy's Streamliner Series. The best protection for your company's past, present, and future.

The best protection for your personal computer data storage needs is available today. From Alloy. Choose tape only. Or combined disk and tape. Either way, the Streamliner Series provides the performance you expect from the leader. At a remarkably affordable price.

Alloy's FT-60 streaming tape backup subsystem gives you up to 60Mb storage capacity and high-speed data transfer. The SL-60 models give you the same high quality tape unit *plus* integral hard disk. And you can choose 20Mb or 41Mb formatted data capacities.

With Alloy's Streamliner Series, you'll get the best protection for your company's past, present, and future. So call Alloy today at (617) 875-6100.

ALLOY
Computer Products, Inc.

100 Pennsylvania Avenue, Framingham, MA 01701 (617) 875-6100, TWX 710-346-0394

In Europe: ALLOY Computer Products (Europe) Ltd., Cirencester, Gloucestershire, England. Tel.: 0285 69571 Telex: 43340

MINI-MICRO SYSTEMS/February 1986

CIRCLE NO. 33 ON INQUIRY CARD
CIRCLE NO. 34 ON INQUIRY CARD

“No, I don't have a FasTape for backup. Why do you ask?”



Now there's no reason for anyone to be caught with unprotected data when power problems flare up. Because with Archive's FasTape streaming tape subsystem, they can back up data in a flash. It's just what you'd expect from the world's largest manufacturer of streaming tape products—and more!

With FasTape, it takes just 4-5 minutes to backup 20 MB of hard disk data. And, at \$995 for the 20 MB version (\$1295 for the 60 MB version), it's a bargain of an insurance policy, especially when you consider the time and money it takes to replace lost data. No installation or operation problems either. Just plug it in to any IBM PC, XT or AT, or any MS-DOS compatible*. Then follow the menu driven software instructions.

And delivery? Simple. Call Hamilton/Avnet, the exclusive industrial distributor for Archive.

*IBM is a registered trademark and XT and AT are trademarks of International Business Machines Corporation. MS-DOS is a registered trademark of Microsoft Corporation.

Hamilton Avnet
ELECTRONICS

ARCHIVE from HAMILTON/AVNET

CIRCLE NO. 81 ON INQUIRY CARD

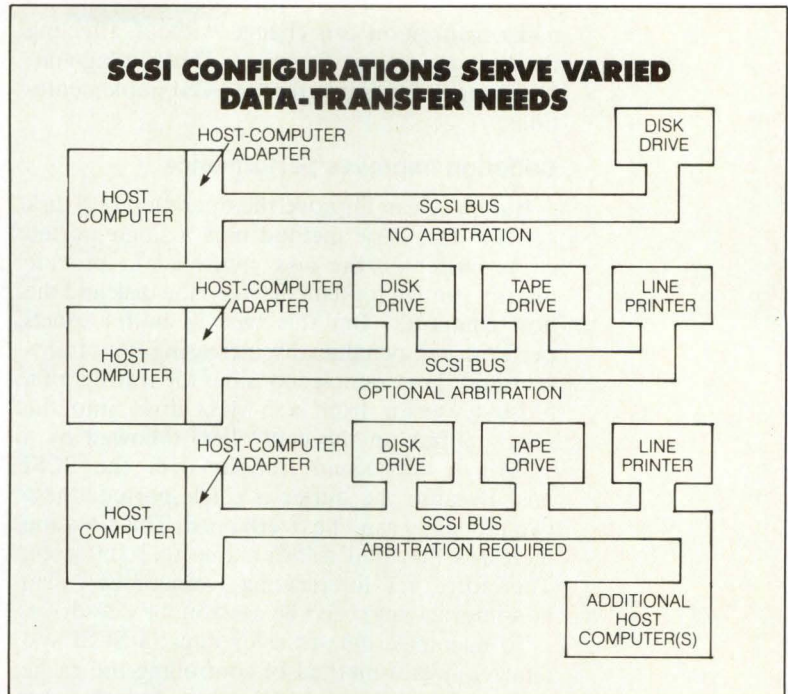
then converts the serial data from the disk into parallel data and passes it to the host.

Device level has limitations

Although using a device-level interface is a cost-effective way to integrate mass-storage devices, the approach has drawbacks. Specifically, the computer must know where each sector of data is located on a disk, the number of sectors and the electrical parameters of each signal line from the interface. As a result, integrating mass-storage peripherals using device-level interfaces requires system integrators to have in-depth knowledge of the connected devices.

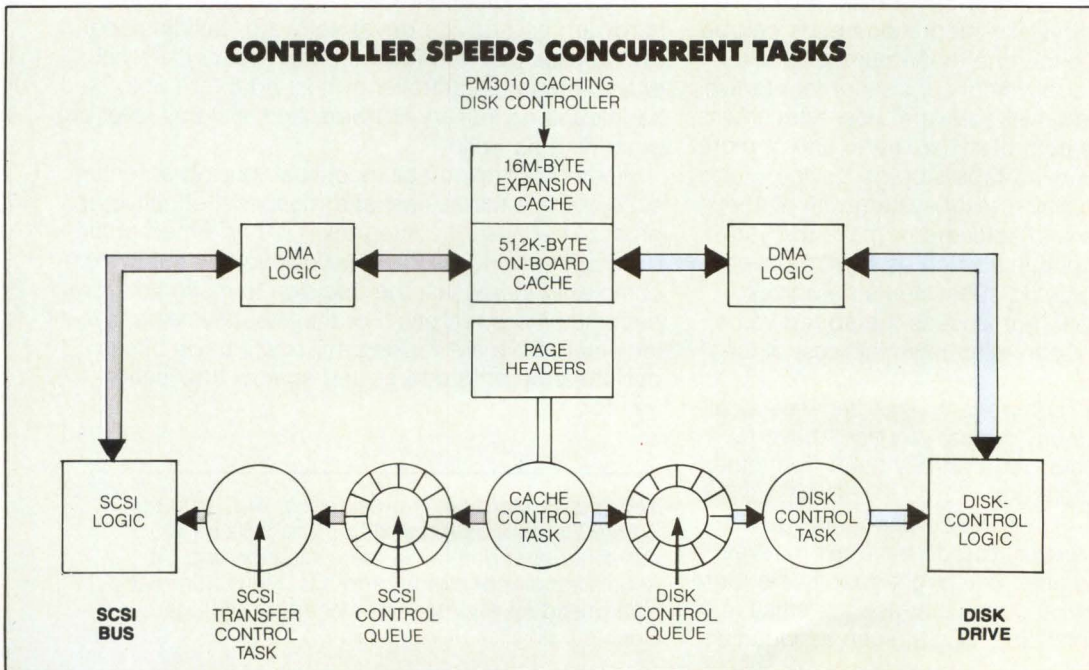
In contrast, an intelligent interface like SCSI makes device characteristics transparent to system integrators and host-computer systems. A set of commands handles such functions as seeking, reading, writing and even bus arbitration. Moreover, SCSI has an 8-bit bus (with optional parity) for data command and status. In addition, because SCSI is tightly coupled to peripherals, such as the Quantum Corp. Q200 series of Winchester, the computer is unaware of the actual data rate of the drive or its operating characteristics.

Quantum has solved drive-integration problems by integrating SCSI into the drive, requiring only a host adapter on the system end. Similarly, Maxtor Corp.'s XT-3000 series of Winchester uses an embedded SCSI controller with an on-board, 48-bit, error-correction-code (ECC) scheme to limit errors to the host.



SCSI bus configurations run the gamut from simple one-host-computer, one-peripheral systems without arbitration to complex two-host-computer systems able to support full SCSI capabilities and eight logical devices on the bus.

Because SCSI uses a "logical" block to automatically define access to a region of data (rather than having to enter the information and specify a physical sector and cylinder), a disk's capacity



Two separate data paths, control queues, on-board logic and MC68000 microprocessor on DPT's PM3010-series caching controller accelerate concurrent data transfers between a disk drive and the SCSI bus.

and organization can change without affecting the host adapter or firmware. Thus, "plug-and-play" capability is inherent in SCSI implementations.

Buffering improves performance

Buffering can improve the operation of a disk system. The basic method uses a single-ported cache buffer on the disk controller to provide interim storage for data between the disk and the host computer. But this type of buffer exacts performance penalties by increasing data-transfer times. For example, consider the transfer of a 512-byte sector from a 5-MHz drive into the sector buffer on the controller, followed by a 1.5M-byte-per-second transfer over the SCSI bus. Because the buffer is single-ported, these two processes can't be overlapped. This situation increases the total transfer time to 1,160 μ sec. Therefore, 1:1 interleaving (sometimes called non-interleaving) can't be used on the disk drive.

To maximize data-transfer rates, a SCSI system requires a method of controlling the cache buffer. For instance, Distributed Processing Technology's (DPT) PM3010 Series caching disk controller handles both a disk drive and the SCSI interface. Two separate data paths—to the SCSI

Spec summary

- **Bus:** SCSI
- **Signal lines:** Nine data, nine control
- **Cable length:** 6 meters or 25 meters
- **Transfer rate:** 1.5M bytes per second at 6 meters; 4M bytes per second at 25 meters
- **Device limit:** Eight, with arbitration
- **Bus response:** 5 μ sec to acknowledge signal at maximum cable length
- **Connectors, cable:** 2-by-25-pin header, shielded Allied Amphenol Products AMPMODU connector, shielded ribbon cable
- **Addressing:** 24 bits; maximum, 32 bits
- **Functions:** Disconnect/reconnect, reset
- **Available chips:** Protocol, controller

bus and to the disk drive—allow simultaneous data transfers with maximum overlap. Using a Motorola Inc. MC68000 microprocessor to execute concurrent tasks, the PM3010 maintains and searches its 512K-byte, on-board, cache memory (expandable to 16M bytes) for blocks requested by the host.

When implementing SCSI systems, system integrators face the choice of building or buying

How to make the build-or-buy decision for a disk subsystem

Thomas E. Gardner
Systems Surety Group

Deciding whether to build or buy a disk-drive subsystem to meet your system-integration needs can be a bewildering experience due to the number of alternatives. Typically, a subsystem consists of four to five elements: the device-driver software, host-attachment hardware, disk-drive-controller hardware, one or more disk drives and possibly a tape-storage device.

You can decide to buy the subsystem with all the necessary hardware and software or make the various supporting components, such as device drivers and host adapters. Buying subsystems minimizes risks in some respects, but lessens the added value. And in some cases it can even raise the cost of the total system.

"Rolling your own" components isn't necessarily all that intimidating. In many cases, you don't have to actually build products; you can buy them from other vendors and integrate them.

Disk and tape drives are the components you usually have to buy. However, you do have alternatives here as well. For example, you might specify the more intelligent disk and tape drives that use the small computer systems interface (SCSI), such as Quantum

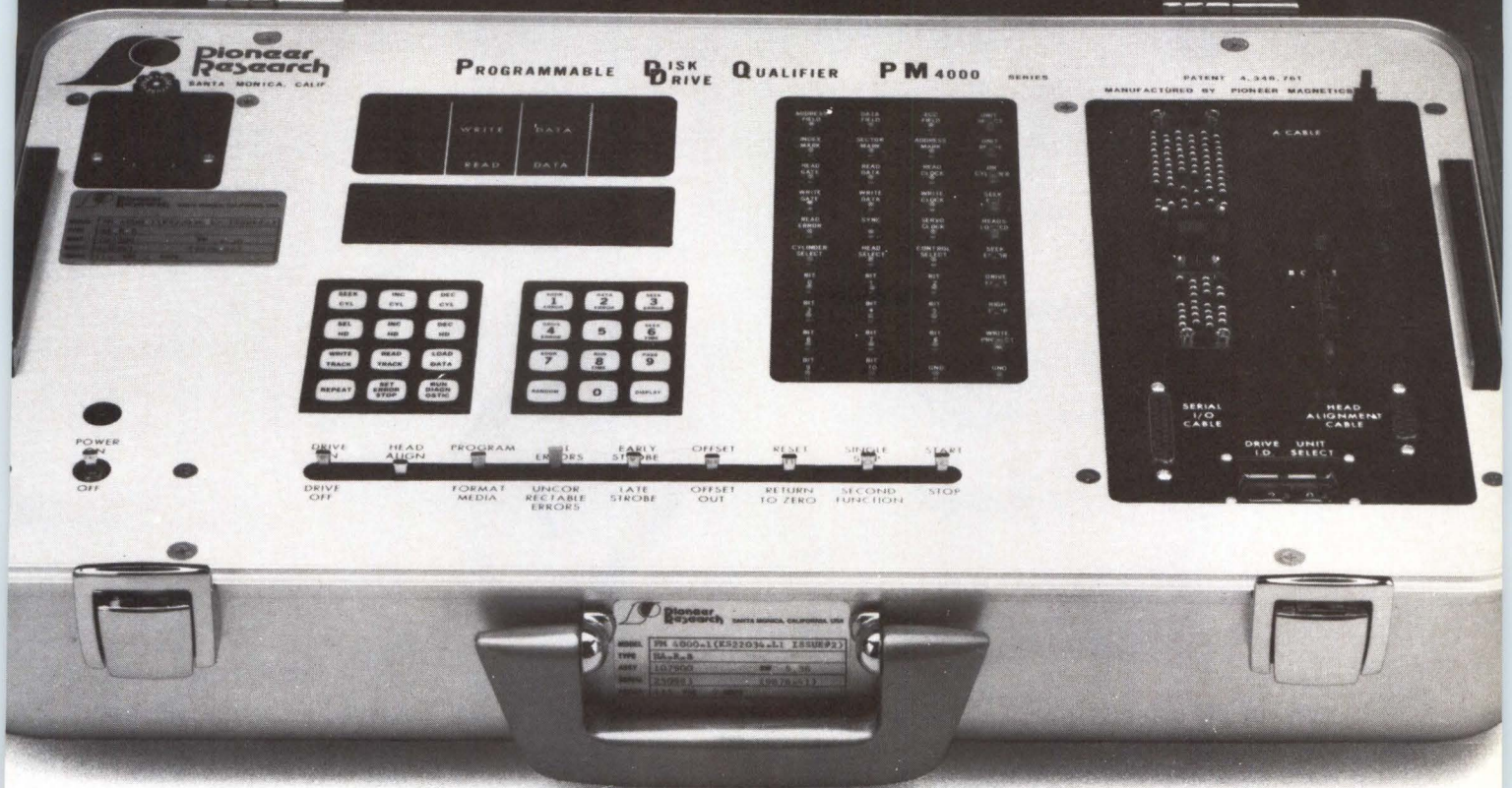
Corp.'s Q200 series or Xebec Corp.'s Owl products. Their SCSI interfaces allow you to integrate them into virtually any host architecture.

The most critical choices involve host-attachment hardware and device-driver software. Building your own implies that you have the necessary skills not only to create a controller or host adapter but to handle the necessary firmware and systems-level programming as well.

Where integration cost is critical, buying an entire subsystem is the easiest and most cost-effective approach, because the integration is performed at the distributor or end-user level. However, as subsystem complexity increases, the decision to make your own becomes more realistic. For these subsystems, system integrators are making important trade-offs in performance or in addressing special application needs.

Thomas E. Gardner is president of the Systems Surety Group, Los Altos, Calif., specializing in assisting management in the evaluation and acquisition of peripheral products. He is a former vice president and general manager of Shugart Corp.'s rigid disk drive division.

All SMD disk drives. One tester.



If you design, manufacture or service SMD-interface disk drives, take a good look at the picture in this ad. It's the only disk drive tester you'll ever need.

It's the advanced, high performance PM4000 Qualifier™ from Pioneer.

This programmable portable micro-computer-in-a-briefcase tests *all* drives with SMD interfaces. And it can test them at transfer rates in excess of 2.45 MB per second.

It will test today's Fujitsu M2361 or any CDC™ Century Data, NEC, Toshiba, you name it.

One size tests all.

With the PM4000 Qualifier you can standardize all your company's testing needs on a single lightweight unit. Use it in development engineering, produc-

tion test, receiving, inspection, and field service.

The PM4000 monitors and diagnoses drive problems. And all the readouts are in English. It can format at 2.45 megabytes per second. Pinpoints errors to a specific media sector or byte. And can rerun tests continually to find intermittents in the output. It works with dedicated or embedded servos. Can be multiplexed to test four drives at once. And even operate remotely using a standard terminal and modem.

The PM4000 enables you to run up to six preprogrammed test sequences or enter your own test programs thru the

keyboard or RS 232C port. And you can input a custom set of drive parameters with no EPROMS to modify or boards to change.

The intelligent disk drive tester.

The PM4000 is so packed with advance features, it takes a six-page information piece to detail them all. Phone us toll free at 800 233-1745 (In CA, 800 848-1745) and we'll speed one off to you, without obligation, in the next morning's mail.

If you'd like to see a PM4000 Qualifier in person, call us. We'd be pleased to arrange a complete demonstration. The Pioneer PM4000. It's the only SMD drive tester you'll ever need.

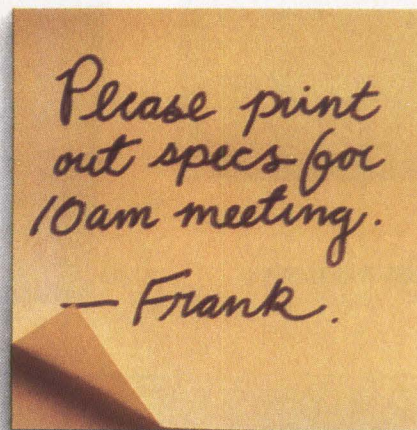
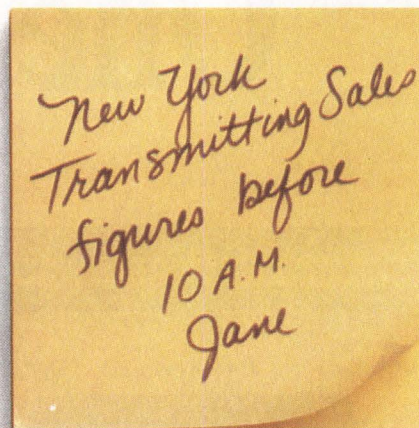
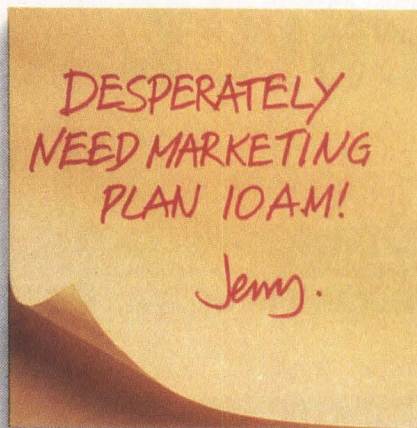
The intelligent disk drive tester.

Pioneer Research

1745 Berkeley Street, Santa Monica, CA 90404,
213 829-6751, TWX 910-343-6249.

CIRCLE NO. 35 ON INQUIRY CARD

Only the Hayes® Transet 1000® can get you out of this one.



© 1986 Hayes Microcomputer Products, Inc.

Now your PC can do three things at once instead of making you wait while it does one thing at once.

We call it *triple tasking*.*

It means you can work with your PC while the Transet 1000 receives your electronic mail and runs your printer for you simultaneously.

Three jobs at once. No waiting.

When you're away from your desk, or at night while your PC is turned off, Transet 1000 serves as an electronic mailbox. Because it has its own independent 128K or 512K memory.

To get the messages that come in through the night, you can call them up on your PC. Access them through a remote modem if you're away from the office.

Or even have them waiting for you in hard copy.

By now it's dawning on you



Hayes®

Say yes to the future with Hayes.

* Manufacturer's estimated retail price.

CIRCLE NO. 36 ON INQUIRY CARD

that Transet 1000 can make your PC about three times as productive as it is now. Which is no small statement.

You've also figured out it's more than just a print buffer. More than just a communications buffer. And probably costs a lot. Right?

Wrong!

It costs only \$399* for the 128K model which stores up to 90 pages. And only \$549* for the 512K version with up to 360 pages of storage.

For more information and specifications, contact your authorized Hayes dealer. Or Hayes directly at (404) 441-1617.

Hayes Microcomputer Products, Inc., P.O. Box 105203, Atlanta, Georgia 30348.

CCS spurs SCSI standardization

The small computer systems interface (SCSI) provides system integrators with a rich command set, but the bus has suffered from manufacturers' tendencies to provide SCSI implementations that are unique to their products. To accelerate the effort to standardize SCSI commands, Scientific Micro Systems Inc., in concert with the ANSI X3T9.2 Committee, has developed a common-command set (CCS) for direct-access devices. Although CCS is not currently a part of revision 17 of the proposed SCSI standard, it is included as an appendix.

Specifically, CCS defines commands, messages, fields, bytes and bits that conform to CCS usage. In addition, there are option codes that a developer can choose. By selecting a common implementation of a subset of the SCSI commands, CCS allows software and hardware developers to create products for a range of systems. In providing true second sourcing to end users, CCS can encourage SCSI market growth by promoting software compatibility among vendors.

Companies in this article

Adaptec Inc.
580 Cottonwood Drive
Milpitas, Calif. 95035
(408) 946-8600
Circle 392

Adaptive Data Systems Inc.
2627 Pomona Blvd.
Pomona, Calif. 91768
(714) 594-5858
Circle 393

Allied Amphenol Products
4300 Commerce Court
Lisle, Ill. 60532
(312) 983-3500
Circle 394

Distributed Processing Technology
132 Candace Drive
Maitland, Fla. 32751
(305) 830-5522
Circle 395

Maxtor Corp.
150 River Oaks Parkway
San Jose, Calif. 95134
(408) 942-1700
Circle 396

Scientific Micro Systems Inc.
339 N. Bernardo
Mountain View, Calif. 94043
(415) 964-5700
Circle 397

Wang Laboratories Inc.
1 Industrial Ave.
Lowell, Mass. 01851
(617) 967-7810
Circle 398

Xebec Corp.
Suite 600
2055 Gateway Place
San Jose, Calif. 95110
(408) 287-2700
Circle 399

adapters, controllers and device drivers (see "How to make the build-or-buy decision for a disk subsystem," Page 76).

Building a device driver can be complicated. It involves having a good understanding of the device, the system and the operating environment. Surprisingly, although the graphics community has solved many device-handling problems with the virtual device interface (VDI), SCSI developers are still complicating the integration by insisting on system- and device-specific device drivers. Thus, to properly use SCSI, system integrators have often been forced to make changes to the operating system or to provide the proper firmware.

This situation, however, could be changing. Microsoft Corp. is taking an active role in SCSI development, especially as it relates to optical-disk storage. Additionally, IBM Corp. reportedly will introduce a compact-disk ROM reader in mid-1986 that will use a SCSI controller.

SCSI excels in optical applications

SCSI is being implemented as the interface of choice for optical-storage systems, due to its ease of integration over a range of architectures and its powerful command set (MMS, December 1985, Page 68). Additionally, Wang Laboratories Inc. is developing a laser printer that reportedly uses a SCSI interface.

SCSI easily handles today's data-transfer rates and can be made to go faster. Currently, most

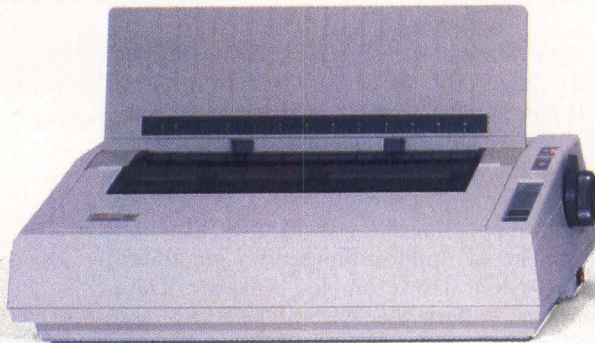
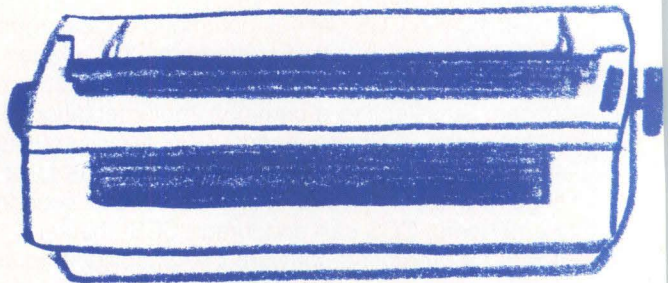
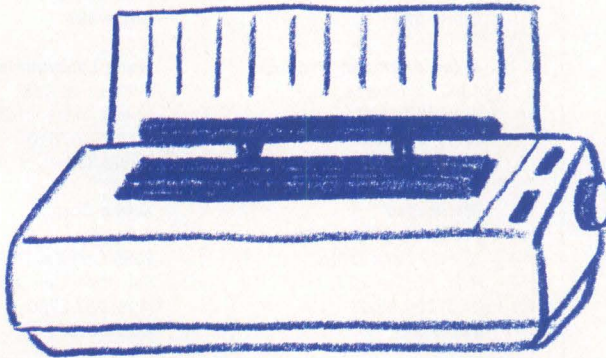
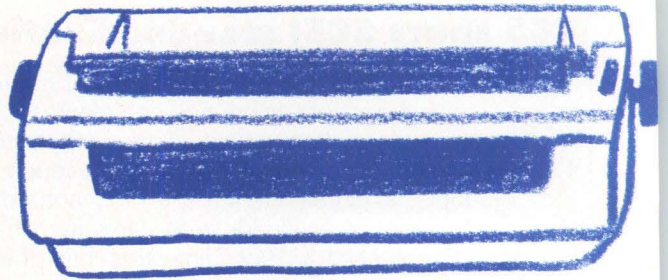
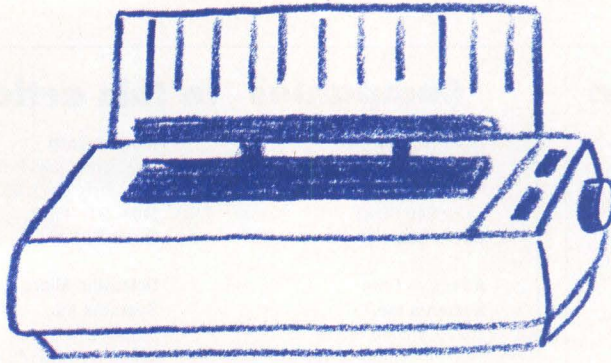
SCSI devices are in the 12-MHz (1.5M bytes per second) range. But SCSI isn't bandwidth-limited. It can handle 32-MHz (4M bytes per second) rates at distances of up to 25 meters, extending the capability of the bus for future systems.

Further supporting the growth of SCSI is the development of application-specific integrated circuits (ASIC). For example, Adaptive Data Systems Inc. offers the ADS-1000 VLSI disk controller that provides data handling for devices ranging from Winchester disk drives to optical drives. Adaptec Inc. offers similar products to allow easy integration of SCSI devices to various host architectures.

Although SCSI is defined as an open-architecture device bus for a variety of peripherals, including printers, adding printers hasn't been high on many system integrators' priority list. One reason is that no real standards for printers had emerged until Hewlett-Packard Co. introduced the LaserJet laser printer, establishing a de facto standard for printer control. Consequently, adding a SCSI interface to permit a printer to reside on the subordinate system's bus is now possible, allowing system integrators to create smarter, multiuser systems. □

Interest Quotient (Circle One)
High 457 Medium 458 Low 459

The perfect way to accent Big



The IBM-compatible NEC printers from Hall-Mark.

You've got an IBM or compatible personal computer. And you're looking for a flexible printer that can deliver the quality you want at an affordable price. Your search is over. NEC makes your printer, and Hall-Mark has it in stock.

Maybe you need the letter-quality performance of the Spinwriter 3500 or 8800 Series with its famous

print thimble and over 70 type fonts to choose from.

Or perhaps the Spinwriter e•l•f 300 Series printer would suit your needs. It's a good, reliable, letter-quality printer for medium-usage environments at a remarkably low price.

