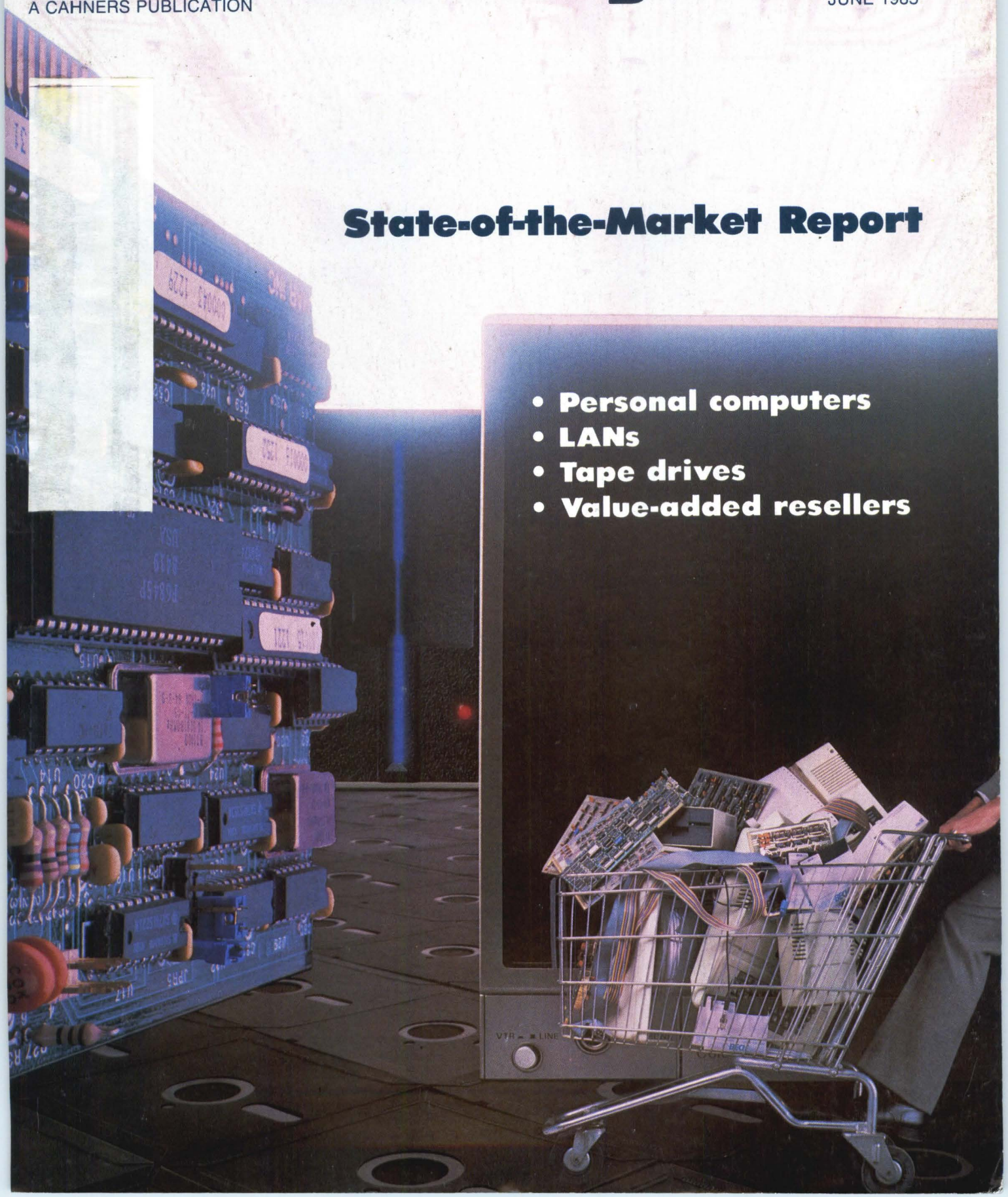
Mini-Micro Systems

A CAHNERS PUBLICATION

JUNE 1985



State-of-the-Market Report

- Personal computers
- LANs
- Tape drives
- Value-added resellers

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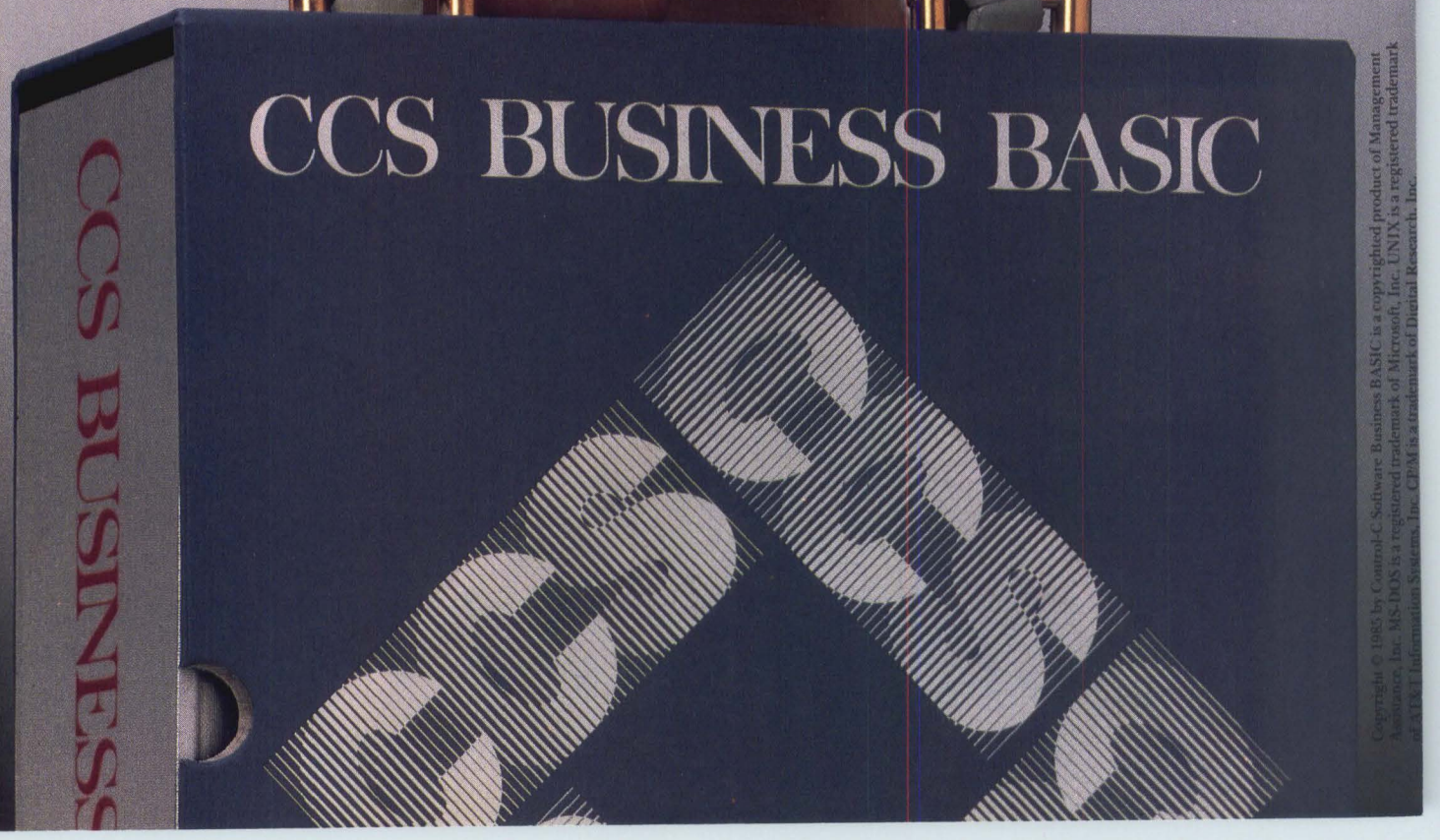

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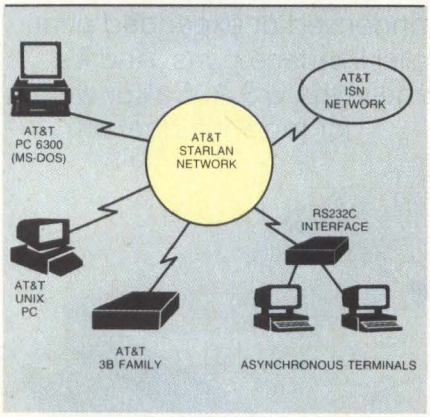