Looking for versatility? Then the Pinwriter P2 and P3 dot matrix printers are for you. From 180 cps



Alabama

Huntsville (205) 837-8700

Arizona

Phoenix (602) 437-1200

California

Bay Area (408) 946-0900
Orange County (714) 669-4700
Sacramento (916) 722-8600
San Diego (619) 268-1201
San Fernando Valley (818) 716-7300
West Los Angeles (213) 217-8400

Colorado

Denver (303) 790-1662

Connecticut

Connecticut (203) 269-0100

Florida

Ft. Lauderdale (305) 971-9280
Orlando (305) 855-4020
Tampa Bay (813) 530-4543

Georgia

Atlanta (404) 447-8000

Illinois

Chicago (312) 860-3800

Indiana

Indianapolis (317) 872-8875

Kansas

Kansas City (913) 888-4747

Maryland

Baltimore (301) 988-9800

Massachusetts

Boston (617) 935-9777

Minnesota

Minneapolis (612) 854-3223

Missouri

St. Louis (314) 291-5350

New Jersey

Fairfield (201) 575-4415

New York

Long Island (516) 737-0600

North Carolina

Raleigh (919) 872-0712

Ohio

Cleveland (216) 349-4632

Southern Ohio (614) 888-3313

Oklahoma

Tulsa (918) 665-3200

Pennsylvania

Philadelphia (215) 355-7300

Texas

Austin (512) 258-8848
Dallas (214) 553-4300
Houston (713) 781-6100

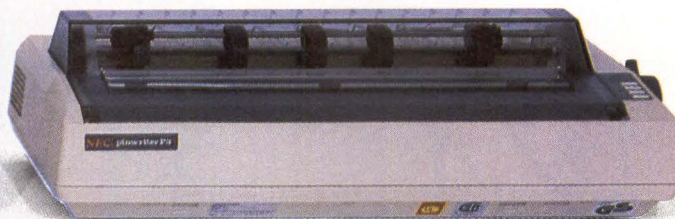
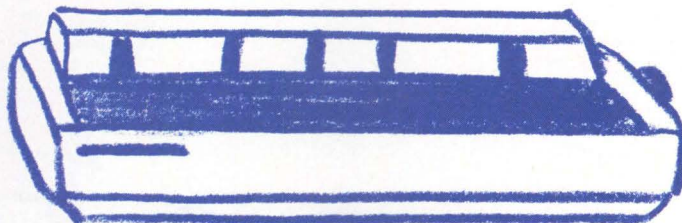
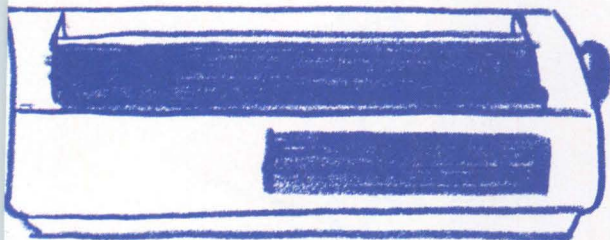
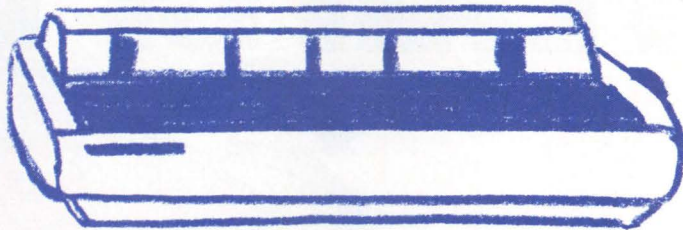
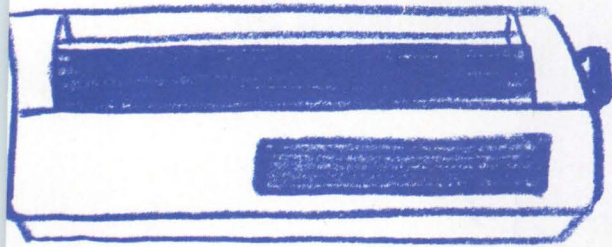
Utah

Salt Lake City (801) 268-3779

Wisconsin

Milwaukee (414) 797-7844

Blue.



high-speed data processing to 90 cps high density to 30 cps near letter quality, it has the print modes for all your applications.

Need the highest performance levels available? The Pinwriter P5 is the fastest, quietest 24-wire dot matrix on the market today. It has nine built-in character fonts with eight more plug-in fonts available. Speeds range

from 100 cps near letter quality to 290 cps data processing. The Pinwriter P5 is a printer that can grow with you.

Hall-Mark has all these NEC printers and their accessories in stock right now, ready for delivery. So call today. Hall-Mark has the products you need and the service you require because we care about your success.

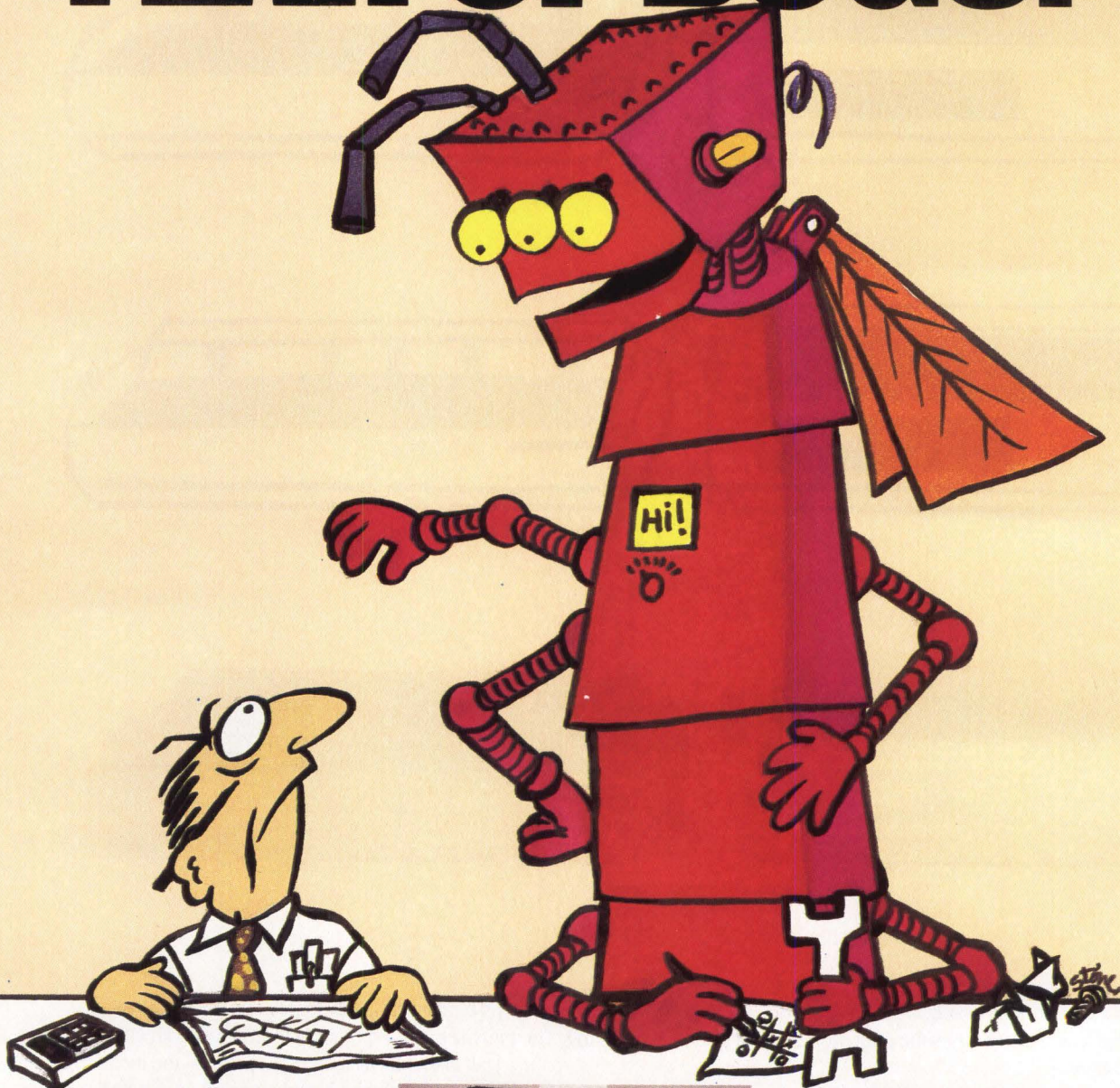
HALL-MARK

Hall-Mark Electronics Corp. • Dallas, Texas • Subsidiary of Tyler Corp. 

© 1985 Hall-Mark Electronics Corp. /0237-1001

CIRCLE NO. 37 ON INQUIRY CARD

FEAR OF BUGS.



Our streaming cartridge tape drives will end your fear of bugs, once and for all. They've proven to be the most reliable on the market—with a return-on-product of less than 1%. That's absolutely the lowest in the industry.

What makes our drives so bug free? They're made in our Factory of the Future. Which includes a \$1.1 million "paperless" Quality Data Management System. (There's nothing like it in the industry.) It gives us the real-time test data to stop a bug dead in its tracks—before it sneaks into the



next assembly stage. It also gives us a complete "history" of all units.

Of course, we're just as committed to our OEM customers. Our 60 and 120 MByte QIC-STOR™ half-height drives come with your choice of QIC-02 or SCSI interface. We also deliver the best

price/performance in the industry on tape subsystems for IBM PC's and compatibles. And if you've got anxieties about support, our West Coast factory manufactures and services all products for the U.S. market—with deliveries 30 days ARO. What's more, we're the only streaming tape drive maker with manufacturing operations in the U.S. and Europe.

We'll help you overcome all your OEM anxieties. Especially the fear of bugs.

Contact Tandberg Data Inc. at 1590 S. Sinclair, Anaheim, CA 92806. (714) 978-6771.

TANDBERG DATA

CIRCLE NO. 38 ON INQUIRY CARD

ESDI JOINS INTERFACE RANKS

Established peripheral interface standards ST506/ST412 and SMD are holding their own, but latecomer ESDI is penetrating new application areas, particularly those with optical disks and varied peripherals

I. Dal Allan, ENDL

Two major developments of last year have significantly affected the disk-drive market. One is the integration of the small computer systems interface (SCSI) into disk drives and tape drives. The other is the emergence of the enhanced small device interface (ESDI) as an alternative to established interfaces, such as the ST506/ST412 and the storage module device (SMD).

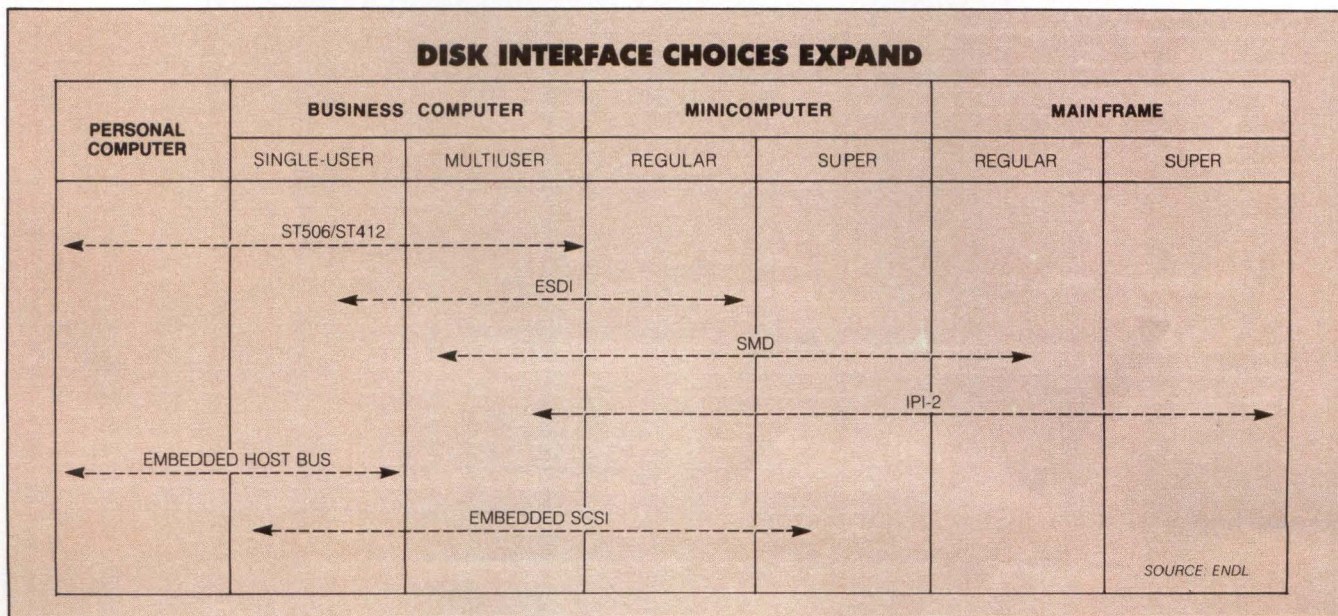
The majority of OEM disk drives are still sold for configurations in which there is one controller for each disk drive. An embedded SCSI drive is attractive here because the vendor has already addressed the system-integration problems of combining disk and controller.

SCSI, which is a host-level interface, has advantages over device interfaces because it provides buffered transfers, implicit error-correc-

tion/retry and a device-independent command set. These advantages don't imply, however, that device-level interfaces will disappear; only that new choices and decisions have to be made.

Despite the availability of new interfaces, "old" interfaces—specifically, SMD, ST506/ST412 and Pertec—dominate current shipments. This condition results from the usual two-year lag between a new product introduction and its volume shipments. Thus, system integrators must decide today which interfaces are going to dominate in the future.

Peripheral manufacturers face an equally difficult situation over the next few years as users upgrade to newer interfaces. Over the past several years, relatively little change took place in disk-drive interfaces: SMD and Pertec have endured as the mid- and high-range alternatives, while ST506/ST412 has dominated the low end.



But this situation will change dramatically because of user demands for higher performance and ease of use.

Peripheral vendors and OEMs must decide whether to incorporate new interfaces, controllers and software in new products or to try to continue using existing products.

ST506/ST412 remains the mainstay

First introduced on small, inexpensive Winchesters, the ST506/ST412 interface is migrating up the performance and capacity scales. As long as data-transfer rate is not critical, ST506/ST412 is suitable for most applications.

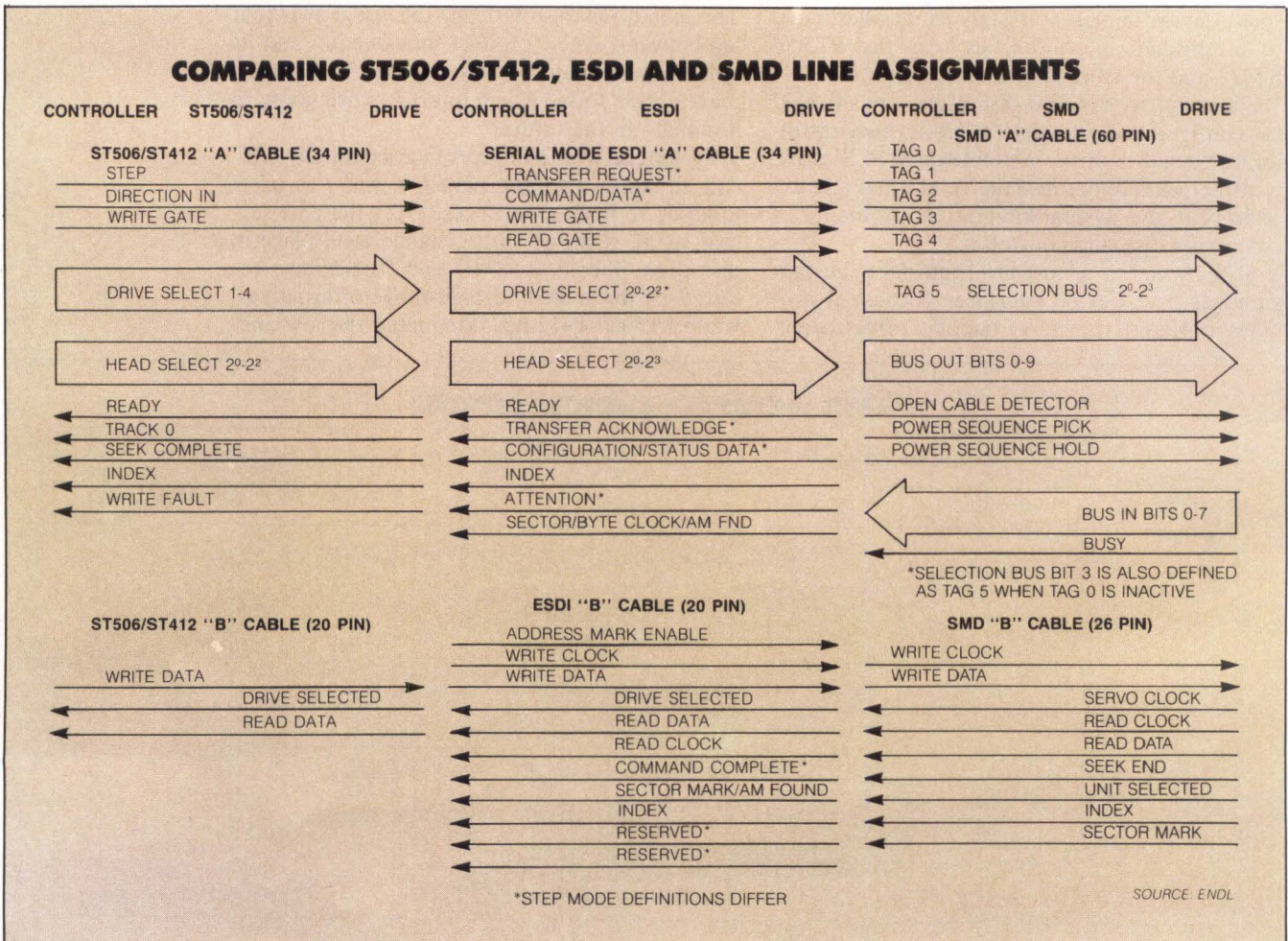
Several companies are shipping 85M-byte, ST412-based Winchesters, and Maxtor Corp. and Priam Corp. offer close-to-200M-byte drives with access speeds as fast as 20 msec. In many applications (especially UNIX-based), access time, actuator performance and rotational delay are more important than data-transfer rate. Unless the application calls for large block transfers, a data rate higher than the ST506/412's 5

MHz offers little performance improvement because of seek, latency and gap-processing times.

ST506/ST412 intermixes clock and data pulses to provide modified FM signals. Some controller manufacturers use run-length-limited (RLL) codes—such as 2,7—to increase bit density by 50 percent. However, the actual performance gain is influenced by a number of factors, such as the quality of the signals (only certain drives have sufficient margin to function with a 2,7 data separator) and increased susceptibility to defect errors. Thus, the effective capacity increase from a 50 percent improvement in bit density may be as low as 25 percent to 30 percent.

SMD serves high end

SMD has been extended with higher levels of functionality and faster data rates since it was first introduced in the early 1970s. Currently, extended versions are the HSMD and SMD-E, which typically deliver data-transfer rates of 2.4M and 3M bytes per second, respectively. To support a 3M-byte-per-second data rate, SMD-E



COMDEX/Winter helps you take the competitive edge—in sales, profits and new business.

COMDEX/Winter features the newest, most exciting products and technologies. Industry giants like IBM and AT&T, and start-up ventures exhibit products and services your customers will demand. See the latest in multi-user and embedded systems, artificial intelligence, electronic publishing, and more.

The first annual Software Business Conference, serving developers, publishers, and resellers of proprietary packaged software, links you to leading software industry figures. *The Software Business Conference is priced separately from COMDEX.*

The COMDEX Conference is still your #1 resource for new ideas in value adding, marketing and management techniques, market research, and positioning your products and business

for maximum growth and profitability.

Complete and return the attached coupon.

Presented by



THE
INTERFACE
GROUP, Inc.

Conference and Exposition Producers
300 First Avenue, Needham, MA 02194

COMDEX®/WINTER '86 SHOWS YOU HOW TO BEAT THE COMPETITION.



COMDEX/Winter '86

April 1-3, 1986
Los Angeles Convention Center
Los Angeles, California

- Send me information and registration forms for COMDEX/Winter '86 • April 1-3, 1986
Los Angeles Convention Center
- Send me information on the Software Business Conference.

Name _____

Title _____ Phone () _____

Company _____

Address _____

City _____ State _____ Zip _____

Complete and return immediately to COMDEX/Winter
Attendee Registration, 300 First Avenue, Needham, MA 02194.

©1986 The Interface Group, Inc.

INTERACTIVE ASYNC / FULL DUPLEX

Dial Up To 19.2 Kbps

The V.H.S. (Very High Speed) ADCoMM is more than just the fastest dial up modem available. It is also the first in a family that maximizes *functionality*... including an optional stat mux channel supporting both a CRT and printer at up to 9600 Bps each. You can prove it to yourself with ADCoMM's 14 day "try and buy" plan.

100% Error Protection
Data and Character Compression
Alternate Bell Compatible Mode
Long Haul/Satellite Operation
Voice Grade Dial Up/Lease
Network Diagnostics/Test
Autocall/Autoanswer
Fallback Mode



"Tell A Friend" Referral Program



ADCoMM 96/48
Advanced Communications
Modem/Multiplexer

Call your nearest distributor or call us directly
1-800-527-1169



Carterfone Communications Corporation (CCC)
A SUBSIDIARY OF CABLE & WIRELESS

1341 WEST MOCKINGBIRD LANE • SUITE 1100 WEST • DALLAS, TEXAS 75247

MADE IN U.S.A.

CIRCLE NO. 40 ON INQUIRY CARD

uses emitter-coupled-logic (ECL) drivers and receivers. Nevertheless, some SMD-E interfaces with ECL drivers and receivers function at 2.4M- or 3M-byte-per-second data rates. The use of SMD-E or HSMD does not guarantee specific data rates.

This confusion makes it difficult to reference a specific variation of SMD. Thus, it is necessary to include information about extended functions such as tags 4, 5 and 6—as well as data rate—to clarify which implementation is being described.

It takes a long time for new products to overtake an installed base, and this is true of interfaces as well as of devices. No interface is

likely to supersede SMD in the high-performance Winchester market until the 1990s.

Two device-interface alternatives to SMD exist. One, IPI-2, is a parallel-transfer interface that provides 10M bytes per second at a distance of up to 50 meters. This exceeds SMD's rated maximum of 3M bytes per second at 15 meters. Initial shipments of IPI-2-based products will begin this quarter, but widespread availability won't emerge until the year-end.

The other alternative to SMD is ESDI and volume shipments are beginning to flow from several drive manufacturers.

ESDI, a hybrid of ST506/ST412 and SMD,

Representative manufacturers of ESDI-based products

CONTROLLERS

Adaptec Inc.

580 Cottonwood Drive
Milpitas, Calif. 95035
(408) 964-8600
Circle 423

Adaptive Data Systems Inc.

2627 Pomona Blvd.
Pomona, Calif. 91768
(714) 594-5858
Circle 424

Ciprico Inc.

2955 Xenium Lane
Plymouth, Minn. 55441
(612) 559-2034
Circle 425

Data Technology Corp.

2775 Northwestern Parkway
Santa Clara, Calif. 95015
(408) 496-0434
Circle 426

Distributed Logic Corp.

1555 S. Sinclair St.
Anaheim, Calif. 92806
(714) 937-5700
Circle 427

Emulex/Persyst Corp.

3545 Harbor Blvd.
Costa Mesa, Calif. 92626
(714) 662-5600
Circle 428

Interphase

2929 Merrell Road
Dallas, Texas 75229
(214) 350-9000
Circle 429

MiniComputer Technology

696 E. Trimble Road
San Jose, Calif. 94303
(408) 942-1616
Circle 400

Motorola Inc.

3501 Bluestein Blvd.
Austin, Texas 78721
(512) 928-6141
Circle 430

Qualogy Inc.

3241 Lundy Ave.
San Jose, Calif. 95131
(408) 946-5800
Circle 401

SMS/OMTI

339 N. Bernardo Ave.
Mountain View, Calif. 94043
(415) 964-5700
Circle 431

Webster Computer Corp.

Suite 107
333 Cobalt Way
Sunnyvale, Calif. 94086
(408) 749-1089
Circle 432

Western Digital Corp.

2445 McCabe Way
Irvine, Calif. 92714
(714) 863-0102
Circle 433

Xebec

2221 Old Oakland Road
San Jose, Calif. 95131
(408) 263-4100
Circle 434

Xylogics Inc.

144 Middlesex Turnpike
Burlington, Mass. 01803
(617) 272-8140
Circle 402

Zetaco Inc.

6850 Shady Oak Road
Eden Prairie, Minn. 55344
(612) 941-9480
Circle 435

WINCHESTER DISK DRIVES

Control Data Corp.

8100 34th Ave. S.
Minneapolis, Minn. 55440
(612) 931-3131
Circle 436

Cybernex Corp.

6580 Via Del Oro
San Jose, Calif. 95119
(408) 224-8010
Circle 437

Fujitsu America Inc.

3055 Orchard Drive
San Jose, Calif. 95134
(408) 946-8777
Circle 403

Hitachi America Ltd.

Suite 100
950 Elm Ave.
San Bruno, Calif. 94066
(415) 872-1902
Circle 438

Maxtor Corp.

150 River Oaks Parkway
San Jose, Calif. 95134
(408) 942-1700
Circle 439

Micropolis Corp.

21123 Nordhoff St.
Chatsworth, Calif. 91311
(818) 709-3300
Circle 440

Mitsubishi Electronics America Inc.

991 Knox St.
Torrance, Calif. 90502
(213) 515-3993
Circle 441

Newbury Data Recording Ltd.

Hawthorne Road
Staines, Middlesex
TW8 3BJ, England
0784-61500
Circle 404

NEC Information Systems Inc.

1414 Massachusetts Ave.
Boxborough, Mass. 01719
(617) 264-8000
Circle 442

Nissei Sangyo America Ltd.

40 Washington St.
Wellesley, Mass. 02181
(617) 237-9643
Circle 443

Pertec Peripherals Corp.

9600 Irondale Ave.
Chatsworth, Calif. 91311
(818) 717-3323
Circle 405

Priam Corp.

20 W. Montague Expressway
San Jose, Calif. 95134
(408) 964-4600
Circle 444

Siemens Communications Systems Inc.

Memory Products Div.
5655 Lindero Canyon Road
Westlake Village, Calif. 91362
(818) 706-8872
Circle 445

Toshiba America Inc.

3910 Freedom Circle
Santa Clara, Calif. 95054
(408) 727-3939
Circle 446

OPTICAL DISK DRIVES

Information Storage Inc.

2768 Janitell Road
Colorado Springs, Colo. 80906
(303) 579-0460
Circle 447

Laserdrive Ltd.

1101 Space Park Drive
Santa Clara, Calif. 95054
(408) 727-8576
Circle 448

Optimem

435 Oakmead Parkway
Sunnyvale, Calif. 94086
(408) 737-7373
Circle 406

HALF-INCH TAPE DRIVES

Electronic Processors Inc.

1265 W. Dartmouth Ave.
Englewood, Colo. 80110
(303) 761-8540
Circle 449

Fujitsu America Inc.

3055 Orchard Drive
San Jose, Calif. 95134
(408) 946-8777
Circle 450

ESDI, a hybrid of ST506/ST412 and SMD, offers data separation and commands within the limitations imposed by the ST412 electrical and cable connections.

offers data separation and commands within the limitations imposed by the ST412 electrical and cable connections. The intent behind ESDI is to take advantage of the installed base of ST506/ST412 with an interface that combines the advantages of SMD with the electrical characteristics of ST412.

To understand the advantages and disadvantages of ESDI relative to ST506/ST412 and SMD, it's helpful to look at the control and data cables of each interface.

ST506 comes with a 34-pin control cable and a 20-pin data cable, which is radially connected. However, relatively few pins are actually used by ST506. ST506 performance is limited by the speed of the step function; so buffered stepping has been added with the ST412, thereby enhancing performance with linear voice-coil disk drives.

SMD, on the other hand, uses a 60-pin control cable and a 26-pin data cable, radially connected. It has a BUS OUT of 10 bits, which are used for addressing cylinders and tracks (under different tags), and an 8-bit BUS IN for reporting status. The tags are used as control lines to indicate the contents of the bus.

ESDI uses more of the available lines than does ST412 to add data separation and tighter control. The interface transfers 16 bits of commands and status serially (including parity).

The biggest advantage ESDI has over ST412 is not that of throughput performance or capacity but of drive yields and data integrity. ESDI gives drive manufacturers greater control over the quality of the read/write chain. This advantage comes at a slight cost, though, because in a multiple-drive configuration, each drive includes a data separator, whereas only one would be needed if it were contained in the controller. However, the extra cost is compensated by improved ease of use.

ESDI provides rotational-position information on the control and data cables in the same manner as does SMD. A high-performance controller can monitor each radial cable for position while still serving another drive. In this way, the controller can select the drive that has the requested data in the shortest possible time.

Three variations of ESDI are employed: One uses a byte-clock scheme similar to that of ST412, in which a missing clock pulse signals that a sector has been located; another uses a soft-sectored approach with address marks; and the third is hard-sectored, in which the drive provides a pulse at the beginning of each sector. The dominant implementation of ESDI is expected to be the hard-sectored version because the byte-clock scheme is not suited to high-performance

applications, and address marks are not popular among users of the SMD interface.

Can ESDI overcome?

The question is whether ESDI will meet with widespread acceptance. Despite its increasing use, there is no obvious answer yet. Many of those who were zealots two years ago, when ESDI first came out, have become disenchanted with the long wait. Those who have invested money in the interface, however, are still enthusiastic.

Some system integrators who chose ESDI two years ago have switched to alternative interfaces for lack of requisite drives. Those who committed themselves to a design conceived around the 5¼-inch form factor were forced to remain with ST412 in its higher capacity versions. Others were forced to change the form factor of their product and incorporate an 8-inch SMD drive.

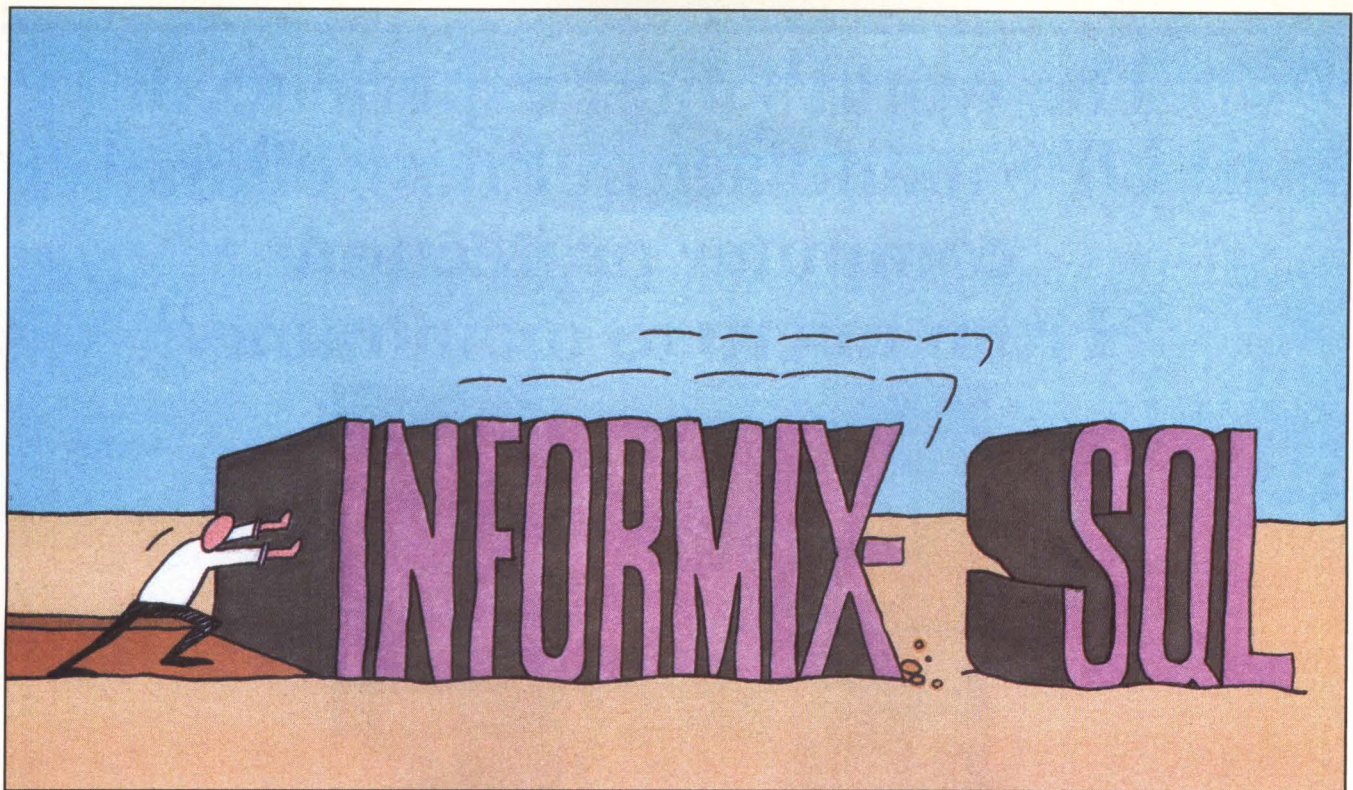
ESDI is the first interface to be implemented by controller manufacturers before the associated drives were available. Initial drive shipments were planned for mid-1984, but it was not until the third quarter of 1985 that units began to appear from multiple suppliers in evaluation quantities.

ESDI tape drives, on the other hand, are available in quantity and provide the ability to implement a disk/tape subsystem with a controller that has only one interface to support. This availability opens up applications for tape backup to disk and movement of data external to the host. It also reduces the cost of the controller because only one logic set is required for the interface, rather than two completely different ones, as required with SMD and Pertec interfaces.

Another peripheral incorporating ESDI is the 5¼-inch optical disk drive. Optical technology is extremely attractive because it offers the combination of high capacity and removability. The first-generation products use write-once technology, commonly referred to as write once, read many, or WORM (MMS, December 1985, Page 68). These WORM drives range in capacity from 100M to 800M bytes and use single-platter, removable cartridges.

ESDI was originally intended for one-controller/one-drive configurations, but embedded SCSI is easier to integrate in that environment. On the other hand, ESDI will succeed in configurations in which there are multiple drives or a mix of peripherals.

There is a large demand for ESDI but not necessarily for use with magnetic disks. A variety of ESDI peripherals other than disk drives are available or planned in the 5¼-inch form factor,



How we improved Structured Query Language.

system. It's built into all our products, but you can buy it separately.

And when you choose RDS, you'll be in the company of some other good companies. Computer manufacturers including AT&T, Northern

Actually, we didn't change a thing.

We just combined it with the best relational database management system.

Introducing INFORMIX®-SQL.

It runs on either MS™-DOS or UNIX™ operating systems. And now with IBM's SQL as part of the program, you can ask more of your database. Using the emerging industry-standard query language.

To make your job easier, INFORMIX-SQL comes with the most complete set of application building tools. Including a full report writer and screen generator. Plus a family of companion products that all work together.

Like our embedded SQLs for C and COBOL. So you can easily link your programs with ours. File-it!™ our easy-to-use file manager. And C-ISAM™, the de facto standard ISAM for the UNIX operating

Telecom, Altos and over 60 others. And major corporations like Anheuser Busch and The First National Bank of Chicago.

Which makes sense. After all, only RDS offers a family of products that work so well together. As well as with so many industry standards.

So call us for a demo, a manual and a copy of our Independent Software Vendor Catalog. Software vendors be sure to ask about our new "Hooks" software integration program. Our number: 415/322-4100.

Or write RDS, 4100 Bohannon Drive, Menlo Park, CA 94025.

And we'll show you how we took a good idea and made it better.



RELATIONAL DATABASE SYSTEMS, INC.

INFORMIX is a registered trademark and RDS, C-ISAM and File-it! are trademarks of Relational Database Systems, Inc. IBM, UNIX and MS are trademarks of International Business Machines Corporation, AT&T and Microsoft, respectively. © 1985, Relational Database Systems, Inc.

The world's most experienced UPS manufacturer now offers computer protection "From micro to mainframe."

Emerson Electric Co. is the most recognized name in UPS both in the U.S.A. and worldwide. With the largest base of installed systems in the world, Emerson has maintained a consistent sales leadership position for over 20 years.

The critical need for *Uninterruptible Power* has now extended down from the mainframe computer into office, mini, and now micro applications.

Emerson has responded to this need by introducing an array of new products to cover all critical power requirements.

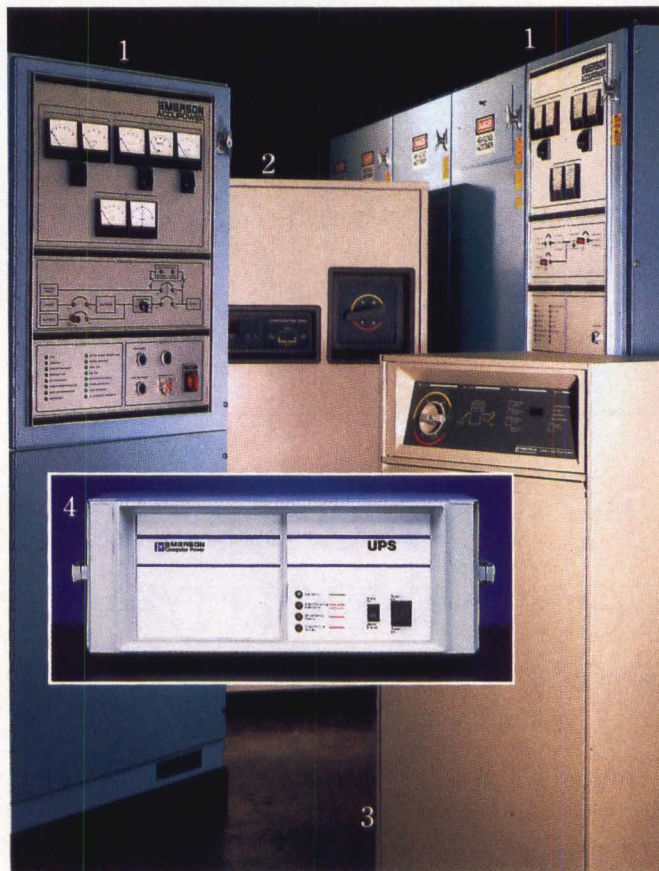
All the products meet Emerson's high standards for quality, reliability, low price, and user-friendly benefits. Such as power monitoring status and simple start-up controls.

AP500 Series (Mainframe)¹

From 50 kva modules up to 4000 kva systems, Emerson's 500 Series systems provide *Uninterruptible Power* for many major DP sites and critical load needs throughout the world.

AP300 Series (Minis)²

These new 15 & 30 kva three phase systems with



From 200 VA all the way up to 4000 KVA

self-contained batteries bring quiet, convenient utility power into the DP room environment at lower costs than ever. The 15 kva provides *full* UPS for IBM System 38 users.

AP100 Series (Minis)³

With single phase ratings of 3, 5, & 10 kva, the new AP100 Series brings a complete UPS into the office environment to cover a wide number of mini systems requirements. It's quiet, has full monitoring functions, and

can meet many power distribution needs. It's a *full* UPS for IBM System 34 and 36 users.

AP1000 Series (Micro)⁴

Emerson's newest addition provides micro and personal computer protection from 1500 watts down to 200 watts. And, it's backed by Emerson's history of quality and experience.

For more information on the most complete line of UPS systems available, call 1-800-BACKUPS.

Emerson Electric Company, Industrial Controls Division, 3300 South Standard Street, Santa Ana, California 92702, (714) 545-5581 Telex 67-8460



The World Leader in Uninterruptible Power Systems and Service

© 1985, Emerson Electric Co.

CIRCLE NO. 42 ON INQUIRY CARD

including tapes (Electronic Processors Inc. and Fujitsu Ltd. are shipping ESDI-based tape drives) and optical disks (such as those from Information Storage Inc. and Optimum).

Peripheral families that use the same interface appeal to system integrators. But multifunction controllers must be developed to save money and thus spur significant market response. A combination of high-performance Winchester and high-capacity optical disks via a single controller (with a SCSI, Multibus or VMEbus) is particularly attractive because it marries the advantages of removability with the performance of Winchester. Similar advantages may also be gained from packaging ESDI tape drives with Winchester.

Erasable optical disks are "just around the corner" with evaluation shipments due this year. They too will adopt the 5¼-inch form factor and will also use ESDI. The configuration capability of ESDI, which permits peripherals to automatically identify their specific characteristics, is one of ESDI's key features.

Controller manufacturers are committed to ESDI and are enthusiastically marketing it as much as are the disk manufacturers. But the real

market demand for ESDI will become clear only after drive shipments appear in volume.

In the meantime, SMD has captured the market in those systems that could not wait for ESDI, and ST412 drives with expanded capacity and performance are attracting customers who are reluctant to adopt new interfaces.

ST412 has an edge over ESDI because it has a larger installed base of drives and controllers. However, ST412 does not offer data separation or automatic configuration, which are important to drive and controller manufacturers.

The advantage of SMD for systems is that it provides compatibility with current host-bus adapters and existing software implementations. On the other hand, ESDI has an advantage over SMD in that it is a general-purpose interface suitable for a number of applications. ESDI permits controllers to support a mixed environment of removable optical disks, fixed magnetic disks and removable magnetic tape. The "mix 'n match" capabilities will prove attractive to OEMs and system integrators.

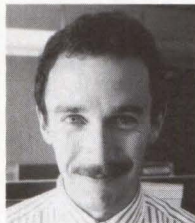
I. Dal Allan, the founder of ENDL, is the publisher of the *ENDL Letter*, which specializes in marketing and engineering consultation on interfaces and system architectures. He has been with IBM Corp., Sperry Corp. and Priam Corp. Allan is also vice chairman of ANSI Committee X3T9.3, which is responsible for the intelligent peripheral interface, and is the editor of the ESDI optical disk interface specification.

Interest Quotient (Circle One)
High 460 Medium 461 Low 462

Concurrent™ PC DOS Works For These People



"PhoneXpress™, our voice messaging product, needs the powerful multi-tasking environment that Concurrent PC DOS offers. Also, our programmers love it, they can be compiling in one window and switch into an editor which increases productivity."
Dennis King
Executive Vice President, Founder Applied Voice Technology



"The file manager is great. It's a step above the old DOS system. You don't have to remember commands and you don't have to read the manual."
John Martinson
Engineer Pacific Gas Transmission



"Concurrent PC DOS gives us the capability to attach additional terminals for a more productive office. It has a true multi-user capacity. We can now meet deadlines."
Richard Vananda
Principal Patrick Sullivan Associates, Architects



"I couldn't live without the product. Time is money and the ability to switch consoles and run more than one program has been a great time saver."
Joe Capp
Project Engineer Union Carbide



"We have created a menu driven system that is totally transparent to our customers. By utilizing the menu system and 4 consoles concurrently we are able to fully utilize Concurrent PC DOS"
Subhasb Chabda
MIS Director Secoin Inc.

Make It Work For You!

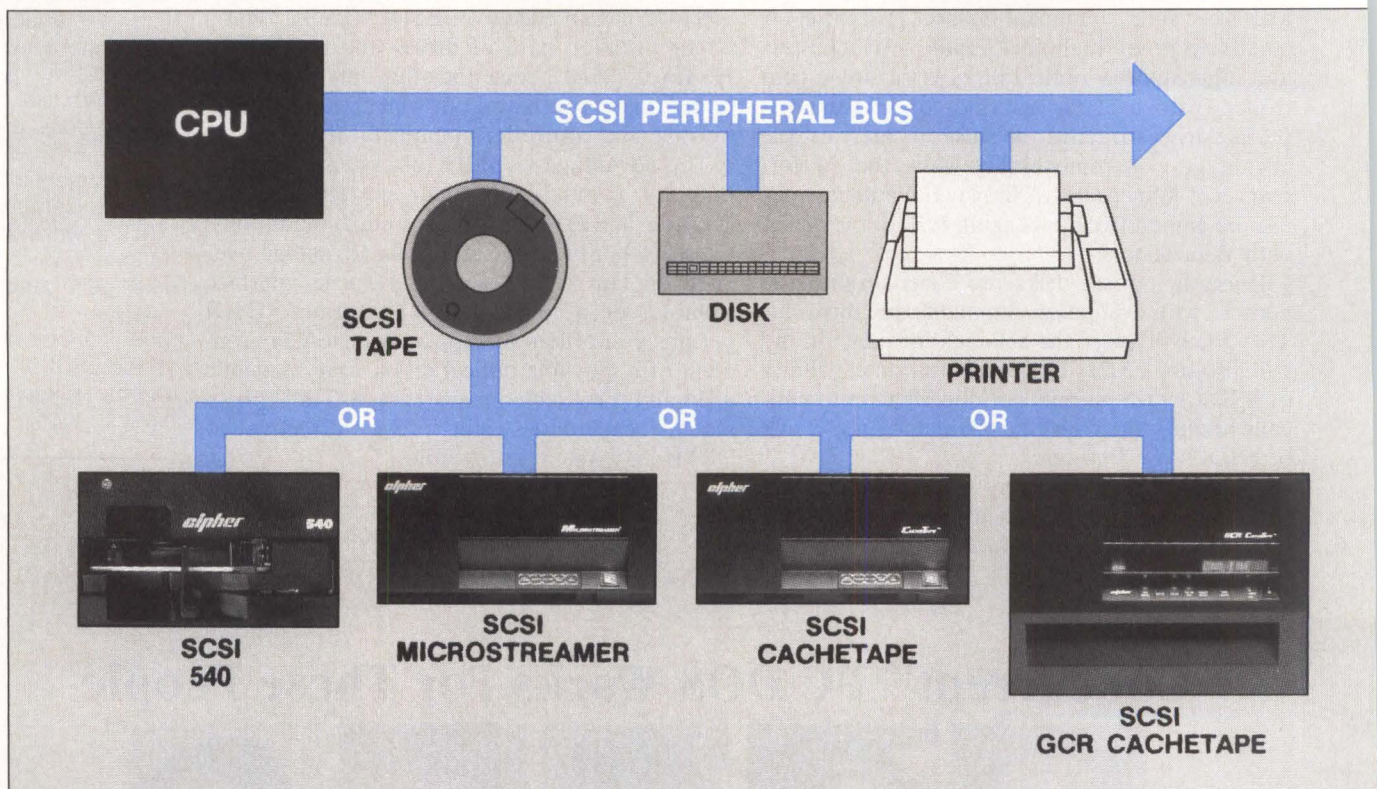
Call (800) 443-4200 for the dealer or sales representative nearest you.

Concurrent PC DOS is a trademark and Digital Research is a registered trademark of Digital Research Inc. PhoneXpress is a trademark of Applied Voice Technology.



CIRCLE NO. 43 ON INQUIRY CARD

The Cipher



Cipher announces SCSI-compatible 1/2-inch tape peripherals.

SCSI, known as the new standard interface for small, low-end computer systems, is also gaining ground in the high-performance market. With the continuing delay in the development of the Intelligent Peripherals Interface (IPI) for disks, SCSI has found its way into larger systems as well.

Cipher has taken the lead in bringing a full line of easy-to-integrate tape drives to this emerging marketplace. In addition to the 540S 1/4-inch streamer, three 1/2-inch products, the Microstreamer[®], CacheTape[®] and GCR CacheTape[®], are also available in SCSI-compatible versions.

SCSI enables integrators to use a single hardware interface, regardless of which drives are being used.

Cipher's SCSI option is a full implementation of the interface specifications being reviewed by ANSI. It offers all of the standard features found with most intelligent interfaces, plus ANSI-supported bus arbitration, disconnect/reconnect and copy command. Multiple initiator and multiple target features to improve tape management and backup efficiency are also included.

Cipher engineers can provide expertise to help you integrate tape drives into SCSI systems. For more information call 1-800-4-CIPHER, ext. 9.

Nixdorf cuts tape integration costs with CacheTape.

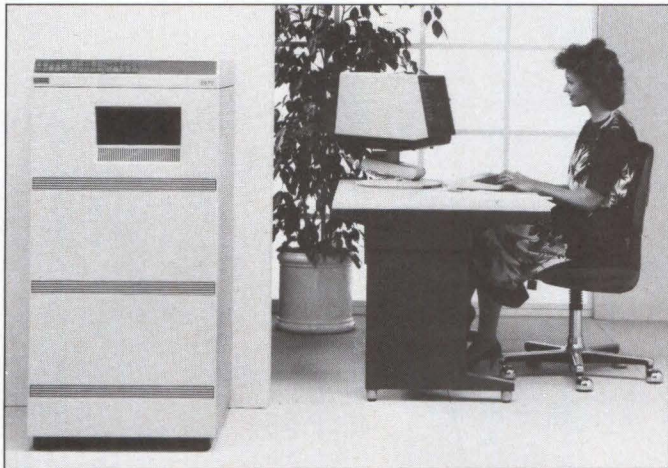
When Nixdorf Computer AG needed a new tape drive for their System 8850[™], their first choice was Cipher's Microstreamer. "It offered both streaming and 25 ips

Files.

Number 1 in a series
for OEMs and System
Integrators.

cipher
data products, inc.

10101 Old Grove Road
P.O. Box 85170
San Diego, CA 92138



start-stop capability at a lower cost than the standard 25 ips drive we were using," said Rainer Muhlenweg, director of OEM product selection.

However, rather than spend time changing software to integrate the Microstreamer, Nixdorf found that Cipher's CacheTape could be integrated immediately, without modification.

"The intelligent cache memory enabled the drive's performance to be matched to that of the computer by managing the differences internally," said Muhlenweg. "And the additional cost of the cache memory was insignificant, compared to what the integration costs would have been without it."

As for the Microstreamer, Nixdorf will be using it in three other systems whose software already allows streaming.

Cipher introduces mainframe-to-PC connection.

If you have an IBM PC®, XT® or AT® you can now access 9-track tape. Just insert the tape into any Cipher Series 9000 ½-inch Tape Subsystem.™ From there, you can upload and download data directly with your PC.

These subsystems act as low-cost, transportable links to large computers and tape libraries. They allow you to freely access and manipulate data, without accessing the mainframe.

Because they are tape devices, there are no expensive data communication costs, or the physical restrictions of micro-to-mainframe networking.

If you'd like to access 9-track tape with your PC, call 1-800-4-CIPHER, ext. 9.



CacheTape: The streamer for systems that can't stream.

Adding a streamer to systems that can't stream leaves integrators with a difficult choice. They can modify the software to fit the streamer. Or they can keep the software the same and sacrifice streaming performance.

Cipher's CacheTape® solves both problems. It gives you three to four times the performance of traditional streamers, and it works with existing start-stop software. And it's only 40% of the price of traditional start-stop drives.

To learn why CacheTape is the streamer that makes sense in systems that can't stream call 1-800-4-CIPHER, ext. 9.

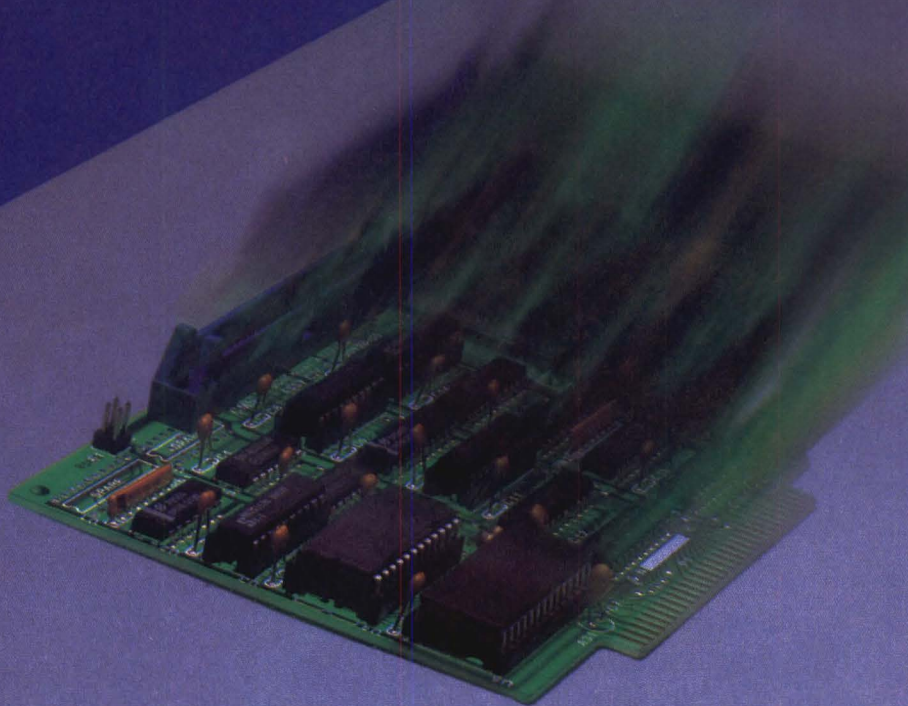
Microstreamer, CacheTape and GCR CacheTape are registered trademarks of Cipher Data Products, Inc. The Series 9000 is a trademark of Cipher Data Products, Inc. System 8850 is a mark of Nixdorf Computer AG. IBM PC, XT and AT are registered trademarks of IBM.

CIRCLE NO. 44 ON INQUIRY CARD

SCSI PERFORMANCE

The CMS SCSI PC Host Adapter multiplies the throughput of your PC or compatible.

- 10 Mbit/sec transfer rate
- SCSI removes as much as 50% of the processing load from your central processor, substantially improving overall system performance.



Best Price • Best Performance

401 W. Dyer Road, Santa Ana, CA 92707 (714) 549-9111

CIRCLE NO. 45 ON INQUIRY CARD

SUPER-SCSI CONTROLLERS BOOST I/O PERFORMANCE

Need fast access to mass-storage devices for multiuser/multitasking computer systems? Consider controllers with bus disconnect/reconnect, command chaining and queuing capabilities

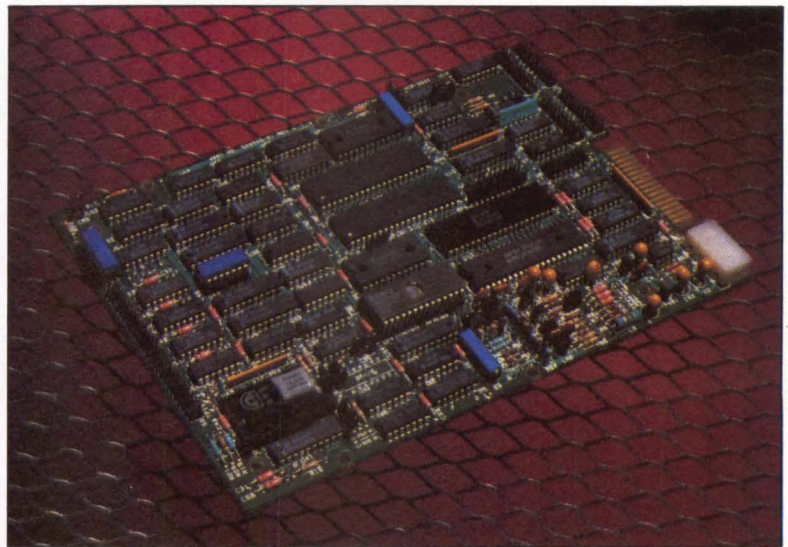
Jeffrey Fisher, Adaptec Inc.

The trend toward multiuser, multitasking computer systems requires system integrators to maximize the I/O performance of mass-storage rigid disk and tape-backup devices. Many single-tasking systems use the small computer systems interface to connect storage peripherals to the host computer bus and to reduce the execution time of I/O tasks.

The SCSI I/O subsystem employs a host-adaptor card, which provides an electrical interface and communications channel between the host CPU bus and the SCSI bus. Each host adapter can be daisy-chained to as many as seven intelligent peripheral controllers, each connecting one or more peripherals. Unfortunately, the basic SCSI interface implementation falls short in multiuser/multitasking environments.

For starters, a basic SCSI system queues all I/O requests one behind the other to be handled on a first-in, first-out basis. But this approach means that, if two users attempt to access two different disk drives, the second user must wait for the first user's task to finish before gaining access to the desired disk.

Because all I/O tasks must be executed serially, this situation creates a serious I/O bottleneck. In fact, most of the time a computer system spends in handling disk I/O involves physical movement—moving and positioning the read/write head over the appropriate rigid disk cylinder and track. And I/O performance is even more adversely affected when the SCSI bus also serves a tape subsystem. In this case, a user calling for rigid disk access must wait while another user is requesting a file to be read from a



slower tape drive.

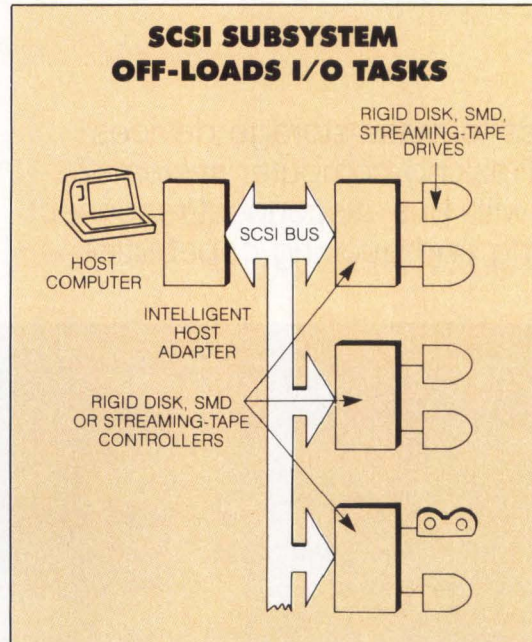
Meeting the performance demands of multiuser, multitasking systems has traditionally forced system integrators to specify costly, dedicated-bus peripheral controllers or design a proprietary controller. However, designing dedicated peripheral controllers can be a difficult task that requires expertise in digital and analog hardware as well as experience in multitasking microprogramming. And limited product availability or insufficient internal redesign effort could limit adaptation to changing peripheral technology.

In contrast, a multithread super-SCSI intelligent rigid disk controller, such as Adaptec Inc.'s ACB-5500, overcomes I/O bottlenecks by providing true concurrent I/O processing for multi-

Super-SCSI controllers reduce the execution time of I/O tasks including storage for multiuser, multitasking computer systems.

ple disks in multiuser, multitasking computer systems. To handle multiple I/O requests simultaneously, without burdening the host computer or reducing system performance, it uses bus disconnect/reconnect, command chaining with relative addressing, command queuing and bus arbitration capabilities. Although listed in the SCSI specification, these features are not implemented by single-tasking controllers.

The SCSI I/O subsystem comprises an intelligent host-computer adapter that off-loads I/O housekeeping operations from the CPU and connects the computer to the SCSI bus and to as many as seven rigid disk, streaming-tape or storage module device controllers.



To evaluate the advantages of a super-SCSI controller in a multitasking environment, consider what is involved in a typical I/O task. For example, reading two physically separated 512-byte sectors from a disk involves three basic delays: host computer and adapter processing, controller processing and disk seek and latency.

The disk seek is the longest task of the three. It ranges from an average of 30 msec for a high-speed, voice-coil positioning mechanism to 85 msec for a slower stepper-motor actuator. Taking all delays into account, the time a disk spends during a read operation extends from about 40 to 100 msec. And this delay can be multiplied by operating systems, such as UNIX, that maximize disk usage by physically scattering files over the disk.

Conventional SCSI controllers execute these operations serially, leaving the bus inactive during disk seeks. Although these single-tasking controllers allow for overlapped disk seeks, the host computer must poll the seeking drives to determine which completes the seek first. The computer must then issue a second command to access the data from the appropriate drive. The

result is slightly higher I/O performance but at the cost of valuable CPU time.

Super-SCSI disk controllers, on the other hand, provide for true concurrent I/O operations without host-computer overhead. Using the disconnect/reconnect function, they can disconnect from the SCSI bus during a disk seek, freeing the bus to transfer additional I/O requests to available peripherals. The controller reconnects to the host computer after the seek is completed and transfers data and/or indicates completion of the task. Although bus disconnection typically takes place during disk seeks, it also occurs during functions that don't utilize the SCSI bus, such as disk formatting, or verification.

A priority arbitration scheme resolves bus-contention problems that could occur, for exam-

Overlapped

Overlapped seek, as implemented by super-SCSI controllers, significantly shortens the delays involved in reading data from two rigid disk drives. Both overlapped and non-overlapped operations follow the same basic steps. The host computer's DOS passes an I/O request from an application program to the computer's basic input/output system. The BIOS generates a SCSI command block and passes it to the host adapter (1). The host adapter obtains the SCSI bus and transfers the command block to the disk or tape controller (2). The controller interprets the SCSI Read command and initiates the drive's seek (3). The disk seeks to the appropriate cylinder and the controller searches for the requested 512-byte sector (4). The controller transfers the requested sector through a dual-ported buffer and indicates completion of the task to the host computer (5). The host adapter passes a data pointer to the BIOS, which passes it to the DOS. The data is now available to the application program.

With non-overlapped seeks, the 512-byte read from drive B (and drive B's seek) must wait for the completion of the read from drive A. With overlapped seeks, however, a super-SCSI controller disconnects from the bus—freeing it for further activity—after it initiates drive A's seek. With the bus free, the host adapter can then pass on the second I/O request to read a 512-byte block of data from drive B. The controller can thus initiate drive B's seek milliseconds after drive A's seek.

ple, when a host computer attempts to initiate a command and a controller simultaneously attempts to reconnect to the bus. Each device connected to the bus is identified with a bus address of zero to seven. The device requesting the bus with the highest number gets access first.