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MINI-MICRO SYSTEMS (ISSN 0364-9342) is published monthly (with 4 special Digest issues) by Cahners Publishing Company, Division of Reed Holdings, Inc., 275 Washington St., Newton, MA 02158. Norman L. Cahners, Chairman; Saul Goldweitz, President and Chief Executive Officer; Ronald G. Segel, Executive Vice President and Chief Operating Officer. MINI-MICRO SYSTEMS is published by the Cahners Magazine Division: J. A. Sheehan, President; William Platt, Executive Vice President. Circulation records are maintained at Cahners Publishing Co., 270 St. Paul St., Denver, CO 80206. Second class postage paid at Denver, CO 80202 and additional mailing offices. Postmaster: Send address changes to MINI-MICRO SYSTEMS,

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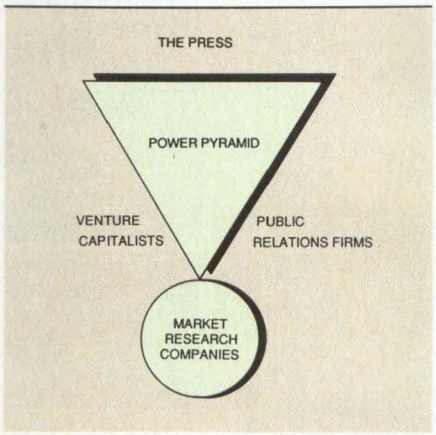

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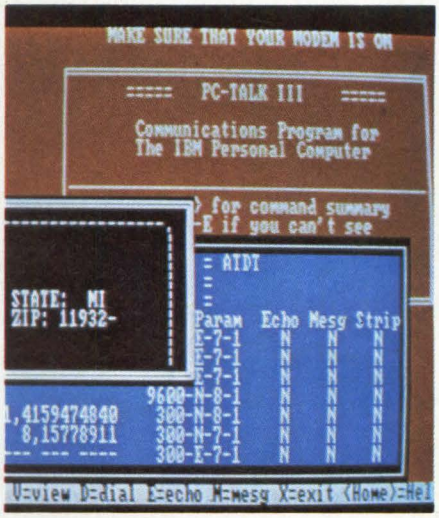

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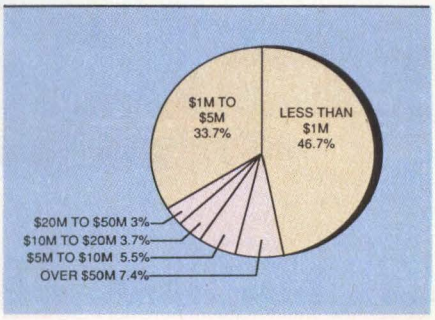

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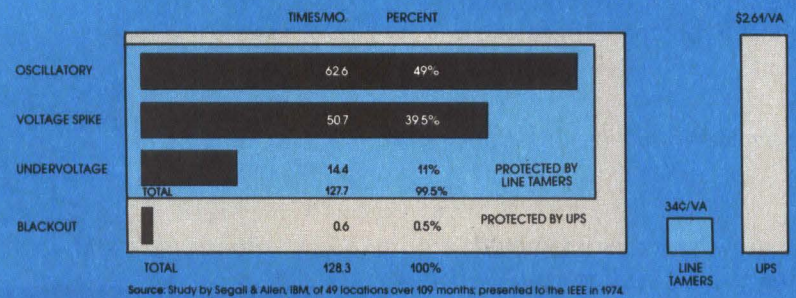

Source: Study by Segall & Allen, IBM, of 49 locations over 109 months; presented to the IEEE in 1974.

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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.

Technical Bulletin
No. 2 in a series.

QNX™

SUBJECT: Engineering a LAN for Maximum Flexibility.

Quantum Software Systems Ltd. proudly announces QNX 2.0 — the Ultimate Distributed Network Operating System. QNX 2.0 is now available for the IBM-PC, IBM-AT, PC compatibles, DEC Rainbow and TANDY 2000. If you have been waiting for a Real-time Multi-tasking Multi-user Operating system with fourth generation LAN support, then QNX 2.0 can offer you today what the competition can't even begin to promise for the future.