A controller's ability to execute a string of disk requests without host-computer intervention improves multitasking performance. Super-SCSI's command-linking feature enables an application program to generate a series of commands for the controller to execute. The controller immediately executes each linked command as the preceding one is completed with neither bus-arbitration nor SCSI device-selection overhead.

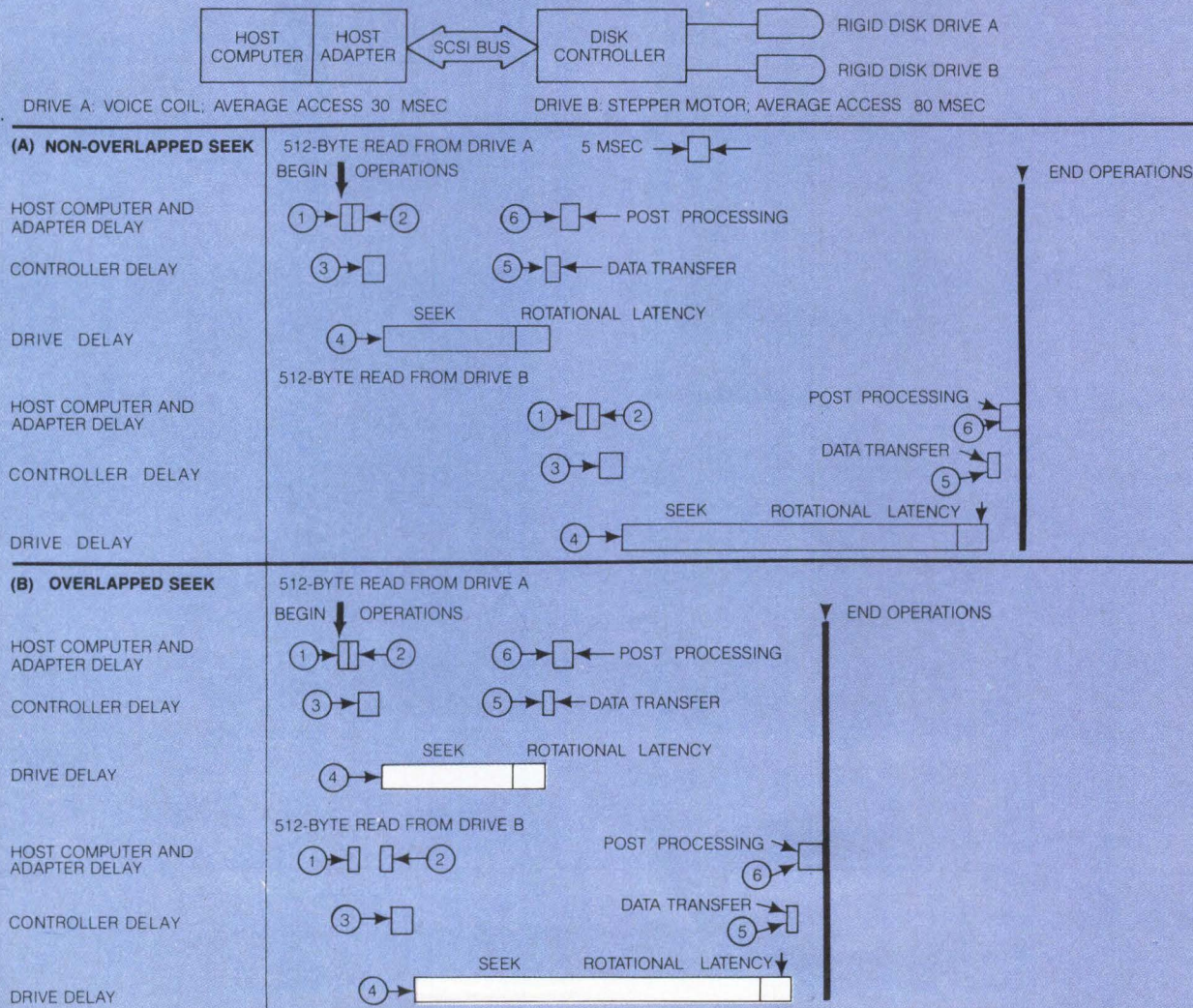
Command linking also allows system integrators to use relative addressing between com-

mands. Although the first operation of a series must address an absolute logical address in memory, all further linked operations can access logical blocks with addresses relative to the last block accessed.

The operating system can assure the integrity of protected areas of a disk by preceding a list of commands with a Set Limits command, indicating restricted areas on the disk. Any attempt to access the restricted areas causes the controller to terminate the command sequence and report an error to the host computer.

In addition to speeding I/O handling for memory access, a super-SCSI disk controller also furnishes significant advantages in backing up rigid disk files. Many users of multiuser computer systems are dissatisfied with conventional

seek reduces data-transfer delays



Super-SCSI capabilities ease rigid disk backup

The disconnect/reconnect and command linking capabilities of the super small computer systems interface controller speed the backup of scattered 8K-byte data from a rigid disk onto a streaming-tape drive. When the rigid disk controller disconnects from the SCSI bus after command processing, it frees the bus for further activity. This allows the streaming-tape controller to begin execution of the first 8K-byte write

to the streaming-tape-controller buffer after the controller completes the transfer of the first 8K-byte read.

Command linking permits a super-SCSI controller to automatically execute a series of commands—in this case 8K-byte reads from the rigid disk—without bus arbitration and without incurring SCSI bus selection overhead between commands.

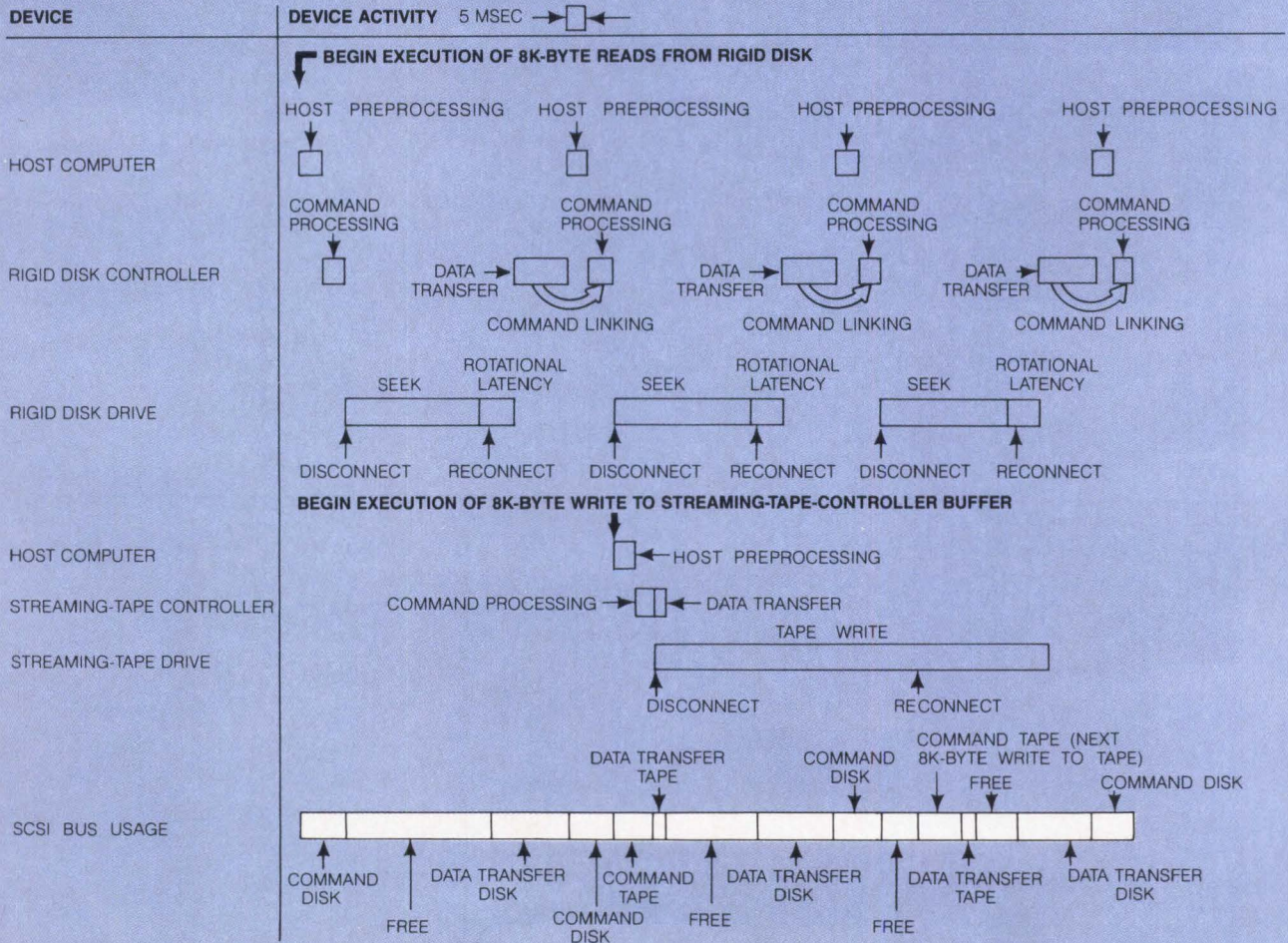
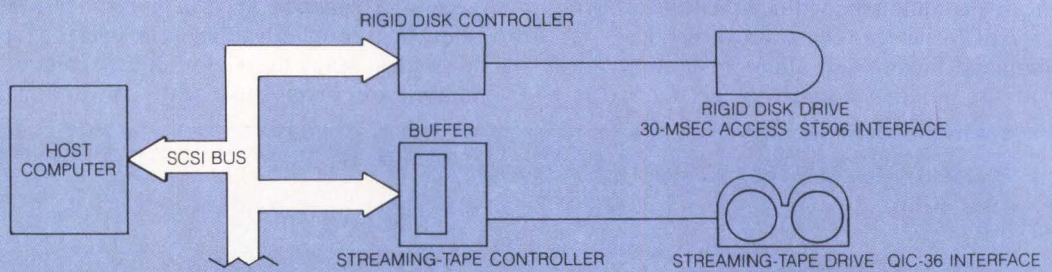


image backup of whole disks onto tape. They want to be able to back up individual files on transportable media. But because file backups may be required during peak system usage, execution time is critical for overall system performance.

Super-SCSI bus' disconnect/reconnect and command-chaining capabilities allow rigid disk backups to quarter-inch, cartridge-tape drives to be performed with little effect on overall system performance. Adaptec's disk controller and streaming-tape controller use linked reads of 8K blocks to implement the backup of a 100K-byte file scattered over a disk. The data is then written to the tape-controller buffer, which begins writing to the tape immediately and disconnects from the bus after the 8K transfer is completed.

While the controller is disconnected from the SCSI bus, the host computer has approximately 60 msec to read the next 8K bytes of file data before the disk controller reconnects to the bus to request additional data. After 12 such operations, the scattered 100K-byte file is stored contiguously on the streaming tape.

Multiple host computers connected to super-SCSI disk controllers can fully utilize bus band-

Spec summary

- **Manufacturer:** Adaptec Inc., 580 Cottonwood Drive, Milpitas, Calif., 95035 (408) 946-8600
- **Model:** ACB-5500 rigid disk controller
- **Host interface:** super-SCSI
- **Disk interface:** ST506
- **Disk data transfer rate:** 5M bits per second (bps).

- **Model:** ACB-5580 storage module device controller
- **Host interface:** super-SCSI
- **Disk interface:** storage module device
- **Disk data transfer rate:** 9.6M bps to 10.2M bps
- **Drives supported:** hard or soft sectored, fixed or removable, up to 16 read/write heads, up to 2,048 cylinders
- **Disks supported:** four
- **Block size:** 256, 512 or 1,024 bytes
- **Minimum sector interleave:** 1:1
- **Defect handling:** disk defects skipped on sector level

width in multiuser, multitasking systems. But multiple CPUs can compromise data security and cause device contention problems. Super-SCSI controllers minimize these problems through reserve/release and command-queuing capabilities.

The reserve/release function permits a com-

Why super-SCSI?

The small computer systems interface is derived from the Shugart Associates system interface (SASI). The SCSI interface is based on the concept of device independence, allowing system integrators to develop hardware and I/O software capable of running with "off-the-shelf" controllers and any type of peripheral. Device independence is achieved via logical block addressing and mode select, mode-sense and read-capacity commands.

Logical block addressing eliminates the need for the host computer to determine the data's physical location by dividing every storage device into disk sectors, each with a logical address starting at zero and incrementing to the last available block.

The mode-select command makes the host computer independent of attached peripherals by eliminating the necessity of configuring the peripheral controller at power-on. Transferring this command and disk-drive parameters before formatting the device causes these parameters to be recorded on the peripheral. The controller is then able to configure from the attached devices at power-on.

The read-capacity command permits the host computer to determine the maximum available block address and the last logical block of each cylinder. The latter information is useful in optimizing disk accesses

by sorting I/O requests by cylinder location.

Super-SCSI controllers provide a more complete implementation than SCSI devices of the ANSI X3T9.2 SCSI specification by furnishing bus arbitration and bus disconnect/reconnect features. Not supported by SCSI controllers, these capabilities allow super-SCSI controllers to execute multiple I/O tasks simultaneously and permit host computers to share peripherals.

The intelligent peripheral interface (IPI) is evolving to challenge the super-SCSI interface in high-performance minicomputer and supermicrocomputer applications. A standard mainframe I/O channel interface for IBM Corp. plug-compatible devices, it is being redefined by an industry working group for minicomputer and microcomputer systems. But as it now stands, IPI only offers 30 percent to 40 percent bus utilization (bandwidth) for I/O data compared with SCSI's 70 percent. And when data is scattered over disks, the interface's specified 3M-byte synchronous bus bandwidth is severely reduced.

The IPI supports only a single master host computer, multiple slave configuration—although multitasking can be supported by overlapping operations on more than one slave peripheral. In addition, the interface is expensive to implement due to the special I/O driver hardware and shielded cable required.

A controller's ability to execute a string of disk requests without host-computer intervention improves multitasking performance.

puter to reserve a group of logical blocks on attached peripherals, preventing another computer from reading from or writing to these blocks of data. Device contention is prevented by queued commands. In SCSI systems, a computer must continue to poll a busy peripheral until it determines that it is free to execute a task. Super-SCSI controllers and intelligent host adapters, in contrast, eliminate polling by accepting and queuing commands from multiple hosts to busy peripherals. The controllers disconnect from the bus and reconnect only when additional data is required.

Specifically, super-SCSI systems handle multiple overlapped I/O operations in the following manner. When a system computer generates I/O requests for access to peripherals, the requests are placed in the system memory allocated to the host adapter, freeing the multitasking CPU to perform other tasks. An interrupt from the super-SCSI host adapter indicates that requested data has been transferred into, or out of, memory. The controller manages all conversions from logical data blocks to physical locations on the attached peripherals.

As computers and disk drives increase in performance, I/O requests generated by multi-user, multitasking systems will require the full bandwidth of the SCSI bus: 1.5M bytes per second. Although systems capable of this level of performance will probably not become available for two to four years, the SCSI bus specification already contains the mechanism to enhance SCSI bus performance. Synchronous bus transfers will enable super-SCSI controllers to implement data transfers over the bus to 4M bytes per second, thus meeting the demands of the next generation of multiuser computer systems. □

Jeffrey Fisher is SCSI product manager at Adaptec Inc., Milpitas, Calif. He has a bachelor of science degree in electrical engineering from Purdue University and a master of business administration degree from the University of Santa Clara.

Interest Quotient (Circle One)
High 463 Medium 464 Low 465

TERMINALS FROM TRANSNET

PURCHASE PLAN • 12-24 MONTH FULL OWNERSHIP PLAN • 36 MONTH LEASE PLAN

	Description	Purchase Price	Per Month		
			12 Mos.	24 Mos.	36 Mos.
DEC	LA50 Personal Printer	\$ 599	\$ 58	\$ 32	\$ 22
	LA210 Letter Printer	1,299	125	70	47
	LA120 DECwriter III KSR	2,195	211	117	79
	VT220 Video Terminal	849	83	46	31
	VT240 Graphics Terminal	1,850	178	99	67
TI	VT241 Color Graphics Terminal	2,650	255	142	95
	LN03 Laser Printer	3,295	316	176	119
	TI707 Portable Data Terminal	\$ 550	\$ 53	\$ 30	\$ 20
	TI820 Data Terminal PKG KSR	1,995	192	107	72
	TI855 Dual Mode Printer	649	63	35	23
WYSE	TI865 Dual Mode Microprinter	810	78	43	29
	WY50 Video Terminal	\$ 459	\$ 44	\$ 25	\$ 17
	WY75 Video Terminal	559	56	30	20
PANASONIC	WY85 Video Terminal	559	56	30	20
	FT70 Executive Partner PC with 640K RAM	\$2,395	\$229	\$128	\$ 87
NORTHERN TELECOM	NT6K90 Displayphone Plus	\$ 995	\$ 97	\$ 54	\$ 37
	CIT-220 + Video Terminal	\$ 775	\$ 75	\$ 42	\$ 28
CITON & CIE	CI-300 Matrix Line Printer	4,045	388	216	146
	CI-3500 Serial Printer	1,550	149	83	56

WE CARRY A FULL LINE OF POPULAR PRINTERS, COMPUTERS, SOFTWARE, ACCESSORIES AND SUPPLIES AT COMPETITIVE PRICES.

FULL OWNERSHIP AFTER 12 OR 24 MONTHS — 10% PURCHASE OPTION AFTER 36 MONTHS

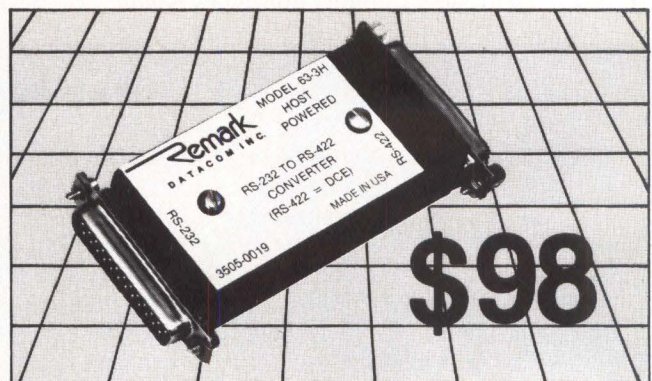


TRANSNET CORPORATION

1945 ROUTE 22 • UNION, NJ 07083 • 201-688-7800
OUTSIDE NJ - 800-526-4965

Offices in Philadelphia — 215-592-4247
New York City — 212-714-0233

CIRCLE NO. 46 ON INQUIRY CARD



RS-422 CONVERTER TO/FROM RS-232

- Up to 100 kilobaud at 4000 feet
- Up to 3 miles at 1200 baud
- Supports eight signals
- Doubles as a high speed short haul modem
- All handshake signals and clock
- Write or call to order or for more information

TELEBYTE

A PUBLIC COMPANY

Remark Division • Telebyte Technology, Inc. • 270 E. Pulaski Rd.
Greenlawn, NY 11740 • (516) 423-3232 800-835-3298

CIRCLE NO. 47 ON INQUIRY CARD

What do these popular micro printers have in common?

Access
Apple
Atari
Burroughs
C.Itoh
Commodore
Coleco
CPT
Cromemco
Digital
Epson
Hewlett Packard
IBM
Integral Data
Leading Edge
NEC
Northstar
Okidata
Radio Shack
Seiko
Sord
Toshiba
Xerox
Zenith Data
Systems

Quality replacement ribbons from Pelikan!

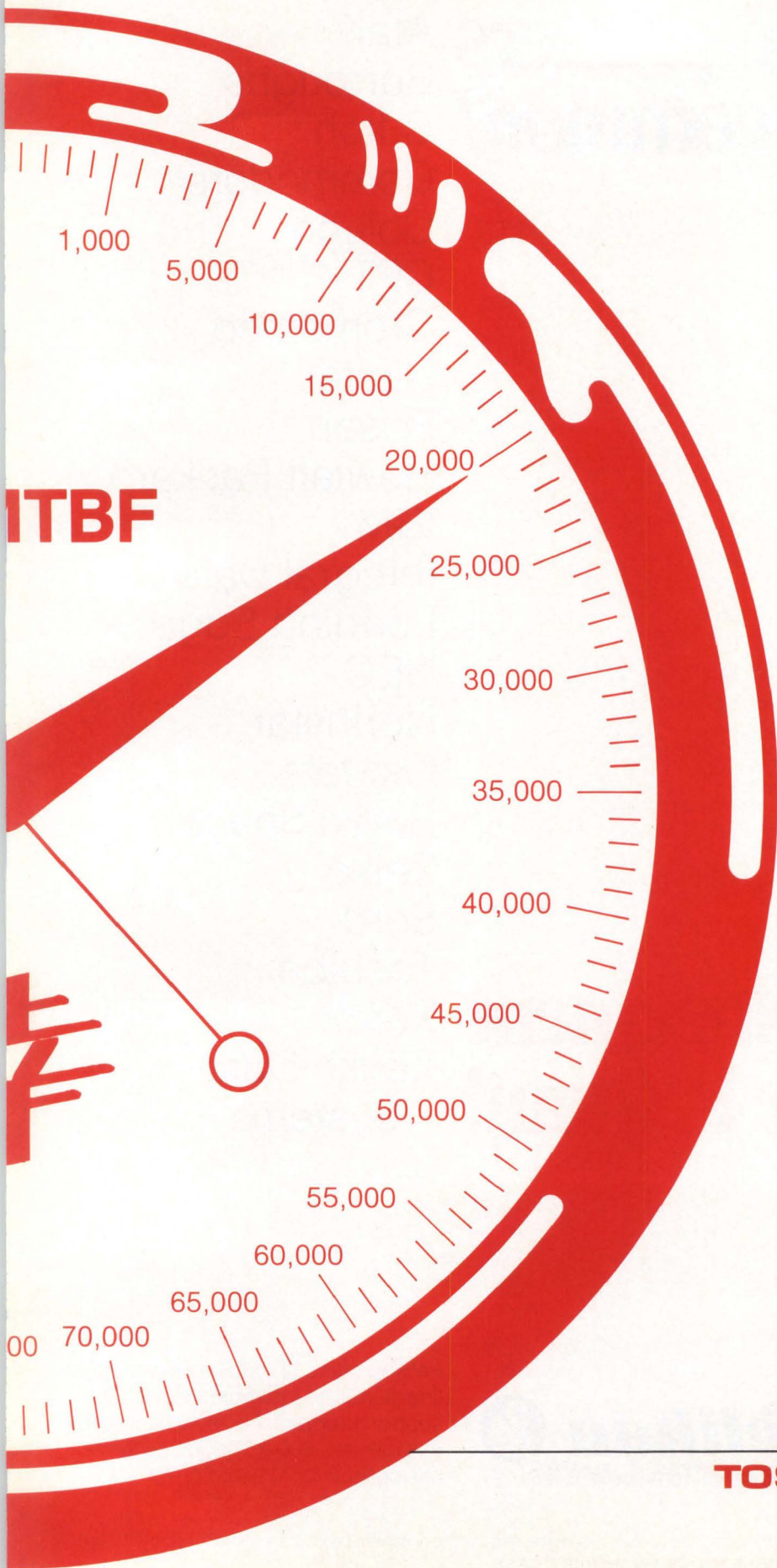
Pelikan 

Franklin, Tennessee 37064

Pelikan offers an outstanding product line as well as a comprehensive dealer support program. For more information call toll free: 800-251-3365 (in Tenn. call collect: 615-790-6171).

The brand names listed are intended only to show the compatibility of the above machines with products manufactured by Pelikan.

CIRCLE NO. 48 ON INQUIRY CARD



TO JAPANESE, 20,000 HOURS IS A BRIEF MOMENT.

The advantage of dealing with Toshiba America Disk Products Division lies in the way we've combined the greatest strengths of two industrial superpowers: Japanese quality and American support.

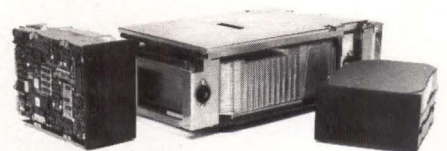
Japanese are well known for their commitment to the long term.

At Toshiba, that commitment is evidenced in the reliability of our high-capacity 5 $\frac{1}{4}$ " and 8" Winchester drives.

Take our MTBF. Like most leading suppliers, we quote 20,000 hours. The difference is that ours is a real 20,000 hours, well below the calculated figure. And substantiated by field experience.

We quote our specs just as conservatively. Under worst-case, not nominal, conditions. So you can expect that, for example, our error rates will be substantially better in most cases than our published specs.

The result of this conservative approach to design and manufacturing is a consistently reliable line of drives. Our QA people are involved in the design from



TOSHIBA AMERICA INC.

TO AMERICANS, EVEN 20 MINUTES CAN BE AN ETERNITY.

the paper stage up. Every drive is patiently tested and retested. Far beyond typical industry practice.

Americans, on the other hand, aren't known for their patience. Which is why American companies have developed the highest standards of customer support.

You expect quick response. Dependable delivery for your just-in-time requirements. Fast service. Applications and configuration support that's as close as your phone. And that's just what you get from Toshiba.

Our American support team is completely American-run. And trained to respond quickly to your every need: applications engineering, training, integration assistance, custom controller qualification, and on-site service.

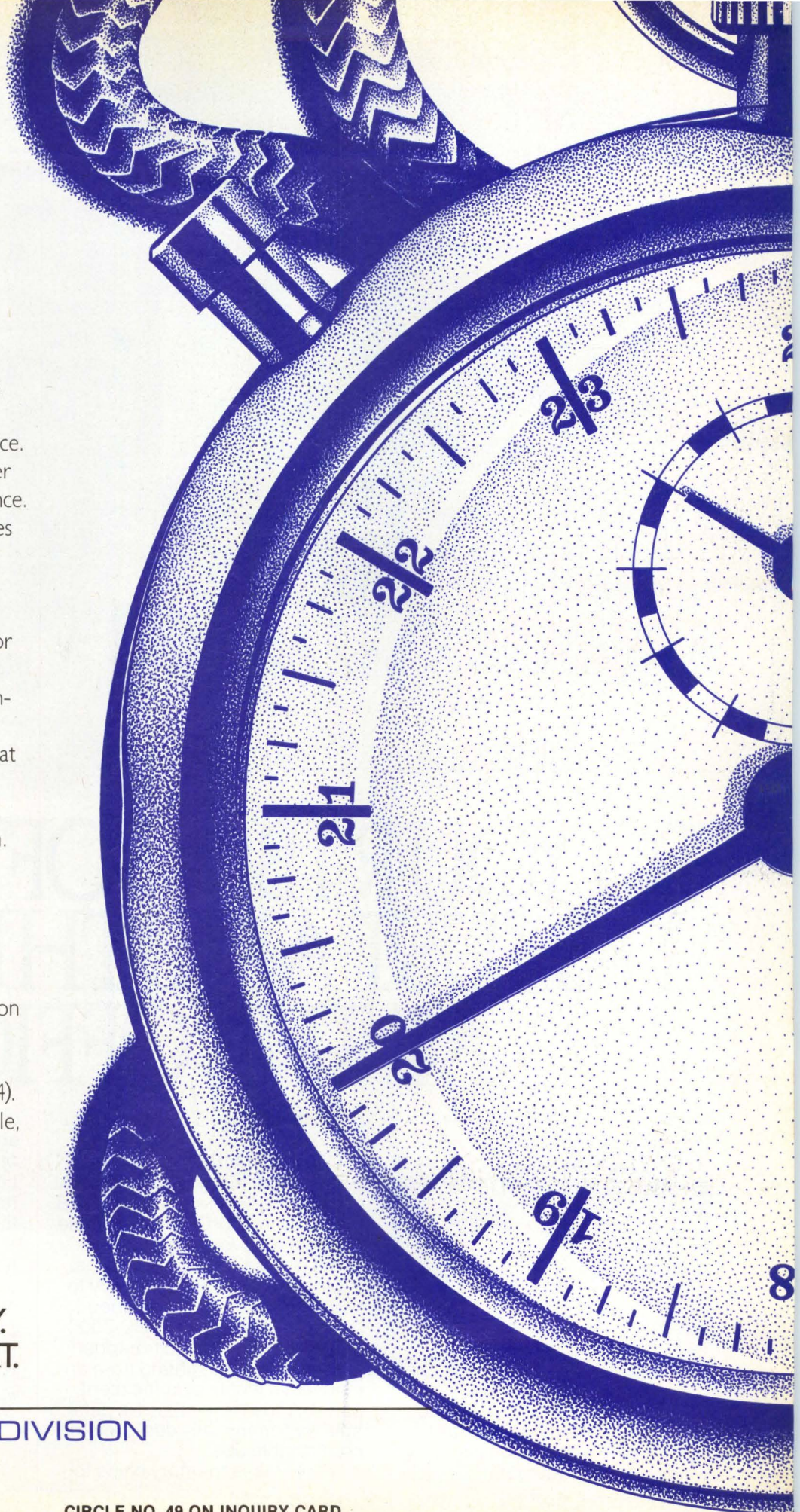
For complete information on our line of high-performance, high-capacity drives, call us at 408-727-3939 (Telex: 510-100-9764). Or write us at 3910 Freedom Circle, Suite 103, Santa Clara, CA 95054.

Toshiba America Disk Products Division. We're in it for the long run. And the short run.

JAPANESE QUALITY. AMERICAN SUPPORT.

DISK PRODUCTS DIVISION

CIRCLE NO. 49 ON INQUIRY CARD





TO YOUR IBM® SOFTWARE, IT'S JUST ANOTHER DAY AT THE OFFICE.

The Sharp PC-7000 makes transporting your work easy. It folds into a case small enough to fit



The Sharp PC-7000.

under an airplane seat, takes up less desk space than this magazine (opened, of course) and weighs less than 19 pounds.

IBM is a registered trademark of International Business Machines Corporation. MS-DOS is a trademark of MicroSoft Corporation.

But don't carry it just because it's easy to carry.

Carry it for MS-DOS 2.11, and built-in dual floppy disk drives that provide the IBM® standard 360KB format. The 320KB RAM is ample memory for even large spreadsheet or data-base applications.

Or carry it because it's easy to use. In addition to a high-speed 16 bit microprocessor, the PC-7000 has an easy-to-read bit-mapped screen with backlighting from an innovative electro-luminescent panel. And the keyboard is detachable, ergonomically designed for comfortable use.

It only takes memory chips to

upgrade RAM, and a modem card enables it to communicate with other computers. And our Near-Letter-Quality (32 x 48 dots) silent transfer printer attaches directly to the main unit.

But best of all, carry it because it'll sell. Fast.

To find out more, call 1-800-BE-SHARP.

Computers and Peripherals, Audio, A/V Equipment, Banking Systems, Broadcast Cameras, Calculators, Cash Registers, Copiers, Electronic Components, Electronic Typewriters, Facsimile, Medical Products, Microwave Ovens, Televisions, Vacuum Cleaners, Video Recorders. © 1985 Sharp Electronics Corp. 10 Sharp Plaza, Paramus, NJ 07652



**FROM SHARP MINDS
COME SHARP PRODUCTS**

CIRCLE NO. 50 ON INQUIRY CARD



COMDEX IN JAPAN: 'SHARE THE OPPORTUNITY'

The second annual conference seeks to turn the Asian computer-resale market into a global marketplace

Frances T. Granville, Associate Editor

"Share the opportunity; share the success" is the theme of the second annual Comdex in Japan conference and exposition, which will be held March 3 to 6 at the Harumi Exhibition Center, Tokyo. Show sponsor, The Interface Group, Needham, Mass., promotes the conference as Asia's only exclusively "reseller" event. The company sees it as a way for U.S. and European manufacturers and suppliers of computer hardware, software, peripherals and services to gain a foothold in the Asian market.

The show will emphasize business, financial and marketing issues relevant to independent sales organizations and will feature 20 sessions in which industry experts address those issues. Last year's show attracted more than 200 exhibitors from 19 countries and more than 40,000 attendees from all over Asia and 50 countries outside the continent. The Interface Group hopes to top those numbers this year.

Exhibitors will display computer systems, peripherals, software, media, supplies, services and accessories. Among the attendees will be computer retailers, distributors, system integrators, value-added resellers, commercial OEMs and dealers.

Among American companies that plan to exhibit are Datacom Northwest Inc., Everett, Wash.; Elgar Corp., San Diego; and Western



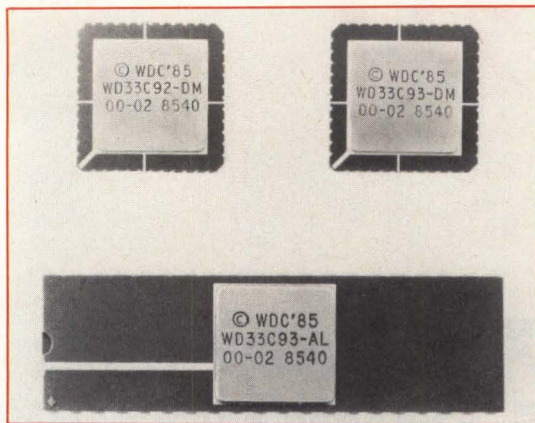
The 30-page-per-minute S3000 ion-deposition page printer was jointly developed by C. Itoh and Delphax.

Digital Corp., Irvine, Calif. Also exhibiting will be the Japanese parents of some U.S. companies, including C. Itoh Electronics Inc., Los Angeles. C. Itoh recently introduced the S3000 and S4500 ion-deposition page printers, aimed at OEMs and system integrators. The company jointly developed the printers with Delphax Systems, Westwood, Mass., and announced them at the Comdex/Fall show. The S3000 and S4500 print at 30 and 45 pages per minute, respectively, contain built-in diagnostics and print at 240 or

The Japanese character for "advantage" symbolizes Comdex in Japan.

和

Western Digital will exhibit its WD33C92 and WD33C93 single-chip SCSI controllers at Comdex in Japan.



300 dots per inch. Both printers have dual input trays and a 2,000-sheet capacity. C. Itoh will market the printers through distributor and retail channels. OEM-evaluation prices will be \$9,900 for the fully configured S3000 and \$11,900 for the S4500.

Western Digital plans to show the WD33C92 and WD33C93 single-chip small computer systems interface (SCSI) controllers, introduced at Comdex/Fall. The controllers implement such

SCSI bus features as arbitration, disconnect/reconnect, parity and synchronous data transfers as fast as 4M bytes per second, along with standard SCSI physical signaling. In addition, the company will exhibit its WD1003A-SCS SCSI-to-ST506 board, designed to support two compatible disk drives, and its enhanced small device interface (ESDI)-to-SCSI host board that supports as many as four disk drives. Western Digital will also show integrated drive/electronics chip sets and boards; a self-adjusting, flexible disk drive data separator with read/write support chips; an ESDI Winchester disk-controller chip set; a half-slot Winchester controller board for IBM Corp. PCs and compatibles and a self-adjusting, quarter-inch-cartridge—the (QIC) 36—streaming-tape data-separator module.

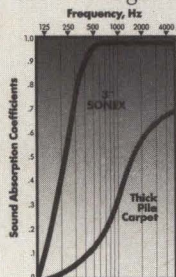
Elgar plans to exhibit its recently introduced fail-safe power supplies, and Datacom Northwest will show its hand-held test-and-measurement equipment. □

Interest Quotient (Circle One)
High 466 Medium 467 Low 468

SONEX sweeps carpet: costs less money, kills more noise.

You might think that because SONEX is a professional acoustic foam, specifically designed to kill industrial noise, it would cost more than carpet. Logical but wrong.

At just \$16/yard, SONEX is one-third the cost of good quality carpeting. Yet it's twice as deadly to noise. And even if you order special SONEX in low quantities, it's still only half the cost of carpet. And 3 times deadlier. So you can't lose. It's less expensive, yet more effective. Call or write for the SONEX brochure, complete with acoustic charts and all the facts: 3800 Washington Ave. North, Minneapolis, MN 55412. (612) 521-3555.

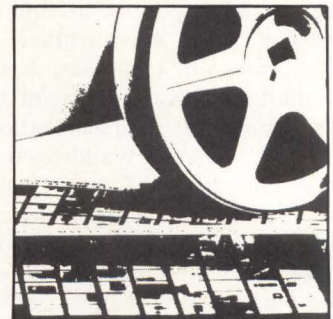


\$50/yard \$16/yard

illbruck

CIRCLE NO. 51 ON INQUIRY CARD

This Publication is available in Microform.



University Microfilms International

Please send additional information for _____
Name: _____
Institution: _____
Street: _____
City: _____
State: _____ Zip: _____

300 North Zeeb Road
Dept. P.R.
Ann Arbor, Mi. 48106

THE FASTEST PLOTTING SOLUTION ISN'T A PLOTTER. IT'S NEW RPM.

Versatec delivers the promise of electrostatic plotting with RPM—the Raster Processing Machine.

QUICK! Now your Versatec can plot at full rated speed. Deliver faster plot turnaround. Generate more plots per day. Produce plots in color, high resolution, or great complexity—even with a small computer. And without raster processing burden.

RELIEF! Versatec RPM off-loads your computer, buffers large plot files. Rasterizing large toned areas at speeds of more than 32 million dots per second, it can support highly complex color plotting at full plotter speed.

GROW! But RPM isn't just for color or high resolution plotting. You can start with a low

cost entry system, then add modules to match application demands. A micro-floppy makes it easy to load configuration updates. Memory goes from 4 to 14 megabytes.

GO! Here's power. A multi-tasking task/memory allocation, dynamic pipeline architecture, dynamic plot processing functions. Multiple processors simultaneously sort, rasterize, and control. Custom VLSI graphics accelerators speed line drawings and area fill. Dedicated high speed data buses boost data movement between processors.

STOP! Don't wait for plot processing. Write for more information, call our toll-free number 800/538-6477 (in California, 800/341-6060), or visit your nearest Versatec office for a demonstration of RPM.

VERSATEC
A XEROX COMPANY

2710 Walsh Avenue
Santa Clara, California 95051
Telephone: (408) 988-2800
Call toll-free: (800) 538-6477.
In California, call (800) 341-6060.
TWX: 910-338-0243
Telex: 334421

Versatec is a trademark of
Versatec, Inc.
Xerox is a trademark of
Xerox Corporation.

It's a Versatec.

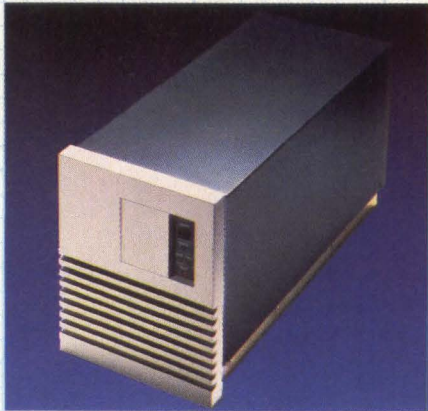
CIRCLE NO. 52 ON INQUIRY CARD



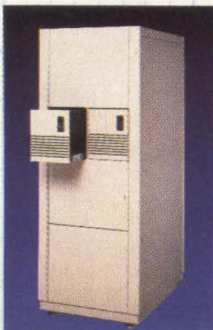
ADDING VALUE TO OEM SYSTEMS THROUGH COMPACT HARD DISKS

HITACHI DK SERIES WINCHESTER DISK DRIVES

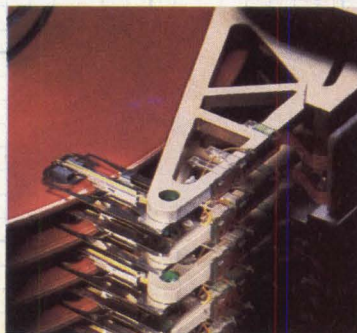
■ Hitachi's line of compact Winchester disk drives embraces 3.5-, 5.25-, 8- and 8.8-inch disk families, each offering a range of capacities up to the highest yet delivered in its class. The line thus offers the OEM the maximum flexibility in making cost/capacity tradeoffs to meet the needs of systems ranging from portable computers to high-performance CAD/CAM workstations. The use of voice-coil technology and high-speed circuits results in access times and transfer rates matching or bettering those of competitive drives. Hitachi drives employ industry-standard interfaces to simplify systems integration. The inherent ruggedness of sealed disk technology and the application of strict quality control standards at every stage of manufacturing and assembly assures that Hitachi disk drives will operate reliably for years in demanding environments such as offices and engineering laboratories.



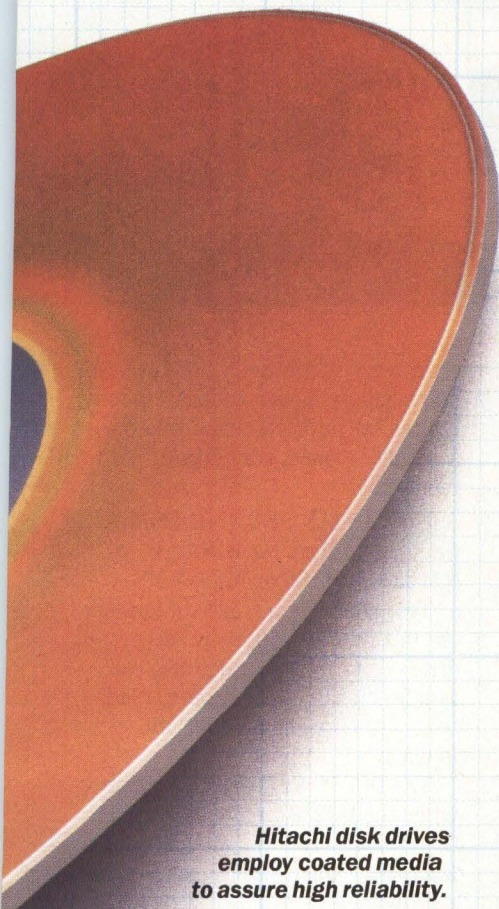
■ The DK815-5 drive employs a high-precision voice-coil actuator and spindle, new high-density read/write circuitry and high-performance 8.8-inch coated disks to squeeze 525 megabytes of unformatted storage capacity into a unit small enough to fit into one-half of a 19-inch rack. The drive, which employs an enhanced SMD interface, has an average access time of 18 milliseconds.



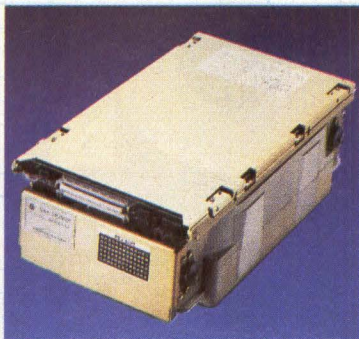
■ By employing two DK815-5 units and a Hitachi controller, you can package a computer and over 1 gigabyte of disk memory capacity in a single 19-inch equipment rack, eliminating the need for an expensive and power-hungry stand-alone drive.



Hitachi disk drives offer extremely fast access times—as fast as 18 milliseconds—thanks to the use of a microprocessor-controlled voice-coil actuator to position read/write heads.



Hitachi disk drives employ coated media to assure high reliability.



■ The DK812S Series and DK814S Series of 8-inch disk drives encompass units having unformatted storage capacities ranging from 51 to 340 megabytes. The SMD-compatible DK812S and ESMD-compatible DK814S Series drives have average access times of 25 and 20 milliseconds, with 1.2- and 1.8 megabyte-per-second transfer rates, respectively.



■ The DK511 (ST506/412) and DK512 (ESDI) Series of 5.25-inch disk drives comprise units having unformatted storage capacities ranging from 36.4 to 172.3 megabytes. Average access times are 23 milliseconds for the DK512 Series and 30 milliseconds for the DK511 Series (23 milliseconds for the DK511-8, which offers 85 megabytes of storage). Transfer rates for the two series are 1.2 and 0.625 megabytes per second, respectively.



■ The DK301 Series of 3.5-inch disk drives encompasses two units having unformatted storage capacities of 12.7 and 19.1 megabytes. These drives offer the industry-standard ST506/412 interface, and offer Hitachi quality storage devices that are ideal for portable and personal computing systems.

How Hitachi Hard Disks Can Enhance the Value of OEM Systems

In the hotly competitive OEM systems market, the name of the game is to increase a system's ease-of-use and functionality while reducing its cost. One way to do this entails increasing a system's storage capacity without increasing its physical size. Therefore, Hitachi has created a new line of compact Winchester disk drives having remarkable storage capacity. For example, you can use two of our DK815-5 8.8-inch disk drives to squeeze over 1 gigabyte of unformatted storage capacity into one shelf of a standard 19-inch equipment rack.

Our DK301 Series 3.5-inch drive is the same size as a microfloppy, yet it can store as much as 19.1 megabytes of data. Our line also includes 5.25-inch and 8-inch disk drives with capacities from 36 to 340 megabytes, giving you the widest possible choice of Winchester products, all from one vendor.

Increased memory capacity is of little benefit if it results in low drive performance. Hitachi's high-performance drives, utilizing voice-coil actuators, high-speed circuitry, and state-of-the-art interfaces, minimize access times and maximize transfer rates.

Unreliable disks can ruin an OEM system vendor's reputation. So we make and assemble all the components of our drives ourselves, applying the strictest possible standards of quality control. Our attention to quality yields demonstrable results: a 20,000-hour MTBF rate for all our drives.

Hitachi America, Ltd.

Peripheral Systems Marketing Department
Computer Sales & Service Division
950 Elm Avenue, San Bruno, CA 94066
Tel: 415/872-1902
or: 313 Speen Street, Natick, MA 01760-1506
Tel: 617/655-5501



HITACHI®

CIRCLE NO. 53 ON INQUIRY CARD

MULTIPLE CHOICE:

Now DILOG gives QBus users even more disk controllers to choose from. These new models contain the latest DEC emulations, and are compatible with 11/23, 11/23+, 11/73, Micro PDP-11 and MicroVAX computer systems.

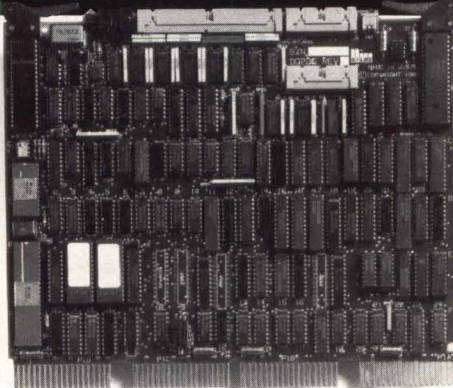
Another important feature is DILOG's Universal Formatting. It allows you to connect different types of drives to the same controller, without having to use special configuration components.

1. New DU driver compatible 2.5 MB/SEC SMD/ESMD disk controller.

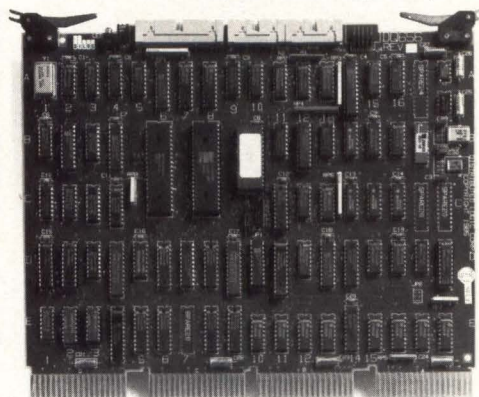
DILOG's DQ226 interfaces one or two 8", 9", 10" or 14" SMD/ESMD disk drives. Compatible with RT-11, RSX-11, RSTS and MicroVMS, it gives you 22-bit addressing and functions with both block mode and non-block mode memory. Data integrity is kept in place with 56-bit ECC, coupled with advanced error recovery routines and the storage capacity is only limited by the drive itself. With over two gigabyte capacity, our controller will grow with your requirements.

2. New DU driver compatible 1.4 MB/SEC ESDI disk controller.

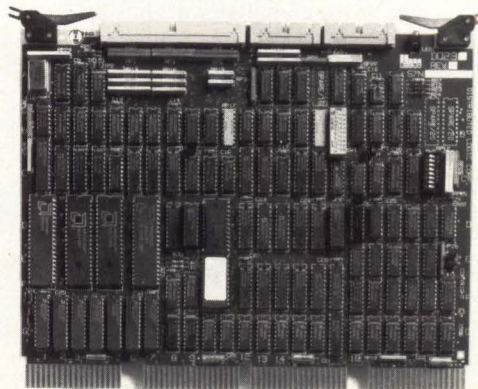
Compatible with RT-11, RSX-11, RSTS and MicroVMS, DILOG's DQ656 interfaces one or two 5 1/4" ESDI disk drives. It gives you 22-bit addressing and functions with both block and non-block mode memory. Data integrity is kept in place with 32-bit ECC, coupled with advanced



1. 2.5 MB/SEC SMD/ESMD Disk Controller. (DU Driver Compatible.)



2. 1.4 MB/SEC ESDI Disk Controller. (DU Driver Compatible.)



3. 2.5 MB/SEC SMD/ESMD Disk Controllers. (RK06/07, RM02/03/05/80 or MicroVMS Compatible.)

error recovery routines. With over two gigabyte capacity, storage is only limited by the drive, enabling our controller to meet your future requirements.

3. New 2.5 MB/SEC SMD/ESMD disk controllers for RK06/07, RM02/03/05/80 or MicroVMS.

This group of controllers interfaces one or two 8", 9", 10" or 14" disk drives. For error recovery, they contain 56-bit ECC, in addition to read retries that keep data integrity in place.

The DQ235 is for RK06/07 drivers, while the DQ238 works with RM02/03/05/80 drivers. The MV230 is for MicroVMS applications and includes a software driver that configures each attached disk drive as one logical unit.

Complete support.

When you go with DILOG, you get more than just a board. There's technical assistance via telephone, a controller board loaner service, on-site customer support, complete documentation, and rigid quality control standards. That's why DILOG has shipped over 50,000 disk and tape controllers to some of DEC's best OEMs.

DILOG has put more high performance peripheral controllers on the QBus than anyone else. Shouldn't we be your choice?

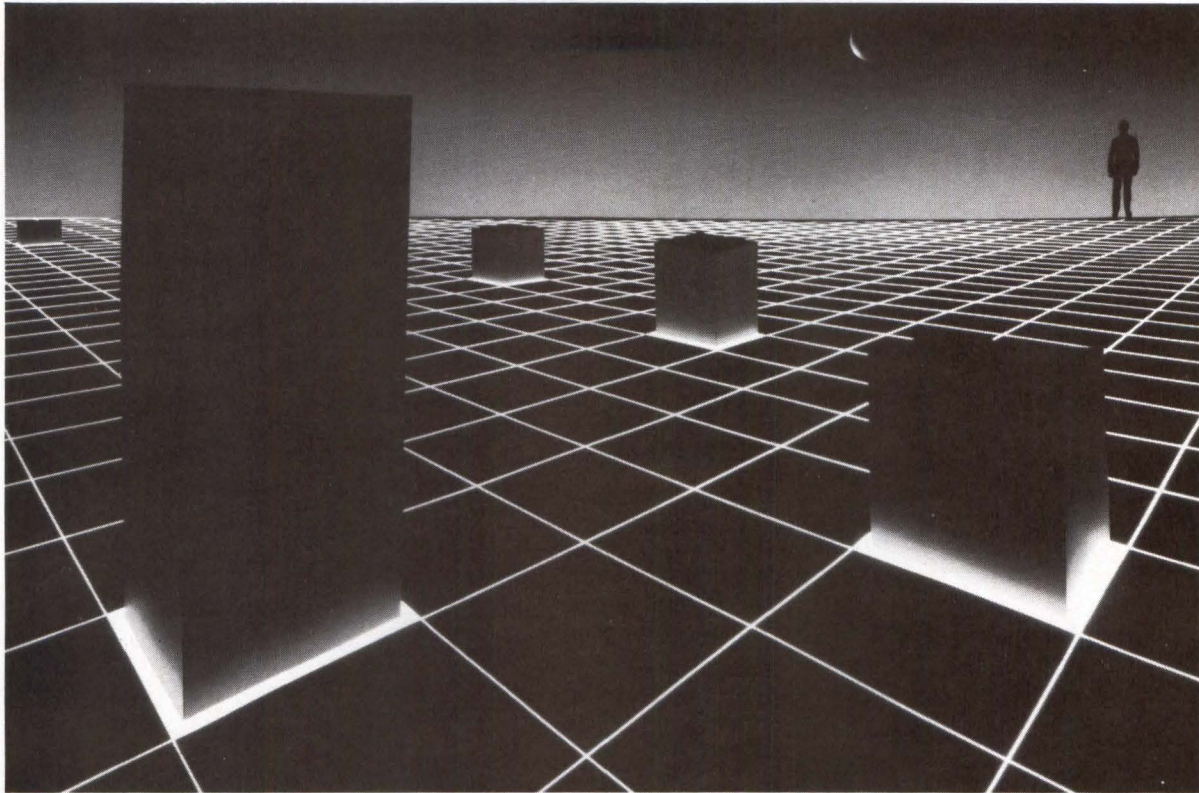
DILOG
DISTRIBUTED LOGIC CORPORATION

DEC, QBus, Micro PDP, MicroVAX, RT, RSX, RSTS, and MicroVMS are trademarks of Digital Equipment Corporation. Universal Formatting is a trademark of Distributed Logic Corporation.

Distributed Logic Corporation/P.O. Box 6270/
Anaheim, CA 92806/(714) 937-5700. 64-A White
Street/Red Bank, NJ 07701/(201) 530-0044. Chester
House, Chertsey Road/Woking, Surrey, England
GU215BJ/(04862) 70262/7.

CIRCLE NO. 54 ON INQUIRY CARD

Before we can share ideas, we have to share information.



Introducing poly-SHARE®. It lets PC and VAX users create an organized, central lending library.

What a novel idea! Programs, files, worksheets, WP documents, created either on a PC or a VAX system, are organized and securely stored on the VAX computer by the poly-SHARE program. So they're instantly accessed and transferred by any authorized PC or VAX user.

Poly-SHARE software is perfect for any company or department that includes a population of PCs and one or more VAX systems. And security features insure that even sensitive and confidential information can be stored in the library.

Engineers and scientists store test data and frequently used programs. Accountants deposit budgets, forecasts, and commonly-used worksheets. Managers file reports, production informa-

tion, and sales results. Administrators and secretaries instantly recall standardized sections of contracts, proposals, and business letters. And software developers organize original and updated code modules.


The poly-SHARE program's breadth of appeal is matched by its ease of use. It provides a menu interface, on-line help and fully automatic transfers of library entries to and from PCs. And it's available for both ALL-IN-1 and standard VMS configurations.

FREE EVALUATION KIT.

Call us today and ask for our fully functional evaluation kit. This no-risk offer will let you put poly-SHARE to the most important test: how will it work for you?

800/545-5405 (Ext. 6)

VAX, VMS, and ALL-IN-1 are trademarks of Digital Equipment Corporation. Polygon, the Polygon logo, and poly are registered trademarks of Polygon Associates, Inc.

 **polygon®**
The difference is experience.

CIRCLE NO. 58 ON INQUIRY CARD

If all you want is a disk drive, you're looking at the wrong ad.

At long last, a few companies have figured out how to make Winchester drives like Maxtor's. But they still haven't figured out how to duplicate the company that makes Maxtor drives.

Which makes all the difference.

You see, every drive we sell comes with a partnership. We work with you as your product takes shape. Your requirements become ours. Your deadlines become our deadlines. Even our new products are developed in response to your expressed needs.

That's how we became the leading manufacturer of the highest quality, highest capacity 5¼-inch drives. And that's how we'll keep our lead. Because what you're buying isn't just a disk drive.

It's a company.

Maxtor Corporation, 150 River Oaks Parkway, San Jose, California
95134, (408) 942-1700, TELEX 171074

Sales Offices: Austin, (512) 345-2742; Boston, (617) 872-8556;
Orange County, (714) 859-3100; San Jose, (408) 435-7884.

Maxtor

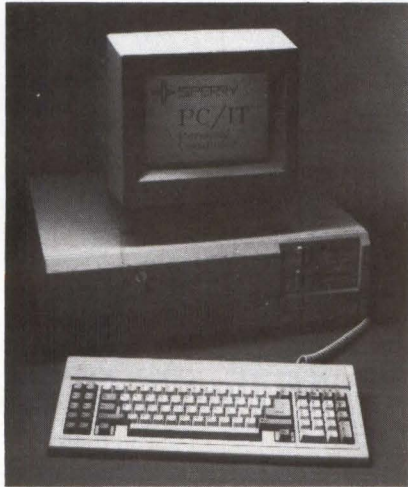
CIRCLE NO. 67 ON INQUIRY CARD



NEW PRODUCTS

SYSTEMS

Megan Nields, Assistant Editor



Personal computer supports nine users

- 512K-byte memory
- XENIX System V
- 16 colors

Supporting the XENIX System V operating system, the PC/IT personal computer uses the Intel 80286 processor and the IBM PC/AT, 16-bit, open-architecture standard. The system handles up to nine users and comes with 512K bytes of memory, expandable to 1M byte, and two RS232C communication ports. It accommodates two 44.6M-byte, rigid disk drives. A 60M-byte tape storage device can be added. Switch selection permits operation at 6, 7.16 or 8 MHz. The monitor displays a range of 16 colors at one time from a total palette of 256 colors in either 640-by-200 or 640-by-400-dot resolution mode. \$6,834. **Sperry Corp.**, P.O. Box 500, Blue Bell, Pa. 19424, (205) 542-4213.

Circle 300

Supermicro runs at 2.1 MIPS

- UNIX-based
- 32-bit
- 2M-byte memory

The UNIX-based Model 1640 supermicrocomputer incorporates three 32-bit, tightly coupled microprocessors that split network communication, file

and application processing. It operates at 2.1 MIPS. Supporting up to 26 local users, the system comes with an application processor with 2M bytes of main memory, a communications processor with 0.5M bytes of memory, a storage processor with 0.5M bytes of memory and a 52M-byte, Winchester disk drive and an 80M-byte streaming tape drive. The system supports 12M bytes of main memory and 572M bytes of disk storage. \$18,500. **Datamedia Corp.**, 491 Amherst St., Nashua, N.H. 03063, (603) 886-1570.

Circle 301

Workstation aids office automation

- 1M-byte memory
- 84M-byte storage
- 16-bit microprocessor

Providing office-automation capabilities such as word processing, business graphics and spreadsheet analysis, the Performer desktop workstation employs an Intel 80186 16-bit microprocessor and stores up to 84M bytes. Internal memory of 1M byte is obtained via 256K-byte expansion cartridges. The workstation employs a 5¼-inch flexible disk and one or two 10M-byte disk-expansion modules. The unit comes with a detachable keyboard and a 12-inch monochrome monitor. Six workstations may be grouped in a local network. \$3,545 to \$11,584. **Prime Computer Inc.**, Prime Park, Natick, Mass. 01760, (617) 655-8000.

Circle 302

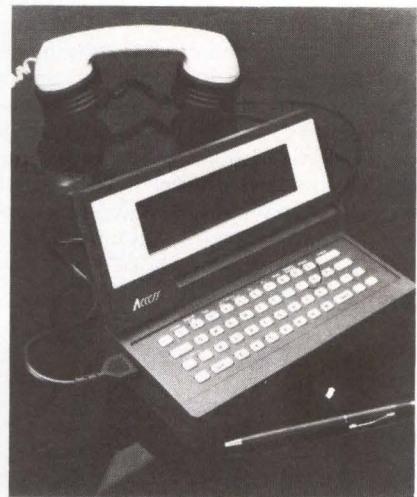
Supermicro suits multiuser tasks

- 4M bytes of memory
- 68020 microprocessor
- Eight serial, two parallel ports

A multiuser, multitasking supermicrocomputer, the P80/20 uses the Motorola 68020, 12.5 MHz microprocessor. The unit has eight serial and two parallel ports and delivers 3 MIPS. No-wait-state memory modules of 1M, 2M and 4M bytes are offered, as well as a total capacity of 16M bytes of no-wait-state or

one-wait-state memory modules. Operating under UNIX System V, the system supports virtual-memory hardware. Features include a half-inch, 9-track tape drive and up to 0.5G bytes of Winchester storage. \$23,500. **Pixel Systems Inc.**, 300 Wildwood Ave., Woburn, Mass. 01801, (617) 933-7735.

Circle 303



Portable computer targets VARs

- 64K bytes of memory
- Bit-mapped graphics
- 8-bit CMOS microprocessor

One third the size of notebook computers, the ACCESS portable computer and remote terminal offers up to 120K bytes of storage and 64K bytes of plug-in memory. The unit provides a 40-character-by-8-line LCD with bit-mapped graphics for word-processing and file-management applications. Based on an 8-bit CMOS microprocessor, the unit employs a 49-key ASCII keyboard with programmable function keys to generate 640-by-240-pixel dot-matrix graphics. An interactive terminal as well as a portable database, the system connects to remote computers, electronic-mail networks and corporate mainframes. Features include a serial interface and a 300-baud modem. \$499 to \$995. **Melard Technologies Inc.**, 5 Westchester Plaza, Elmsform, N.Y. 10523, (914) 592-3044.

Circle 304

NEW PRODUCTS PRINTERS

Laser printer offers four emulations

- 128K-byte memory
- 12 fonts
- 300 dpi

An 8-ppm laser printer with 300-dpi resolution, the model 810 comes with 12 fixed-pitch fonts. These include four IBM Selectric-style fonts (Letter Gothic, Prestige Elite, Courier and Orator), two DEC technical scientific/math fonts, two DEC VT100 line-drawing fonts, a landscape sans serif line printer font and three Epson model FX-80 fonts (Epson Pica, Epson Elite and Epson Compressed). Four printer-emulation modes are Diablo 630 ECS, Qume Sprint, Epson FX-80 and ANSI 3.64. Bit-map memory for Epson FX-80 and ANSI raster plotting is 128K bytes. Down-line-loaded font and overlay storage is 80K bytes of dynamic RAM, permitting up to five fonts to be loaded at a time. \$3,850. **Talaris Systems Inc.**, 5160 Carroll Can-

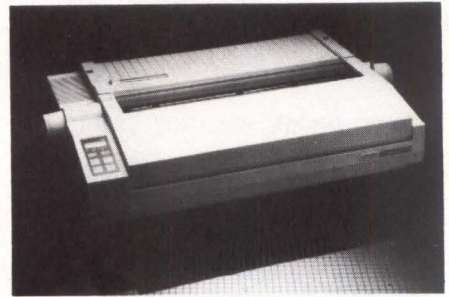
yon Road, P.O. Box 261580, San Diego, Calif. 92126, (619) 587-0787.

Circle 310

Daisywheel offers 200 character sets

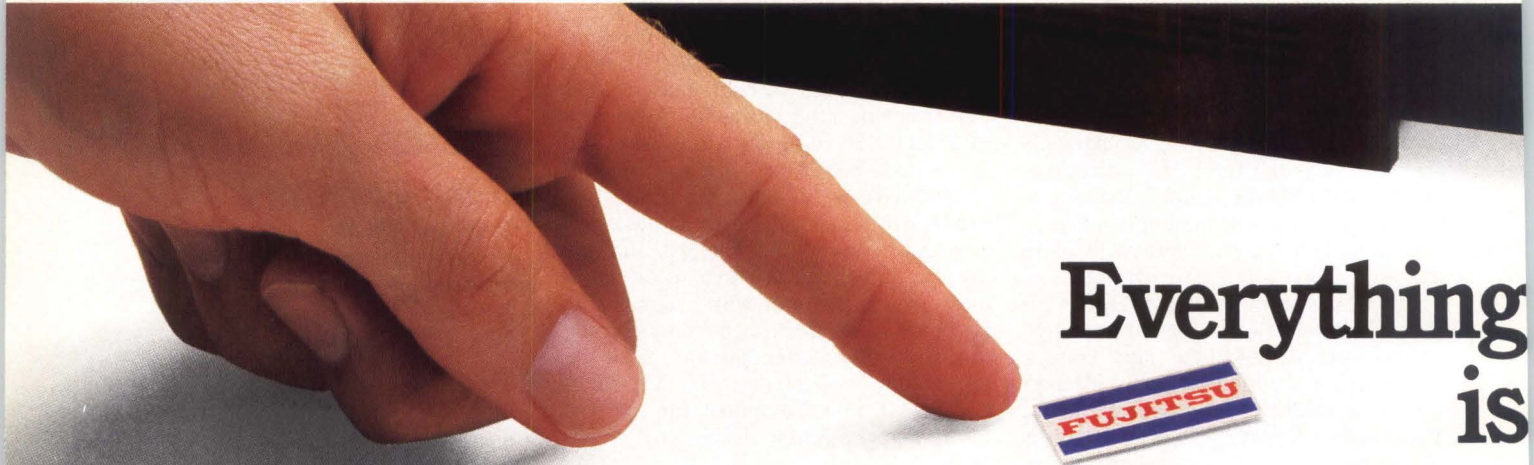
- 55 dB(a)
- 8K-byte buffer
- Diablo, NEC compatibility

Printing 35 cps in 10 pitch, the Premiere 35 letter-quality, daisywheel printer operates at a 55-dB(a) noise level. Operating bidirectionally, the unit produces 136 cpl in 10 pitch, 163 cpl in 12 pitch and 204 cpl in 15 pitch. It offers switch-selectable software compatibility with the Diablo 630, the NEC 3550 and the Qume Sprint 11+. Features include an 8K-byte buffer; selectable proportional spacing for typeset, justified appearance; push-feed, variable-width tractor and automatic paper-loading system; user-in-



terchangeable interface cartridges for hardware coupling; and LCD of print functions and error messages in English. The unit provides 200 available character sets, 18 languages and special scientific, mathematical and legal characters. Protocols supported include DTR, ETX/ACK, DCI/DC3 and X-on/X-off. \$599. **Citizen America Corp.**, Suite 300, 2425 Colorado Ave., Santa Monica, Calif. 90404, (213) 453-0614.

Circle 311



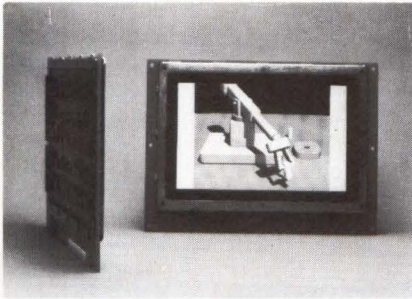
Throughout the disk drive industry, the Fujitsu name stands for proven technology, superior performance and unmatched reliability.

Throughout the world, the name represents a company that comes through with products instead of promises.

And when it comes to 5¼" Winchester disk drives, Fujitsu America has a new 172MB drive, with units available today for your evaluation.

It's the newest member of our 5¼" disk drive family—and it's based on the same proven technologies. It's fully compatible with industry standards. And it gives you a significant price/performance advantage.

This drive represents a major step in the evolution of your multi-user system. And Fujitsu America has the technology, the strength and the experience to help you continue on that growth path.



Flat-panel display is 0.55-inches thick

- 83 lines per inch
- 35 active inches
- 640 by 200 pixels

The EL8358 M is a 640-by-200 individually addressable pixel, electroluminescent flat-panel display. Providing a resolution of 83 lines per inch with a 5-by-7-inch active matrix area, the unit facilitates graphics, text and utility soft-

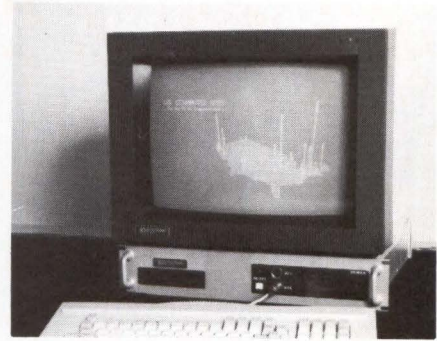
ware created for MS-DOS-compatible computers. The monitor is 0.55-inches thick, and suits personal computer and industrial control applications. Features include driver/control electronics, bezel and a two to one pixel aspect ratio. \$775. **Planar Systems Inc.**, 1400 N.W. Compton Drive, Beaverton, Ore. 97006, (503) 629-2006.

Circle 312

Terminal emulates DEC, Tektronix units

- 1,024 by 720 pixels
- 4,096-color palette
- 14-, 19-inch monitor

Providing DEC VT52, VT100, VT220 and Tektronix emulation, the ID 1024 graphics terminal displays 1,024 by 720 pixels from a 4,096-color palette on a 14- or 19-inch screen. The unit offers 16 levels of zoom, up to eight view ports, RS343 video and a 512K-byte display-list memory. Graphics functions include a



full set of graphics drawing primitives and multiple alphanumeric sizes and angles. The terminal supports 96 ASCII characters, ANSI X3.64 protocol, 64 control characters and reverse video. Additional features are independent graphics and alpha planes, multipage editing, pan, serial/parallel printer support and an external cursor-control port. \$6,995, 19-inch; \$4,995, 14-inch. **ID Systems Corp.**, 6175-W. Shamrock Court, Dublin, Ohio 43017, (614) 766-0440.

Circle 313

this name represents built into these 5 1/4" drives.

So no matter what capacity 5 1/4" drive you need, you can be sure of its performance, reliability and delivery. We keep close control of all three by manufacturing virtually every component of our drives ourselves. And we recently opened a plant that adds 220,000 square feet to our 5 1/4" and 3 1/2" manufacturing capacity.

For more information about Fujitsu's full family of 5 1/4" drives, call (408) 946-8777. Or write Fujitsu America, Inc., Storage Products Division, 3055 Orchard Drive, San Jose, CA 95134-2017.

When you want the best in data storage technology—and you want it now—just remember our name.

We're developing technology for you.

Model	M2233	M2235	M2243	M2246E
Capacity (MB) (unformatted)	13	27	86	172
Access Time (msec)	95	83	33	25
Interface	ST506/412	ST506/412	ST506/412	ESDI
Transfer Rate (KB/sec)	625	625	625	1250
Technology	Composite ferrite heads, Oxide media			



CIRCLE NO. 68 ON INQUIRY CARD

FUJITSU AMERICA

IEEE-488



GPIB ↔ PC

Hardware Flexibility

- Low cost for instrument control
 - 300K bytes per second
 - \$395 complete with software
- High performance data links
 - Maximum speed of GPIB
 - On-board buffering

Software

- Over \$1,000,000 in software development
- Easy to use, yet handles any GPIB application
- Works with Lotus 1-2-3
- UNIX, DOS and over 12 languages

Applications Support

- Applications Library with sample programs & TIPS for all major instruments
- Full staff of Applications Engineers dedicated to support your specific needs

Other IEEE-488 Products

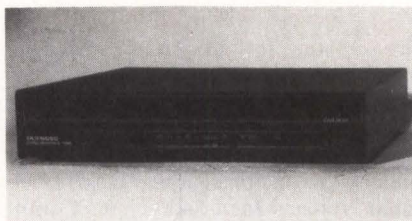
- Interfaces & Software for
 - Multibus VMEbus
 - DEC Q-bus & UNIBUS
 - STD & S-100 bus
- General GPIB Products
 - GPIB Bus Testers
 - GPIB Bus Extenders
 - Stand-Alone Controllers



12109 Technology Boulevard
Austin, TX 78727
1 (800) 531-GPIB
In Texas (800) IEEE-488
Telex: 756737 NAT INST AUS

CIRCLE NO. 69 ON INQUIRY CARD

NEW PRODUCTS DATACOMM



Multiplexer runs at 19.2K bps

- 9.6K to 64K baud
- six inputs
- three interfaces

The DCP9050 synchronous time-division multiplexer combines up to six inputs for transmission over the Data-telephone Digital Service network. It operates at switch-selectable baud rates of 9.6K, 14.4K, 19.2K, 56K or 64K. The unit comes with RS232C, RS422 and V.35 link interfaces. Each input channel is individually programmable for operating parameters including speed and timing options. These parameters are set using DIP switches on the local DCP9050 and the speed is automatically down-line loaded to the remote, unattended unit. Built-in pattern generator transmits test messages. Individual channels may be looped back, locally or remotely. \$2,150. **Datatel Inc.**, Data Communications Products, Cherry Hill Industrial Center, Cherry Hill, N.J. 08003, (609) 424-4451.

Circle 314



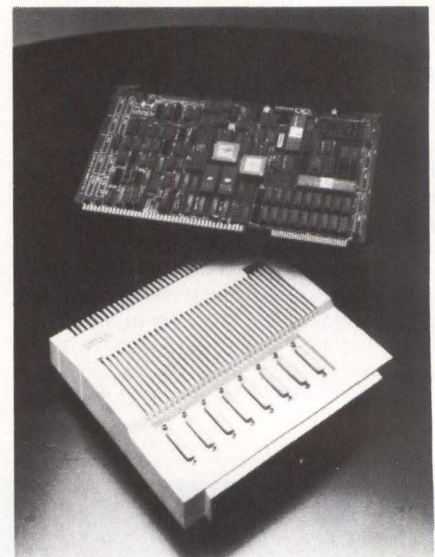
Modems offer Bell compatibility

- 2,400 bps
- Half duplex
- Synchronous, asynchronous

Offering Bell 202S, 202T and 201C compatibility, the 2200 Series of modems consists of models 2215, 2216 and 2217. Models 2215 and 2217 are two-wire, half-duplex dial modems operating at 1,200 bps asynchronously and 2,400 bps synchronously. Model 2216 runs at 1,200 bps asynchronously as a four-wire, full-

duplex, leased-line unit. Model 2215 provides a serial auto-call unit that allows both pulse and tone dialing, and stores 30-character telephone numbers. Model 2216 contains an anti-streaming unit that prevents lockups by using a strap-selectable time-delay option. \$495, Model 2215; \$425, Model 2216; \$685, Model 2217. **Codex Corp.**, 20 Cabot Blvd., Mansfield, Mass. 02048-1193, (617) 364-2000.

Circle 315



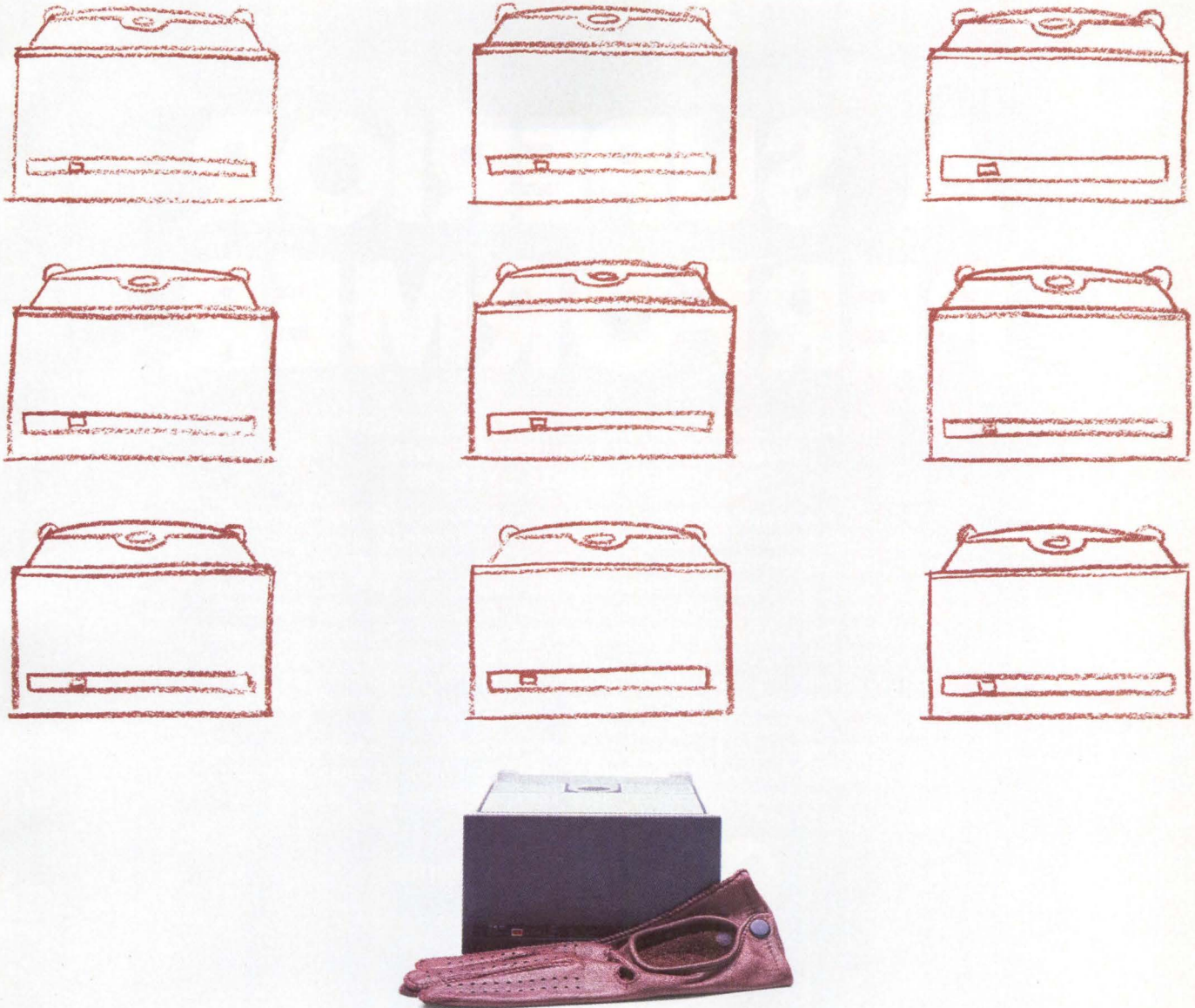
Multiplexers connect up to 128 terminals

- 512K-byte memory
- MC68010 CPU
- 2.5M-bps transfer interface

The HPS Series of intelligent, asynchronous multiplexers consist of host adapters and remote cluster controllers that handle terminals in increments of eight or 16 each. The series suits multi-user microcomputers and supermicrocomputers based on Multibus I, II and VMEbus. Supporting up to 128 terminal ports while occupying one slot in the host backplane, the host adapters include a 10-MHz MC68010 CPU, a no-wait memory of up to 512K bytes and a 2.5M-bps transport interface to the cluster controller. They run the host operating system's TTY manager as well as emulate a block-mode multiplexer with standard TTY driver. Transport mechanism between the host and cluster controllers uses token-passing LAN technology. \$895 to \$1,080. **Systech Corp.**, 6465 Nancy Ridge Drive, San Diego, Calif. 92121, (619) 453-8970.

Circle 316

Take a drive in the fast lane.



The Micropolis 1320 Series from Hall-Mark.

Cruise at top speed while improving your performance when you select the Micropolis 1320 Series 5¼" Winchester Disk Drives from Hall-Mark Electronics.

Featuring high capacities of up to 85 megabytes, super reliability and fast access times of 28 milliseconds, the Micropolis 1320 Series Winchester is fully compatible with the industry stan-

dard ST 506/ST 412 interface and is designed to perform in diverse application environments.

When you're ready for the fast lane, make Hall-Mark your nationwide source for Micropolis Disk Drives. With 32 stocking locations nationwide, we provide on-time delivery backed by technical support. Put yourself in the driver's seat. Call us for an evaluation. We're the people who care.



Alabama
Huntsville (205) 837-8700

Arizona
Phoenix (602) 437-1200

California
Bay Area (408) 946-0000
Orange County (714) 669-4700
Sacramento (916) 722-8600
San Diego (619) 268-1201
San Fernando Valley (818) 716-7300
West Los Angeles (213) 217-8400

Colorado
Denver (303) 790-1662

Connecticut
Connecticut (203) 269-0100

Florida
Ft. Lauderdale (305) 971-0280
Orlando (305) 855-4620
Tampa Bay (813) 530-4543

Georgia
Atlanta (404) 447-8000

Illinois
Chicago (312) 860-3800

Indiana
Indianapolis (317) 872-8875

Kansas
Kansas City (913) 888-4747

Maryland
Baltimore (301) 988-9800

Massachusetts
Boston (617) 935-9777

Minnesota
Minneapolis (612) 854-3223

Missouri
St. Louis (314) 291-5350

New Jersey
Fairfield (201) 575-4415

New York
Long Island (516) 737-0600

North Carolina
Raleigh (919) 872-0712

Ohio
Cleveland (216) 349-4632
Southern Ohio (614) 888-3313

Oklahoma
Tulsa (918) 665-3200

Pennsylvania
Philadelphia (215) 355-7300

Texas
Austin (512) 258-8848
Dallas (214) 533-4300
Houston (713) 781-6100

Utah
Salt Lake City (801) 268-3779

Wisconsin
Milwaukee (414) 797-7844

HALL-MARK

Hall-Mark Electronics Corp. • Dallas, Texas • Subsidiary of Tyler Corp.

CIRCLE NO. 70 ON INQUIRY CARD

© 1985 Hall-Mark Electronics Corp. 0232-1000

A SUPERIOR PERFORMER

INTRODUCING THE C2600.....THE 613 MEGABYTE, 8-INCH WINCHESTER DISK MEMORY FROM CENTURY DATA SYSTEMS

The C2600, the newest addition to our line of 8-inch Winchester disk memories, provides OEM's capacity, performance and quality in a compact, 8-inch package.

In fact, the C2600 is the highest capacity 8-inch disk memory currently available. Using an ESMD interface, the C2600 offers 613 megabytes of storage with a data transfer rate of 1.813 megabytes per second and an average access time of 15 milliseconds. The C2600 is equipped with eight 8-inch disks, 24 read/write heads and one dedicated servo head with 845 tracks per head. The compact size of the C2600 allows two units to be installed side-by-side in a 19-inch Retma rack. Using thin film technology and simplicity of design, the C2600 is the perfect disk memory for multi-user, multi-task environments.

The C2600 offers OEM's superior capacity and superior performance combined with proven Century Data Systems reliability. For more information contact: Century Data Systems, Product Marketing, 1270 N. Kraemer Blvd., Anaheim, CA 92806 (714) 632-7500.



CIRCLE NO. 71 ON INQUIRY CARD

NEW PRODUCTS SUBASSEMBLIES

Circuit boards suit IBM PC/AT

- Seven DMA channels
- 512K-byte RAM
- Keyboard/speaker

The series of IBM PC/AT-compatible circuit boards, consisting of the Qc1032 processor board, the Qc1033 AT bus-compatible connector board and the Qc1034 memory card, allows system integrators to configure AT-compatible products. Using the 8-MHz, 80286 CPU, the Qc1032 processor includes a proprietary ROM BIOS, seven DMA channels, a keyboard/speaker and external reset interfaces and battery-supported clock/calendar. The Qc1033 bus connector panel has eight slots. Six of these are the two connector slots for AT boards. The remaining two suit standard PC cards. The board fits into a standard AT enclosure or equivalent. Memory for the system is provided by the Qc1034, which comes standard with 512K bytes of parity-checked RAM, expandable to 2.5M bytes. \$995, Qc1032; \$125, Qc1033; \$395, Qc1034. **Quam Corp.**, 2817 Anthony Lane S., Minneapolis, Minn. 55418, (612) 788-1099.

Circle 317

Tape controller works with VMEbus

- Pertec-compatible
- MC68000 CPU
- Two formatters

The V/Tape 3209 tape controller interfaces VMEbus-based systems to Pertec-compatible, half-inch, nine-track tape drives. The device side of the controller supports up to eight tape drives (two formatters with four transports each), with 8K bytes of on-board buffering. Its MC68000 microprocessor relieves system CPUs of tape-handling tasks. Used as a bus master for programmable, 8-, 16- and 32-bit-wide data transfers, the controller frees system CPUs from DMA activities. Addressing can be 16, 24 or 32 bits wide. \$1,750. **Interphase Corp.**, 2925 Merrell Road, Dallas, Texas 75229, (214) 350-9000.

Circle 318

REGIONAL SALES OFFICES

BOSTON

Robert K. Singer
National Sales Manager
John J. Fahey
Regional Manager
Katie Kress
Sales Coordinator
275 Washington St.
Newton, MA 02158
(617) 964-3030

PHILADELPHIA

Stephen B. Donohue
Regional Manager
1873 Route 70, Suite 302
Cherry Hill, NJ 08003
(609) 751-0170
in N.Y.: (212) 972-0058

ATLANTA

Larry Pullman
Regional Manager
6540 Powers Ferry Rd.,
Suite 170
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.
Suite 236
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
Northwestern Region Sales Manager
Rick Jamison
Regional Manager
Kathleen Maxwell
Sales Coordinator
Sherman Building, Suite 100
3031 Tisch Way
San Jose, CA 95128
(408) 243-8838

AUSTRIA/WEST GERMANY

Elan Marketing Group
Neutor g. 2
P.O. Box 84
1013 Vienna, Austria
Tel: 43-222-663012

BENELUX

Elan Marketing Group
BOSCHDIJK 199B
5612 HB Eindhoven
The Netherlands
Tel: 31-40-455724

ISRAEL

Elan Marketing Group
13 Haifa St., P.O. Box 33439
Tel Aviv, Israel
Tel: 972-3-252967
Telex: 341667

JAPAN

Kaoru Hara
General Manager
Trade Media Japan Inc.
Suite 412 Azabu Heights
1-5-10 Roppongi Minato-ku,
Tokyo 106, Japan
Tel: (03) 587-0581

TAIWAN

Donald H. Shapiro
Trade Winds, 2nd Floor
132 Hsin Yi Road, Sec. 2
Taipei, Taiwan
Tel: 3932718
Telex: 24177

UNITED KINGDOM

Elan Marketing Group
5th Floor, Suite 10
Chesham House
136 Regent St.
London W1R 5FA
Tel: 437-6900
Telex: 267653

SWEDEN

Elan Marketing Group
Humlegardsgatan Nr. 5
11446 Stockholm, Sweden
Tel: 46-8-677243

Mini-Micro Marketplace

Carol Flanagan
275 Washington St.
Newton, MA 02158
(617) 964-3030

Direct-Response Postcards

Carol Flanagan
275 Washington St.
Newton, MA 02158
(617) 964-3030

Career Opportunities

Carol Flanagan
Recruitment Advertising Manager
275 Washington St.
Newton, MA 02158
(617) 964-3030

Cahners Magazine Division

William Platt, President
T.M. McDermott, Vice President
Electronics/Computer Group
Tom Dellamaria, VP/Production
Ira Siegel, VP/Research

Promotion Staff

Susan Rapaport
Marketing Communications Director
Mary Gregory
Promotion Manager
Elizabeth Phillips
Marketing Assistant

Circulation

Denver, CO:
(303) 388-4511
Sherri Gronli
Group Manager

ORACLE®

SALES
PARTNER

the portable version of IBM's DB2 and SQL/DS.

DB2 is the hardware dependent
SQL Standard.

ORACLE®
is the hardware independent
SQL Standard.

If your company creates applications we invite you to consider matching your development skills to our application engine, the ORACLE Relational Database Management System – the leader in the Value Added Remarketeer (VAR) industry for DBMS packages.

You have good people. But the tools are letting you down. The new applications you must deliver to your customers just aren't finished fast enough. Additional qualified application developers are scarce and expensive. And any delay lets in the competition. Time-to-market is the key.

ORACLE Corporation can help.

We want to share with you the technical and commercial benefits of building your packages on ORACLE and in remarketing ORACLE. The goal is to cooperate with you, as a technology and marketing partner in building applications that sell.

Ask for ORACLE's Brochure:

Building Software that Sells.

ORACLE® CORPORATION EUROPE

Huizerstraatweg 111, NL-1411 GM Naarden, The Netherlands
Phone: +31 - 2159 - 49344, Telex: 73602 (orce nl), Fax: +31 - 2159 - 48352

Compatibility

The ORACLE relational database management system is fully compatible with IBM's SQL/DS and DB2. SQL/DS and DB2 represent IBM's latest generation of database management technology for IBM's largest computers. ORACLE's capabilities and user interface – the SQL language – are identical to those of SQL/DS and DB2. Programs written for SQL/DS and DB2 will run unmodified on ORACLE.

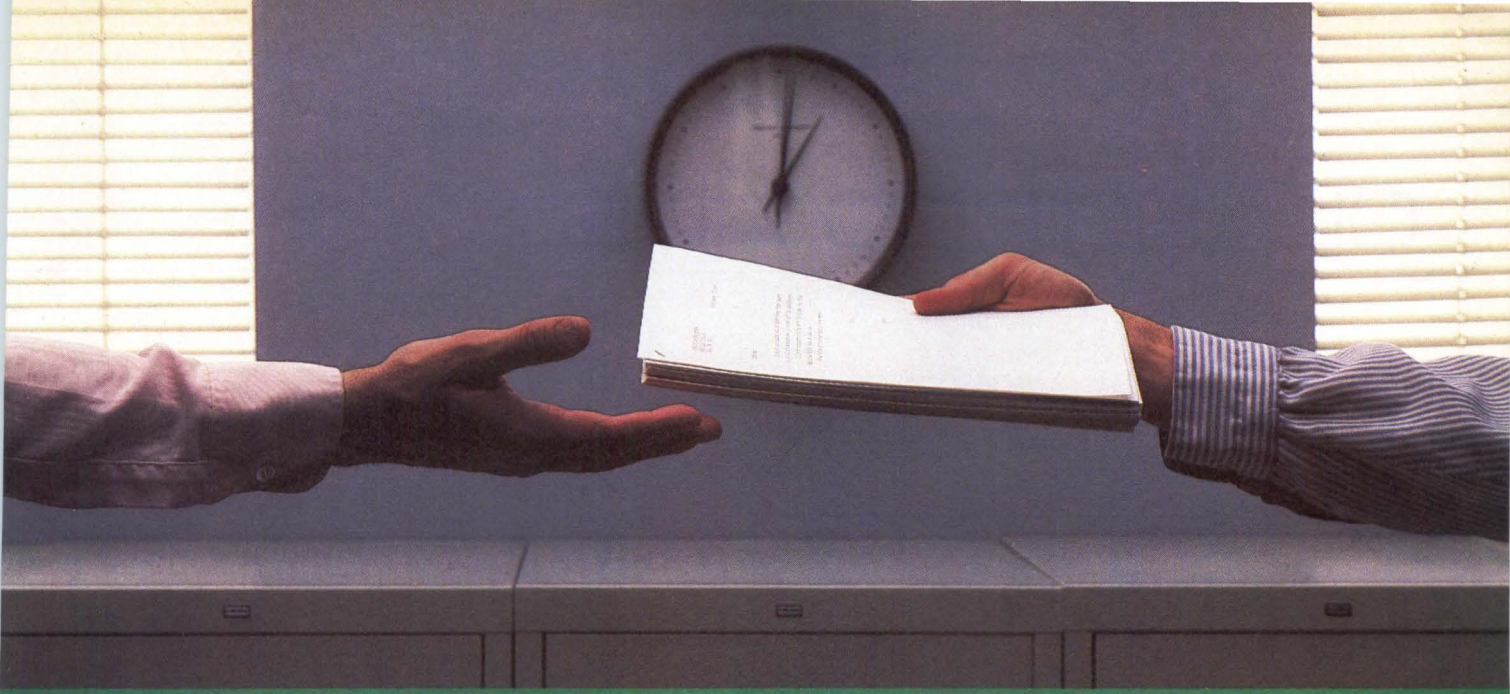
Portability

SQL/DS and DB2 run only on IBM mainframes; ORACLE runs on IBM mainframes, DEC, DG, AT&T, HP, STRATUS, and several other manufacturers' minicomputers, and on a wide range of microcomputers including the IBM PC/XT and PC/AT. All versions of ORACLE are identical and include a complete implementation of SQL – not a subset.

Connectability

Having the same software running on your mainframe, minis, and micros greatly simplifies the task of connecting your machines into a network. ORACLE's network software allows microcomputer users to directly access data stored in the shared database on the mainframe or microcomputer, or copy that data into the database on their micros and operate independently.

CIRCLE NO. 72 ON INQUIRY CARD



2400 bps modems: Do you Really need another speed?

- Is the shift from 300 to 1200 bps going to repeat itself at 2400 bps? The answer is both yes and no. There certainly are applications for 2400 bps asynch dial-up modems, but we shouldn't expect 1200 bps to die overnight.

- 2400 bps modems can improve throughput, thereby getting tasks done quicker and more economically. However, 1200 bps has become the virtual standard for professional dial-up communications, and most users are satisfied with it. So why consider a 2400 bps modem at all?

- One reason is flexibility. If the modem you select operates at all three speeds (300, 1200 & 2400) in accordance with accepted industry standards, it will serve virtually all dial-up applications now and in the foreseeable future.

- The modem you select should be the MultiModem224. It is Bell 212A and 103 compatible at 1200 and 300 bps, and CCITT V.22bis compatible at 2400. It is also 100% compatible with the Hayes command set, meaning that it will work with virtually all communications software packages, at all three speeds. Other features include both synchronous and asynchronous operation, full intelligence and a phone number memory.

- The MultiModem224 is available in both desktop and IBM PC™ internal card versions. (There is also a rack-mounted version for central sites.) And as a bonus, we provide free offers from ten of the most popular on-line information services, including CompuServe™, Dow Jones™ and The Source™.

- A 2400/1200/300 bps modem is just a plain good investment. Why not let the MultiModem224 provide your communications for both today and tomorrow?

For more information, call us toll-free at
1-800-328-9717 (in Minnesota, call 1-612-631-3550).

CIRCLE NO. 57 ON INQUIRY CARD

MultiTech 
Systems

The right answer every time.

82 Second Ave. S.E., New Brighton, MN 55112 (612) 631-3550, TWX: 910-563-3610

MultiTech 
Systems

MultiModem 224
2400/1200/300 BPS Intelligent Modem

1200 Ans
300

CLASSIFIED ADS

This Publication is available in Microform.

University Microfilms International

Please send additional information

for _____
(name of publication)

Name _____

Institution _____

Street _____

City _____

State _____ Zip _____

300 North Zeeb Road, Dept. P.R., Ann Arbor, Mi. 48106

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.

inventions wanted

**INVENTIONS, IDEAS,
NEW PRODUCTS WANTED!**

Presentation to industry.
National Exposition.

Call: 1-800-528-6050, X831
ISC-MMS, 903 Liberty,
Pittsburgh, PA 15222

This space should be
working for you.
For details call:



Linda Lovett
(617) 964-3030

CLASSIFIED ADVERTISING ORDER FORM

Mini-Micro Systems classifieds reach more mini-micro people

Rates: \$90.00 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. _____

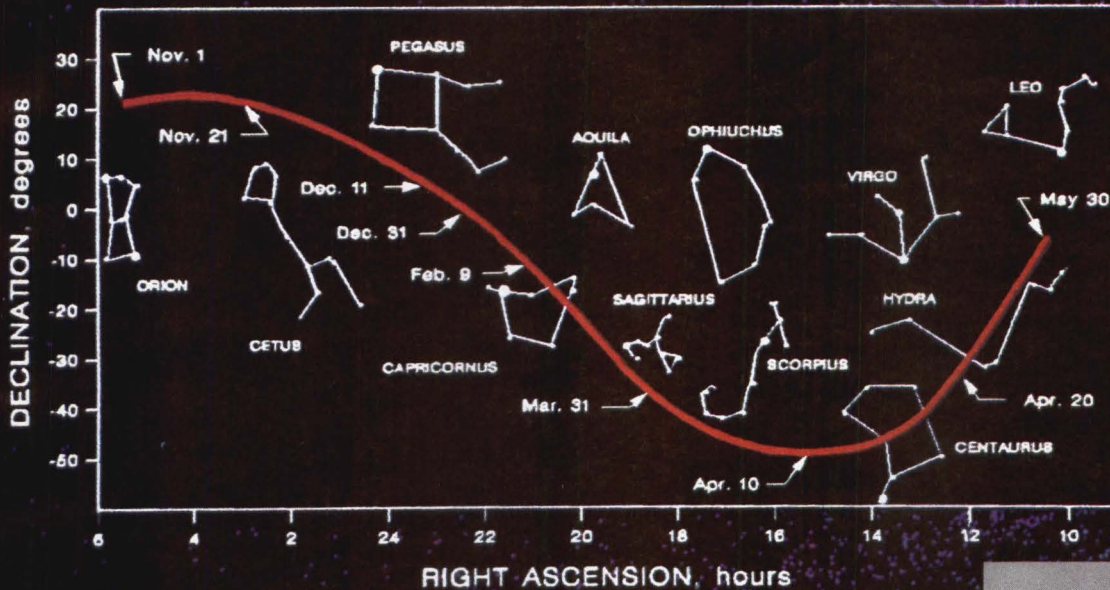
Address _____

City _____ State _____ Zip _____

**MAIL TO: Linda L. Lovett, Classified Advertising, Mini-Micro Systems,
275 Washington St., Newton, MA 02158**

Path of Halley's Comet

1985 - 1986



*Celestial Path of Halley's Comet.
Graphic designed and produced by Michele Matossian. This image was created interactively using PicSure's symbol generation and multichart capabilities. Color palette selection and previewing were done on a Tektronix 4125 connected to a DEC VAX 11/785. The photo was shot directly from the screen of the 4125 on 35mm film. PicSure is machine/device independent.*

Precision Visuals' PicSureTM The Software for Serious Technical Graphics

The Product

PicSureTM is a new conversational computer graphics system for designing and producing charts and graphs without having to learn a computer language. To design a PicSure graphic the user types a series of simple English commands. PicSure turns these commands into the computer instructions for drawing images. PicSure combines ease of use with high performance to give your graphics the quality and precision your data demands.

The User

PicSure's command driven interface makes professional quality graphics easy for any computer user. From novice, to occasional user, to skilled programmer. PicSure users include engineers, scientists, project managers, researchers, system integrators, and other professionals. PicSure's documentation, tutorials, and helpful prompts enable the user to accomplish, in minutes, what used to take hours.

The Environment

PicSure is machine- and device-independent, with streamlined versions for IBM, and DEC minis and mainframes. PicSure users can compose graphs on a range of interactive terminals and engineering workstations. Get fast "snapshot" hardcopies printed on laser, and ink jet printers as well as pen plotters. Create high-quality images on film

recorders. PicSure supports graphics devices from Tektronix, IBM, Hewlett-Packard, DEC, CalComp, Matrix, Zeta and other vendors. Prices vary according to machine types. Prices start at \$2,800 on workstations.

The Features

PicSure is a compact feature-rich program.
 Dynamic input using a joydisk or graphics tablet for interactive positioning. Output to multiple graphics devices from within the program. Read up to 10,000 data points from binary, formatted, or tabular files. Shielding and locator positioning easily places windows to create charts within charts. Color table selection and typeset quality text. Curve fitting and anchored regression lines for rapid data analysis and professional appearance. Programmer interface as a gateway to FORTRAN, enabling the user to access custom subroutines, design logos and icons or read/edit data from databases.

The Applications

Today PicSure is used by scientists, researchers and engineers in fields ranging from biogenetic research to aerospace engineering. Typical uses include: Charting applications that require regular updating, such as graphing test instrument data, or plotting weekly or monthly progress reports. Preparation of text charts for presentations using either overhead trans-

parencies or 35 mm slides. Analysis, reduction, or review of scientific or engineering data. Visual portrayal of trends, projections, and relationships. Publication-quality illustrations for technical publications or management reports.

The Offer

Creating technical graphics from your data is serious business. Let us provide you with the information you need to decide if PicSure is right for your application. Just phone and we'll send you technical information on PicSure, a list of supported systems, a user list and a color mini-poster of the Halley's Comet chart.

Call Jackson Letts at:
303/530-9000.



Precision Visuals[®]

Precision Visuals, Inc.
6260 Lookout Road
Boulder, Colorado 80301 USA
303/530-9000
TELEX (RCA) 296428

PVI Precision Visuals International GmbH
Lyoner Stern, Hahnstrasse 70
D-6000 Frankfurt/Main 71
West Germany Telephone: 49-69/6666 597
Telex: 17-6997150 Teletex: 6997150

The one number to call for Winchester and diskette drive repair.



TRW is the disk drive repair service you can count on! Now you can trust your critical repair requirements to the one company with a successful nationwide reputation in electronics maintenance and repair: TRW Customer Service.

We provide Prompt, Professional and Price Competitive Repair Services to meet your Winchester and diskette drive repair needs. Our new Electronics Industry Services capabilities include state-of-the-art Centralized Repair Centers, complete with an east coast Class 100 HEPA environment and

a service history that is truly unsurpassed!

Our repair centers are staffed with teams of factory-trained technicians. These experts have been trained by the same people who built your disk drives and have an established reputation for meeting and exceeding exacting OEM material and calibration specifications. This training and experience provides you with a full "No Questions" 90 Day Warranty on our repairs.

For professional, fast disk drive repairs call TRW. The source for disk drive repair. 1-800-922-0897.

TRW Customer Service

15 Law Drive
Fairfield, NJ 07006

**Nationwide
Service From
A Company
Called TRW**

Buy your computer's memory a little Life Insurance

You've all heard of blackouts, brownouts, lightning surges and those nasty things that can ruin your computer's memory. But, what about noise on your AC line that causes electrical fluctuations that can have your system spit out wrong information? Maybe your building has a poor grounding situation, or the elevator motor causes interference. Heavy machinery, construction equipment and power company switching can create real problems.

RTE DELTEC specializes in equipment that protects your large or small computer system from all of these things. Here are some of them.

① On-Line Uninterruptible Power Systems

Single and Three Phase, 3KVA to 45KVA, 50 and 60Hz
RTE DELTEC on-line UPS provide complete protection against blackouts, brownouts, spikes, surges and sags, in short, any disturbance in your power line. All standard 60Hz models are available with stock to 3-week delivery; 50 Hz models are stock to 6 weeks.

② AC Line Conditioners

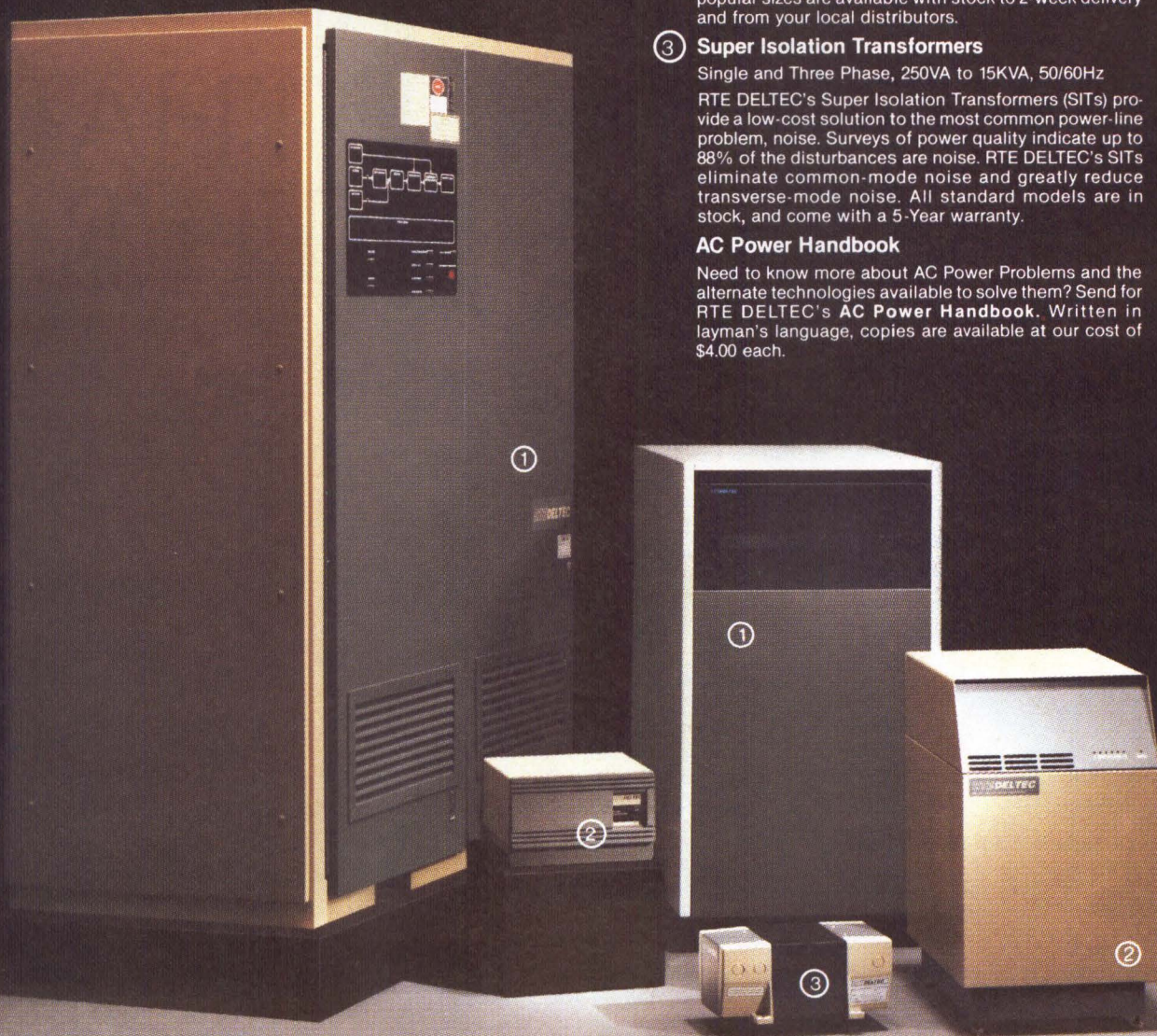
Single and Three Phase, 500VA to 45KVA, 50 and 60 Hz
RTE DELTEC AC Line Conditioners eliminate power line noise and regulate AC line voltage to within the tight limits modern computers require. In fact, they solve all power-line problems except outages (only an UPS will handle those.) RTE DELTEC has a complete selection of compact, silent electronic AC Line Conditioners. All popular sizes are available with stock to 2-week delivery and from your local distributors.

③ Super Isolation Transformers

Single and Three Phase, 250VA to 15KVA, 50/60Hz
RTE DELTEC's Super Isolation Transformers (SITs) provide a low-cost solution to the most common power-line problem, noise. Surveys of power quality indicate up to 88% of the disturbances are noise. RTE DELTEC's SITs eliminate common-mode noise and greatly reduce transverse-mode noise. All standard models are in stock, and come with a 5-Year warranty.

AC Power Handbook

Need to know more about AC Power Problems and the alternate technologies available to solve them? Send for RTE DELTEC's **AC Power Handbook**. Written in layman's language, copies are available at our cost of \$4.00 each.



RTE DELTEC

2727 Kurtz St. • San Diego, CA 92110 • Tel. (800) 854-2658 • (619) 291-4211 (in California) • TWX 910-335-1241

CIRCLE NO. 75 ON INQUIRY CARD

AT LAST, I/O CONTROLLERS BUILT ON THE PREMISE THAT FASTER IS BETTER.

Your system's performance isn't what it could be.

It could be faster than a main-frame. How?

By adding an Adaptec controller.

They're used in everything from low-cost, single-user micros to multi-user, multi-tasking, UNIX™ based systems.

In every instance, our controllers have led to increased data transfer rates and faster access to data.

©1985, Adaptec, Inc. UNIX is a trademark of AT&T.

Often as much as five times faster. Regardless of which processor or drive you're using. Including the fastest SMD and ESDI drives.

Naturally, we have the performance features to prove it. As well as the customers. Like Daisy Systems, Intergraph, PRIAM, Sun Microsystems and Tektronix to name only a few.

We also have a brochure.

It explains our high-performance

chips, chip sets and controller boards in detail. For your copy, call 408/946-8600, ext. 400.

Or write Adaptec, 580 Cottonwood Drive, Milpitas, CA 95035.

Because, at Adaptec, we believe if your system is worth making, it's worth making it faster.

That's the premise anyway.

adaptec

CAREER OPPORTUNITIES/ RECRUITMENT ADVERTISING

Rates

	Page	3/4	1/2	1/3	1/4	Col. Inch
1 x	\$4,475	\$3,425	\$2,340	\$1,750	\$1,170	\$120
3 x	4,235	3,300	2,245	1,690	1,105	110
6 x	4,105	3,200	2,175	1,625	1,075	105
9 x	3,985	3,100	2,110	1,575	1,040	100
12 x	3,850	3,005	2,050	1,560	1,015	95
15 x	3,735	2,915	1,985	1,510	980	85
18 x	3,590	2,800	1,910	1,495	950	80
24 x	3,525	2,750	1,875	1,430	925	75

Circulation

Over 137,000 technically sophisticated professionals in computer operations/systems management, data communications, engineering management, systems engineering/integrators, educators and systems programming specialists.

Recruitment
Hot Line

(617) 964-3030

Call your ad in—
we'll set the type
at no charge.

Mail Film to:

Carol Flanagan
Recruitment Manager

CAHNERS PUBLISHING CO.
275 Washington St.
Newton, MA 02158

EMPLOYMENT SERVICE FOR PROGRAMMERS AND ANALYSTS

National Openings With Client Companies
and Through Affiliated Agencies

Scientific and commercial applications • Software development and systems programming • Telecommunications • Control systems • Computer engineering • Computer marketing and support

Call or send resume or rough notes of objectives, salary, location restrictions, education and experience (including computers, models, operating systems and languages) to either one of our locations. Our client companies pay all of our fees. We guide; you decide.

RSVP SERVICES, Dept. MM
Suite 700, One Cherry Hill Mall
Cherry Hill, New Jersey 08002
(609) 667-4488

RSVP SERVICES, Dept. MM
Suite 201, Dublin Hall
1777 Walton Rd., Blue Bell, PA 19422
(215) 629-0595

From outside New Jersey, call toll-free 800-222-0153

RSVP SERVICES

Employment Agents for Computer Professionals

CIRCLE NO. 240 ON INQUIRY CARD

DIRECTOR OF ENGINEERING & MANUFACTURING

Education: MS in EE or CS, or MBA with BS in EE or CS, knowledgeable in product introduction, engineering design, and production management.

Experience: Substantial experience in project management and production in microcomputer or related industry.

Skills: Good verbal and written communications skills, proven supervisory and organizational skills.

Salary: Negotiable.

Send resumes and salary history to:

Regency Systems, Inc.
Attn: President
P.O. Box 3578
Champaign, IL 61821

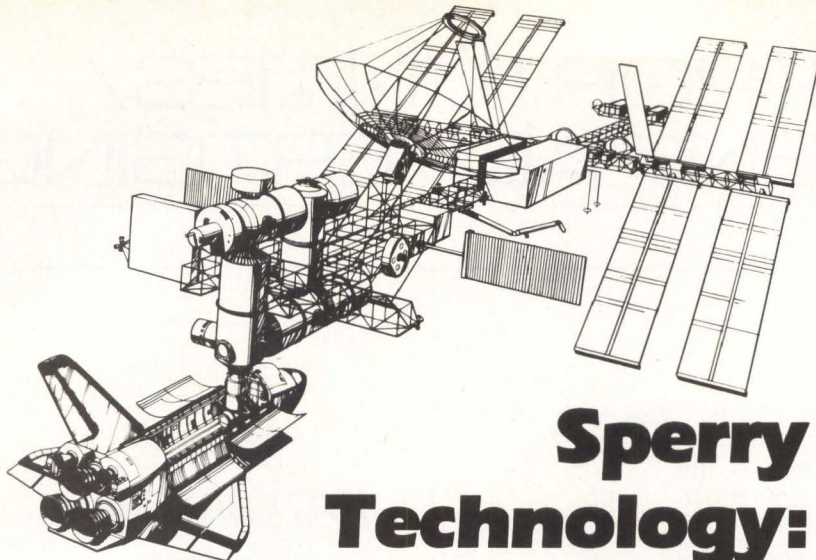
CIRCLE NO. 241 ON INQUIRY CARD

**Let this space
do the work
for you**

call or write for more information:

Carol Flanagan
MINI-MICRO SYSTEMS
275 Washington Street
Newton, MA 02158
617-964-3030 ext. 413

CIRCLE NO. 242 ON INQUIRY CARD



Sperry Technology: Preparing for tomorrow's challenges

Sperry's Space Systems Division is developing advanced programs for the Space Station and a number of other spaceborne systems. Our programs involve challenging positions in both test systems and software/hardware applications. Sperry invites you to explore the following career opportunities:

Test Systems Engineers

Hardware and software positions are available for the development of test systems for spacecraft attitude control components, mechanisms, subsystems, and data management hardware. Positions open include test system design, test hardware development, test software development and system simulation. To qualify for software and systems positions, you should be familiar with HP-1000 and HP-9800 series hardware and software or with the MC68000 microprocessor, Unix operating system, "C" and ATLAS languages. Test hardware development will require and background in analog or digital circuit design.

Integration/Test Engineers

In this assignment you will prepare for and execute the integration and test of spacecraft control subsystems, spacecraft mechanisms, and data management systems. Activities will include test planning and procedure generation, test fixture specification, test monitoring, failure investigation and orbital anomaly analysis. You should have experience in integration and testing of complex electromechanical systems or electronic data management systems, and be familiar with spacecraft control components and automated test systems.

Hardware/Software Specifications

To qualify for this assignment you will need five or more year's experience in transforming system level requirements into detailed equipment hardware and software definitions, interface documents, mechanization diagrams and end-item specifications.

Minimum requirements include three or more year's experience and BS degrees in EE, ME, CS or Physics.

Take the Challenge

Find out about our generous salary and benefits package. Send your resume and salary history, in confidence, to Clarence Williams, Sperry, (MMS-E667), DV5C, P.O. Box 29222, Phoenix, AZ. 85027



Equal Employment Opportunity/Affirmative Action Employer
U.S. citizenship is required

Mini-Micro Systems

*delivers an audience
of
qualified computer
professionals
with titles
like these:*

- Software Engineer
- System Designer
- Project Engineer
- Systems Application Engineer
- Technical Staff Members
- MIS Director
- Network Planner
- Communication Manager
- Data Processing Manager
- Systems/Programming Specialist
- Instructors of Computer Technology
- Marketing Director
- Director of R&D
- Systems Engineering

Located within
industries like:

- Manufacturing
- Government
- R&D
- Education
- Computer Services
- Data Processing Services
- Utilities
- Finance
- Trade

For more information contact:
Carol Flanagan
Recruitment/Career Opportunities
275 Washington Street
Newton, MA 02158
617-964-3030 ext.413

New, free 1986 Salary Survey!

Understanding which technologies and markets are on the rise and which are on the wane can be important to your long-term career growth. If you keep up with new trends and tailor your professional plans accordingly, you can make sharp gains in your compensation and career.

Comprehensive data on industry trends and salaries

The new 1986 *Computer Salary Survey and Career Planning Guide* is based on information from more than 48,000 computer professionals and 36,000 firms across North America. Over sixty position titles are reviewed including those in programming, systems analysis, software engineering, EDP auditing, office automation, operations, computer sales, marketing, technical support, management and more. You'll learn whether your salary is keeping pace with your peers, what you can expect to earn as you advance, and how to direct your career by taking advantage of emerging trends.

Free to computer professionals

This valuable 24-page Survey is available without charge. Since 1966 we have distributed over one-half million copies to other professionals like you who are determined to realize their fullest career potential. You owe it to yourself to be informed. Contact us today.

Call today

To receive your free copy call the the Source Edp office nearest you.

United States:

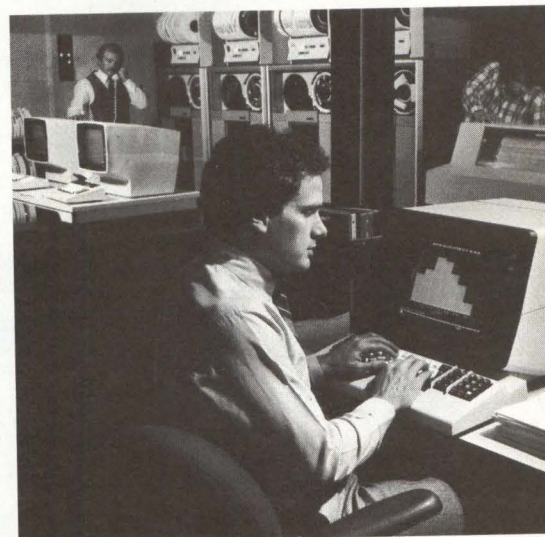
Alabama	
Birmingham	205/322-8745
Arizona	
Phoenix	602/279-1010
Tucson	602/792-0375
California	
Northern	
Mountain View	415/969-4910
Sacramento	916/446-3470
San Francisco	415/434-2410
Walnut Creek	415/945-1910
Southern	
Fullerton	714/738-1313
Irvine	714/833-1730
Los Angeles	
Downtown	213/688-0041
South Bay	213/540-7500
West	213/203-8111
San Diego	619/573-0100
San Fernando Vly	818/781-4800
Colorado	
Colorado Springs	303/632-1717
Denver	303/298-8268
Englewood	303/773-3700
Connecticut	
Danbury	203/797-0590
Hartford	203/522-6590
New Haven	203/787-4595
Stamford	203/967-4888
Stratford	203/375-7240
Waterbury	203/574-5633
Delaware	
Wilmington	302/652-0933
District of Columbia	
Washington D.C.	202/293-9255

Florida	
Fort Lauderdale	305/491-0145
Jacksonville	904/356-1820
Melbourne	305/725-3095
N. Miami Beach	305/940-1014
Orlando	305/282-9455
Tampa	813/251-3215
Georgia	
Atlanta/Downtown	404/588-9350
Atlanta/North	404/953-0200
Atlanta/Perimtr.	404/255-2045
Illinois	
Chicago/E. Loop	312/861-0770
Chicago/W. Loop	312/346-1280
Oak Brook	312/986-0422
Peoria	309/673-0274
Rolling Meadows	312/392-0244
Indiana	
Fort Wayne	219/432-7333
Indianapolis	317/631-2900
Iowa	
Des Moines	515/243-0191
Kansas	
Overland Park	913/888-8885
Wichita	316/688-1621
Kentucky	
Louisville	502/581-9900
Louisiana	
Baton Rouge	504/924-7183
New Orleans	504/561-6000
Shreveport	318/222-6188
Maryland	
Baltimore	301/727-4050
Beltsville	301/595-4884
Columbia	301/730-6833
Rockville	301/258-8800
Towson	301/321-7044
Massachusetts	
Boston	617/482-7613
Burlington	617/273-5160
Springfield	413/739-4080
Wellesley	617/237-3123
Michigan	
Detroit	313/259-7607
Grand Rapids	616/459-6539

Lansing	517/484-4561
Southfield	313/352-6520
Troy	313/362-0070
Minnesota	
Bloomington	612/835-5100
Minneapolis	612/332-6460
St. Paul	612/227-6100
Mississippi	
Jackson	601/354-7900
Missouri	
Kansas City	816/474-3393
Clayton	314/862-3800
St. Louis	314/576-4444
Nebraska	
Omaha	402/346-0709
New Hampshire	
Nashua	603/888-7650
New Jersey	
Cherry Hill	609/488-5400
Clifton	201/473-5400
Edison	201/494-2800
Morristown	201/267-3222
Paramus	201/845-3900
Princeton	609/452-7277
Somerset	201/469-9444
New Mexico	
Albuquerque	505/247-4270
New York	
Albany	518/482-2035
Buffalo	716/855-0400
New York City	
Grand Central	212/557-8611
Penn Station	212/736-7445
Wall Street	212/962-8000
Rochester	716/263-2670
Syosset, L.I.	516/364-0900
Syracuse	315/422-2411
White Plains	914/694-4400
North Carolina	
Charlotte	704/552-6577
Greensboro	919/379-1155
Raleigh	919/847-7605
Winston-Salem	919/724-0630

Ohio	
Akron	216/535-1150
Cincinnati	513/769-5080
Cleveland	216/771-2070
Columbus	614/224-0660
Dayton	513/461-4660
Toledo	419/242-2601
Oklahoma	
Oklahoma City	405/722-7410
Tulsa	918/599-7700
Oregon	
Portland	503/223-6160
Pennsylvania	
Harrisburg	717/233-8066
King of Prussia	215/265-7250
Philadelphia	215/665-1717
Pittsburgh	412/261-6540
Rhode Island	
Providence	401/751-0065
South Carolina	
Columbia	803/256-7446
Greenville	803/271-7044
Tennessee	
Chattanooga	615/265-8890
Memphis	901/525-0743
Nashville	615/256-0625
Texas	
Austin	512/479-0720
Dallas	
Central	214/954-1100
North	214/387-1600

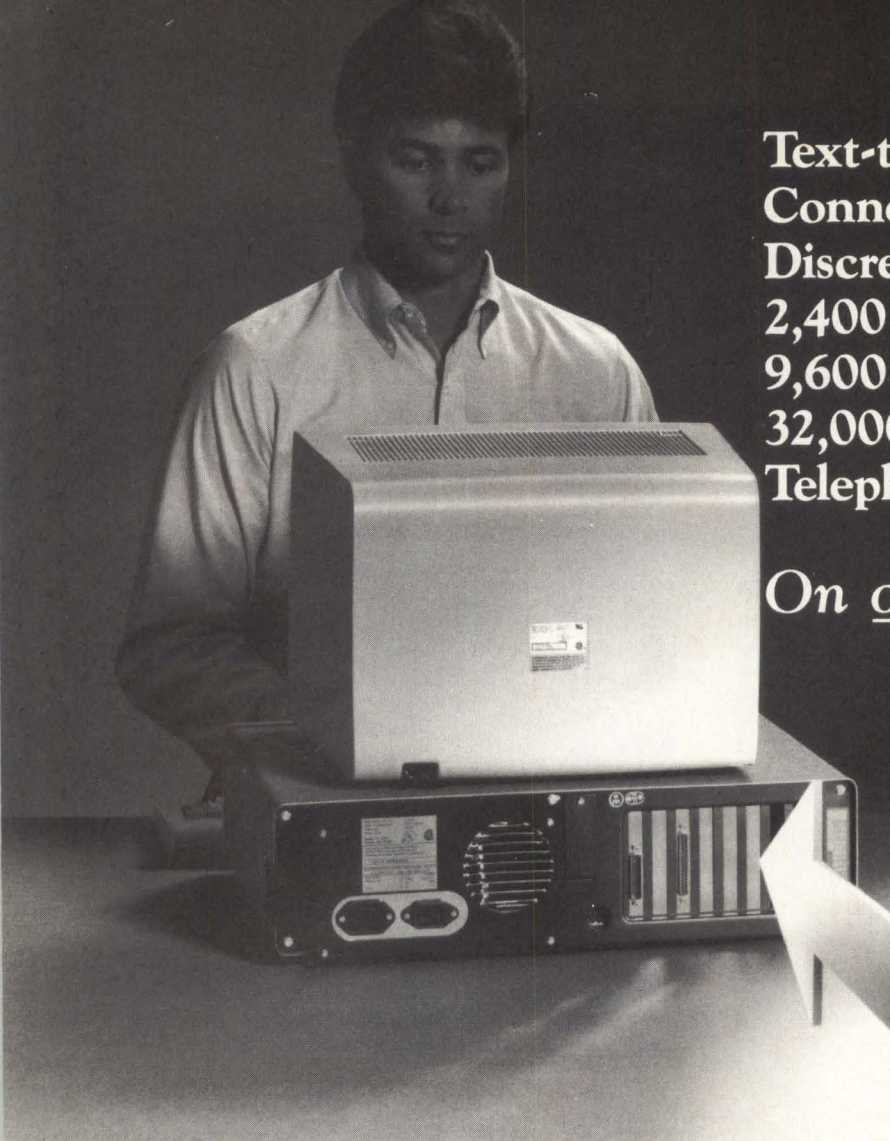
El Paso	915/532-6316
Fort Worth	817/338-9300
Houston	
Downtown	713/751-0100
Galleria/Post Oak	713/439-0550
San Antonio	512/342-9898
Utah	
Salt Lake City	801/966-3900
Virginia	
McLean	703/790-5610
Washington	
Seattle	206/454-6400
Spokane	509/838-7877
Wisconsin	
Green Bay	414/432-1184
Madison	608/251-0104
Milwaukee	414/277-0345
Canada:	
Alberta	
Calgary	403/279-1940
Edmonton	403/459-1153
British Columbia	
Vancouver	604/222-1155
Manitoba	
Winnipeg	204/942-1151
Ontario	
Mississauga	416/848-3344
Toronto	416/591-1110
Willowdale	416/495-1551



source edp[®]
Personnel Services

source edp[®]
Personnel Services

The world's largest recruiting firm devoted exclusively to the computer profession. Client companies assume our charges.
Department 741, P.O. Box 7100, Mountain View, CA 94039. (When writing, please include your title.)



Text-to-Speech
Connected Word Recognition
Discrete Word Recognition
2,400 bps Record and Playback
9,600 bps Record and Playback
32,000 bps Record and Playback
Telephone Interface (optional)

On one PC option board!

The TI-Speech™ option says it all ...for under \$1,000.

The TI-Speech option gives you versatile speech capabilities on one plug-in option board—for both the Texas Instruments Professional Computer family and IBM® Personal Computer products.*

The Text-to-Speech capability allows any English information stored as ASCII text to be spoken—and the natural, computer-generated voice provides the flexibility of an unlimited vocabulary.

Connected word recognition lets the computer understand specific commands spoken in a natural, conversational manner. For situations that require it, discrete word recognition allows the computer to listen for specific commands spoken individually. In either case, spoken commands can replace a number of predetermined keystrokes.

You get a range of 2,400, 9,600, or a full 32,000 bps for voice storage and playback. This lets you balance the maximum recording time with high-quality, natural voice output, depending on your application requirements.

With the optional telephone interface, your computer can place a telephone call, send and receive Touch Tone® signals, or answer your phone. You may combine any of the telephone and speech functions to create applications that can dramatically extend the capabilities of your computer.

Let's start talking.

For more information on the TI-Speech option and how you can get started, call

CIRCLE NO. 77 ON INQUIRY CARD

us toll-free at 1-800-527-3500. If you want to hear an example of TI-Speech, call 1-512-250-4114 (this is a toll call).

*(Not for use on the TI Pro-Lite™ computer or the IBM PCjr™ computer.)

TI-Speech and Pro-Lite are trademarks of Texas Instruments.

IBM is a registered trademark and PCjr. is a trademark of International Business Machines Corporation.

Touch Tone is a registered trademark of AT&T.

© 1985 TI

TEXAS 
INSTRUMENTS

Creating useful products
and services for you.

ADVERTISERS' INDEX

Adaptec Inc.	126	Maxtor Corp.	112
Alloy Computer Products	73	Micro Data Base Systems	52
Carterfone Communications Corp.	86	Microdesign International	114
Century Data Systems (a Xerox Co.)	118	Mini & Micro Educational Services	D11
Cipher Data Products Inc.	92-93	Motorola Semiconductor Products	30-31
CMS	94	Multi-Tech	121
Convergent Technologies.	10-11	National Instruments.	116
Dataram	D6	NCR Corp.	61
Datasouth Computer Corp.	48	NEC Peripherals	21
Data Technology Corp. (DTC)	54	Optotech	24
Digital Equipment Corp.	22-23	Oracle	120
Digital Research	91	Optical Storage International (CDC)	42-43
Dilog (Distributed Logic Corp.)	110	Pelikan	101
E J Krause	29	Pertec Peripherals Corp.	8
Electronic Processors Inc. (EPI)	58	Pioneer Research	77
Electronic Solutions	Cov. 2	Polygon	111
EMC	35	Precision Visual	123
Emerson Electric	90	RDBS-Relational Database Systems.	89
Equinox Systems	Cov. 3	RTE/Deltec	125
ExpoConsul International	D3	Santa Cruz Operations.	51
Facit Data Products.	38-39	Seed Software	D5
Falco Data Products.	57	Sharp IED	104
Fujitsu America Inc. Storage Division	114-115	Silicon Systems	62
General Power Systems.	45	Sperry Univac.	6-7
Hallmark/Micropolis	117	Tandberg Data Inc., Data Storage Div.	82
Hallmark/Motorola	37	TEAC Corp.	64
Hallmark/NEC	80-81	Telebyte Technology.	100
Hamilton/Avnet Electronics	74	TeleVideo Terminals	65-70
Hamilton Standard	36	Texas Instruments Inc.	130
Hayes Microcomputer Products.	78	Toshiba.	102-103
Hewlett-Packard Co.	12-13	Touchstone Technology Inc.	44
Hitachi America Ltd.	108-109	TransNet Corp.	100
Human Design Systems Inc. (HDS)	D10	TRW Inc./Customer Service Div.	124
Ibex Computers Corp.	9	Unify Corp.	46-47
ID Systems	D9	Universal Data Systems Inc.	Cov. 4
Illbruck/USA.	106	U.S. Design Corp.	D12
Imperial Technology Inc.	4	Versatec Inc. (a Xerox Co.)	207
Infotron Systems Corp.	1	Wyse Technology.	40
Interface Group	85, 134		
JDL	32	See P. 126 for Classified Advertisers	
Keytronics	14	See P. 127-129 for Career Opportunity Advertisers	
Logicraft	D4	See P. 132-133 for Mini-Micro Marketplace	
Macrolink.	17		
Matrox Electronic Systems Ltd.	18		

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

MINI-MICRO MARKETPLACE

A special section for advertisers of hardware, software and services.

READERS: Please circle reader service numbers on Reader Inquiry Card for additional information.



**GTR01
BIT-MAP
DISPLAY
TERMINAL**

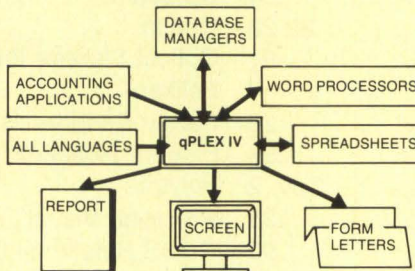
- High Resolution 1024 x 768 Display
- User Programmable MC68000
- Up to 2MB Memory
- RS232C & RS422 Interfaces to 1 Mbps
- Tektronix 4010/4014, VT100 & VT52 Compatible

EASTMARK, INC.

240 SMITH STREET, LOWELL, MA 01851 (617) 453-9150
VT100 & VT52 are registered trademarks of Digital Equipment Corp.
Tektronix is a registered trademark of Tektronix Corp.

CIRCLE NO. 201 ON INQUIRY CARD

REPORT WRITER



All-language qPLEX IV lets you select or sort your own special forms, reports, labels, bar graphs or queries. Export your reports to spreadsheets and word processors. Reads Basic, Assembler, Pascal, C, Fortran, Cobol, ASCII, Data Base Managers and more. Dealer demos available. MSDOS, Xenix, Unix.

Snow Software Corporation
3330 Fisher Road
Clearwater, FL 33519
(813) 784-8899

CIRCLE NO. 202 ON INQUIRY CARD

T-310 Telephone Access Unit



Connect the unlimited capabilities of your computer to the telephone system

- A complete telephone line controller
- FCC-approved for direct connection
- RS-232 compatible
- Provides call following
- Couples audio sources (speech synthesizers, tape players) onto the phone line
- Permits remote data entry from any Touch-Tone phone anywhere
- Offers incoming call security—up to 15 digits
- Priced at less than \$375, including power supply and phone cord

Use the T-310 and your computer to dial and control outgoing calls or receive incoming calls—automatically! For more information, call Teltone today:

(206) 827-9626, ext. 437



Teltone Corporation, P.O. Box 657
Kirkland, WA 98033

In Canada contact Teltone Ltd., 183 Amber St., Markham, Ontario L3R 3B4, (416) 475-0837

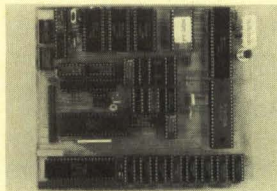
CIRCLE NO. 205 ON INQUIRY CARD

6809 SINGLE BOARD COMPUTER

The PT-69, a powerful computer system on a single board, performs equal to larger and more expensive systems. It features:

- OS/9 Operating System (Optional)
- 2 8-Bit Parallel Ports
- 2 RS-232 Ports
- Time-of-day Clock
- 56K RAM; 4K EPROM
- Controls up to 4 DS/DD 5 1/4" Drives

OEM PRICE: \$185



FLOPPY/HARD DISK SYSTEMS AVAILABLE

PERIPHERAL TECHNOLOGY
1480 Terrell Mill Rd., Suite 870
Marietta, GA 30067
404/984-0742

* OEM Qty is 100.
OS/9 is a trademark of Microware and Motorola.

CIRCLE NO. 203 ON INQUIRY CARD

PRINTERS.

Available for immediate delivery

DYNAX DM20 – Panasonic 1093 compatible	\$ 299.00
C6400 40 cps Daisywheel – C Itoh F1040	\$ 465.00
Diablo 620 API – Parallel/Serial/IEEE	\$ 385.00
All Machines are Brand New – Factory Boxed.	

COMPUTERS.

IBM PC-XT Compatibles:-

256K, 2FDD, Graphics, Parallel Port, K/board	\$ 995.00
640K, as above PLUS Serial/Game/Clock/Cal	\$1295.00
640K, 1FDD, as above PLUS 20 Meg. Hard Disk	\$1795.00
PC-AT Compatible, 512K, 1.2FDD, K/board	\$1995.00
PC-AT Com. 1024K, 1.2FDD, 20 Meg. Hard Disk	\$2995.00
Xidex Diskettes DS/DD per box of 10	\$ 10.95
Adivan Diskettes DS/DD –AT – per box 10	\$ 26.95
M/Card – VISA, C.O.D. Cal. Res. add 6.5% Sales Tax	
TW Inc., 3359 Mount Diablo Blvd., Lafayette, CA 94549 415-283-5833/4 Telex 172551	

CIRCLE NO. 204 ON INQUIRY CARD

Get the whole story on graphics terminal emulation.

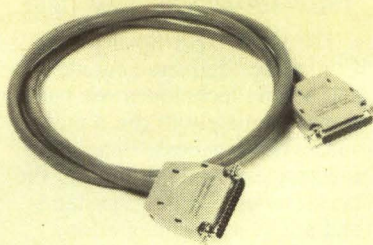


To find out more about software that lets your PC emulate TEKTRONIX™ 4105/6/7/9 and DEC VT100™ terminals, call or write:

GRAFPOINT

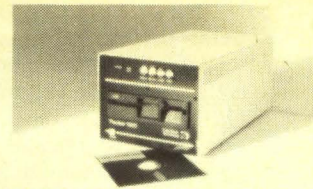
4340 Stevens Creeks Blvd., Suite 280,
San Jose, CA 95129 (408) 249-7951

CIRCLE NO. 206 ON INQUIRY CARD



EIA CABLES—FIVE DIFFERENT KINDS of this most frequently used interface including Regular, Extended Distance, Flame Retardant, Shielded, Shielded Extended Distance. Order exact lengths you need, 4 to 50 conductors, standard pinning or to your specs; quick delivery. RS 232-C-25 conductors, all connected \$16 plus 50¢/ft. Free new catalog—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



IBM PC COMPATIBLE STAND ALONE RS-232-C FLOPPY DISC DATA COLLECTION SYSTEM

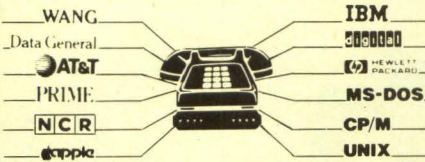
- Reads and writes IBM PC DOS 2.0 compatible 5¼ discs
 - Dual RS-232-C ports with independent switch selectable baud rates to 19.2K
 - Power fail restart with No Data Loss
 - Manual front panel or remote operation with English or ASCII control code commands
 - On-board disc formatting, no program loading
- Tracker 1400's low quantity price of 1200\$ makes it ideal for data collection from loggers &/or information transfer from Non-IBM compatible systems to the IBM PC.

Data Track USA

Data Track USA
9451 Sohap Lane
Columbia, MD 21045
301-992-9143

CIRCLE NO. 208 ON INQUIRY CARD

BLAST



PC-MINI-MAINFRAME COMMUNICATIONS SOFTWARE

ANY COMPUTER WITH BLAST CAN TALK TO ANY OTHER COMPUTER WITH BLAST, the universal file transfer utility linking many different computers, operating systems, and networks, via RS 232 serial ports

NO ADD-ON BOARDS TO BUY! BLAST software uses any asynchronous modems or direct connect for fast, error-free data transfer through noisy lines and PBXs, across LANs, and over satellites or packet switched networks

THE PERFECT LOW-COST LINK FOR PC's, MINIS, MAINFRAMES Transfer binary or text files, or executable commands. Use BLAST standalone, or build it into your application.

\$250/ Micros \$495-895/ Minis \$2495/ up Mainframes

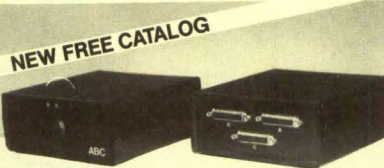
COMMUNICATIONS RESEARCH GROUP

(800)-24-BLAST

CIRCLE NO. 209 ON INQUIRY CARD

CRAIG DATA CABLE FREE!!

SURGE PROTECTOR, MINI-TESTER, MINI-PATCH BOX, GENDER MENDER, ABC RS232 DATA SWITCH. CIRCLE, WRITE, CALL TO FIND OUT HOW!!



ABC RS232 DATA SWITCH ONLY \$69.95

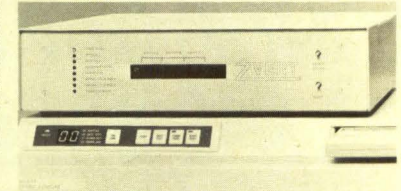
THIS UNIT PERMITS YOU TO SHARE BETWEEN PERIPHERALS WITHOUT HAVING TO CHANGE CABLES. DURABLE ROTARY SWITCH. 1 YEAR WARRANTY. NO POWER REQUIRED. ALSO AVAILABLE IN CENTRONICS AND COAX INTERFACES AS WELL AS ABCDE BOXES!

800-243-5760 203-356-9315

652 GLENBROOK ROAD, STAMFORD, CT 06906
VISA & MASTERCARD NOW ACCEPTED

CIRCLE NO. 210 ON INQUIRY CARD

NEW RELEASE



LASER TECHNOLOGY Developmental Breakthrough In Word Processing

Guaranteed compatibility to the following systems:

- | | |
|---------------------|--------------------|
| 5000 SERIES | NEC |
| Philips/Micom | QUME |
| CPT | ECS SERIES |
| Harris/Lanier | Scientific |
| NBI | 100 SERIES |
| Vector Graphics | IBM |
| AM/AC Jacquard | IBM Compatibles |
| Xerox | Displaywrite 2 & 3 |
| Wang | Serial/RS 232 |
| 600 SERIES | Parallel/ |
| Burroughs | Centronics |
| AT & T | AX SERIES |
| Convergent | Foreign Languages |
| Technology | on all IBM PC's |
| Diablo 630 | |
| Motorola/Four Phase | |

- Full emulation allowing absolutely no change to current software or hardware
- On Hewlett-Packard approved hardware solutions list (most recent)
- Electronic 3-way printer sharer/allowing simultaneous workload
- All current word processing features and benefits still available, yet now at laser speed
- Prints bolds, italics, foreign languages and bold italics
- World-wide service/support/maintenance/30-day trial/90-day warranty

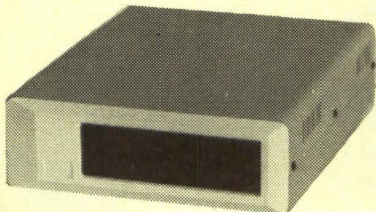
ZVERT LASER SOLUTIONS BEAM YOU LIGHT YEARS AHEAD OF TIME

ZVERT (714)-675-2525
323 Larkspur Ave. TLX: 6501760525 MCI
Corona Del Mar, CA 92625

FASTER PRINT QUALITY OUTPUT • NO RETAINING DOWNTIME • DISPOSABLE INK CARTRIDGE

CIRCLE NO. 213 ON INQUIRY CARD

ENCLOSURE PRODUCTS

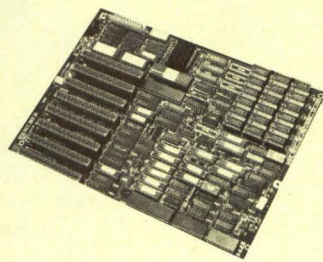


- Floppy and Hard Disk Drives Enclosures for all Major Micros.
- Xebec Controllers Optional
- Custom Design Available
- Class 'B' Certification Support Can Be Provided
- Call For Pricing and Catalog

Microware Inc.

41711 Joy Road • Canton, MI 48187
(313) 459-3557

CIRCLE NO. 211 ON INQUIRY CARD



8 Mhz 80286 IBM PC/XT MOTHERBOARD

- 9 Times Faster Than PC; 65% Faster Than AT
- 1MB Ram On-Board; Zero Wait States
- Optional 80287 Math Co-Processor
- PC/XT Hardware & Software Compatible
- Supports PC-DOS, Unix, Pkix, CP/M-86, SMC OS

XXX

WAVE MATE, Inc.

14009 S. Crenshaw Blvd.

Hawthorne, CA 90250

(213) 978-8600 TLX 194369

In Europe: Brussels 649-1070 TLX 61828

CIRCLE NO. 212 ON INQUIRY CARD

You're in a race. To find and sell better products. To make more profit. To attract more customers and increase volume sales.

COMDEX/Spring '86 delivers new products and selling strategies that can help you lead the race, all year long. You'll see the latest products from hundreds of key manufacturers—products that your customers will look for in the important Fall and holiday selling periods.



THE COMDEX CONFERENCE: THE VALUE-ADDERS' ADVANTAGE

The COMDEX/Spring Conference delivers new ideas and selling techniques you can use immediately to run a more successful business. Leading industry experts will present the latest in value adding, systems and applications integration, communications, multi-user systems, and the new wave of "ESP" (Expert Systems Programs) software.

Pull ahead of the competition with products and added value

that will pull new customers into your business.

Complete and return the attached coupon today for registration and travel information for COMDEX/Spring '86.

Presented by



**THE
INTERFACE
GROUP, Inc.**

Conference and Exposition Producers
300 First Avenue, Needham, MA 02194

PULL AHEAD OF THE COMPETITION AT COMDEX®/SPRING '86.



COMDEX/SPRING '86

April 28–May 1, 1986
Georgia World Congress Center
Atlanta, Georgia

YES! I want to pull ahead in sales and profits at COMDEX/Spring '86. Please send me complete information and registration forms.

Name _____

Title _____ Phone () _____

Company _____

Address _____

City _____ State _____ Zip _____

Complete and return immediately to: COMDEX/Spring Attendee
Registration, 300 First Avenue, Needham, Massachusetts 02194



We demo our Data PBX on-site. (They just send brochures.)

Since we introduced our first Data PBX two years ago we've been doing things that other vendors would like to do . . . but can't. Things like on-site demos, 30 day free trials and packing more data switching features into less space for less money than anyone else. Today over 100,000 terminals and computer ports are connected to over 500 Equinox Data PBX's.

We're a tough act to follow.

Our new DS-5 (shown above) gives you more of a good thing in an even smaller package. A fully featured Data PBX, the DS-5 is smaller than an IBM PC and provides keyboard controlled switching and port sharing for 120 async terminals and computer

ports at \$120 per line. It can be expanded to 1320 lines and is completely compatible with its bigger brother, the DS-15.

We're easy on your wires.

All Equinox products are designed for fast, easy installation using modular telephone wiring accessories and in most cases your existing wiring can be used.

Let's get together.

Whether you need to connect 50, 100 or 1000 terminals and computer ports together and are looking at Data PBX's, Port Selectors, or LAN's, we've got a switch for you. Don't just settle for brochures - see for yourself how easy data switching can be.

Call 1-800-Data PBX* for a no-hype demonstration.

Equinox Systems
12041 S.W. 144th Street
Miami, FL 33186-6108

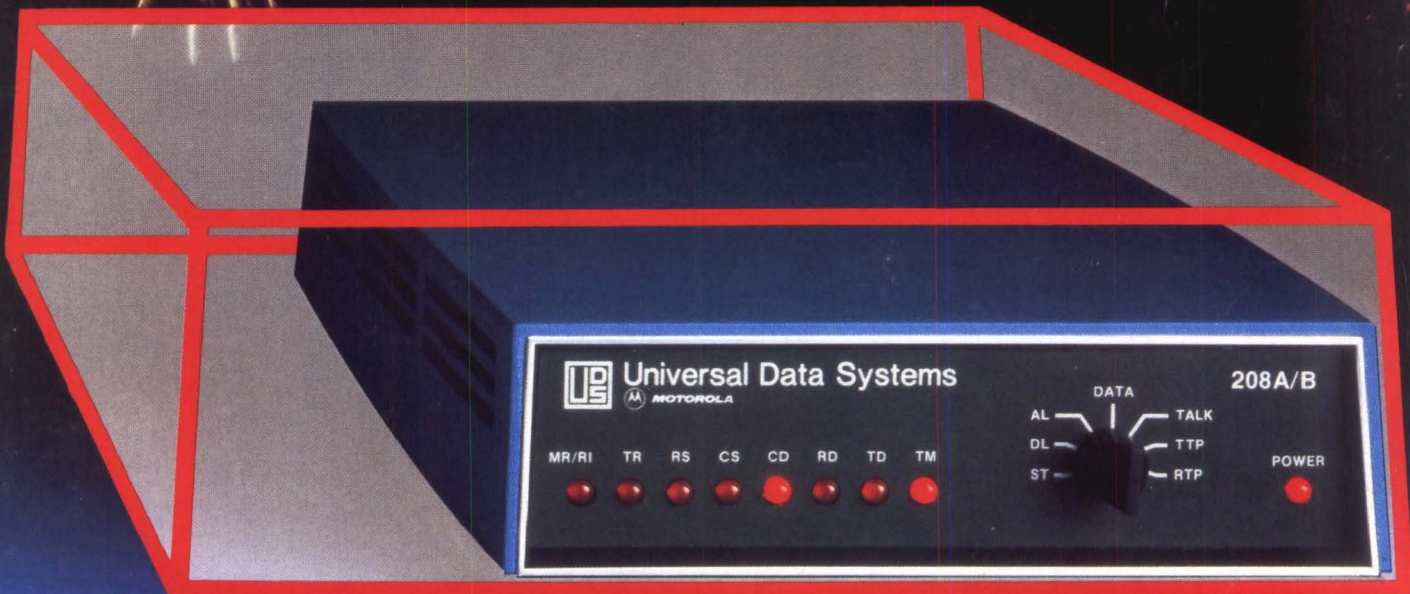
*In Florida call
(305) 255-3500



EQUINOX
Systems

We Make The Right Connections

CIRCLE NO. 79 ON INQUIRY CARD



Design refinements cut size, cost and power consumption for 4800bps modems

Additional LSI microminiaturization in UDS' 208A/B modems has produced significant performance improvements, along with dramatic reductions in size and power consumption. The 208A/B can be strapped as either full-duplex, four-wire (half-duplex, two-wire) over dedicated lines or half-duplex on the dial-up telephone network. It is now available in the "minibox" package. The result: a 54% reduction in volume. The 208A/B is also available in space-saving OEM card configurations.

DC power consumption has been reduced to approximately 2W. Other performance improvements include:

- Compatibility with *all* currently available 208s.
- Full loopback capability—local and remote; analog and digital.
- Suitability for multi-drop applications.
- Improvement in signal-to-noise performance, thanks to advanced equalizer design.

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 • Aurora, CO, 303/368-9000 • Blue Bell, PA, 215/643-2336 • Boston, MA, 617/875-8868 • Columbus, OH, 614/895-3025 • East Brunswick, NJ, 201/238-1515 • Glenview, IL, 312/998-8180 • Houston, TX, 713/988-5506 • Huntsville, AL, 205/837-8100 • Issaquah, WA, 206/392-9600 • Mesa, AZ, 602/820-6611 • Milwaukee, WI, 414/273-8743 • Minnetonka, MN, 612/938-9230 • Mountain View, CA, 415/969-3323 • Richardson, TX, 214/680-0002 • St. Louis, MO, 314/434-4919 • Silver Spring, MD, 301/942-8558 • Tampa, FL, 813/684-0615 • Thousand Oaks, CA, 805/496-3777 • Tustin, CA, 714/669-8001 • Uniondale, NY, 516/222-0918 • Willowdale, Ont., Can., 416/495-0008 • Ypsilanti, MI, 313/483-2682

Created by Dayner/Hall, Inc., Winter Park, Florida

If it's time to bring your datacomm system up to 4800bps, then it's time to ask for technical details on UDS 208s. Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35805. Telephone 205/837-8100; Telex 752602 UDS HTV.

QUANTITY ONE PRICE \$1,295

 **Universal Data Systems**

 **MOTOROLA INC.**
Information Systems Group

CIRCLE NO. 80 ON INQUIRY CARD