QNX 2.0 integrates the Local Area Network architecture right into the heart of the operating system, at the fundamental level of intertask communication allowing tasks to communicate transparently with other tasks across the whole network. This means that any task (program/application) may access ANY serial port, ANY printer or ANY disk on the network. There are no artificial restricitons. Every PC with a disk is a potential file server. PCs without disks will automatically BOOT over the network.

QNX on the IBM-PC AT:

QNX is the first Multi-tasking Multi-user Operating system available for the AT. It is available in both networked and single machine configurations. At about 2.5 times faster than the QNX 8088 PC based systems, and 10 times faster than other multi-tasking operating systems on the same processor, QNX is the ideal program development environment.

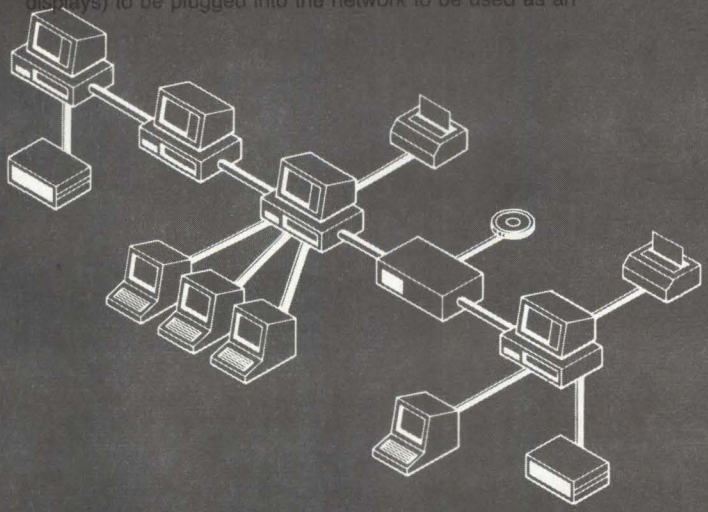
O/S	Computer	Processor	Measured time
QNX ™	IBM-PC AT	80286	480 usec
XENIX ™	Intel-286	80286	4,930 usec

File Security:

Designed with extensive file security features, QNX 2.0 provides login protection with network wide file permission checking based on 255 groups of 255 users. In addition, each PC user may control network access to devices attached locally to their machine.

Distributed Processing:

The QNX LAN supports distributed processing as well as distributed devices. Tasks may be executed on remote stations as easily as they may be executed on the local work station. This allows pure processing elements (PCs without keyboards or displays) to be plugged into the network to be used as an un-committed processing resource. This is ideal for real-time, process control, data acquisition and data communication applications.



Global Communications:

QNX supports a full implementation of X.25 allowing connection to public networks such as Telenet and Datapac. This allows you to link geographically separate LANs together providing true global area networking.

Cost Effective Growth and Flexible Solutions:

QNX is affordable, and will work with the PCs you use today and those you will use tomorrow. You may mix and match different brand PCs on the same QNX network with absolute ease. Multi-user expansion may be accomplished by adding terminals to PCs or PCs to the network. You can start your multi-user application on a single PC with 1 to 10 attached terminals. Once your single processor starts to show signs of degradation, add another PC and connect terminals to the new processor. If the disk becomes the major bottleneck, you may add hard disks to other attached PCs to distribute the processing. Applications which are very CPU intensive may wish to limit a single user to each processor and expand the system with low cost diskless PCs used as work stations. QNX does offer a truly cost effective and flexible solution to your applications needs.

Portability:

QNX 2.0 is portable. The operating system is independant of the physical local area network. It is available in a form suitable for porting to other 8088/8086/80186/80286 computers in the consumer, educational and industrial market place. QNX is ROMable and can operate in as little as 128Kb RAM.

DOS Compatibility:

PC-DOS version 2.1 can run as a task under the QNX 1.2 or 2.0 operating systems. QNX will also allow transparent access to the DOS file system partition and floppies.

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PC-DOS Emulator
Electronic Mail
Electronic Teleconferencing
Full Screen Menu Developer
Isam File Utility
Networking Board
OEM Customization Kit
(to port QNX)

Established:

Quantum sold over 10,000 copies of its operating system during 1984, into all business systems environments, to developers of real time applications, government and educational systems, to software developers/integrators, universities and research establishments.

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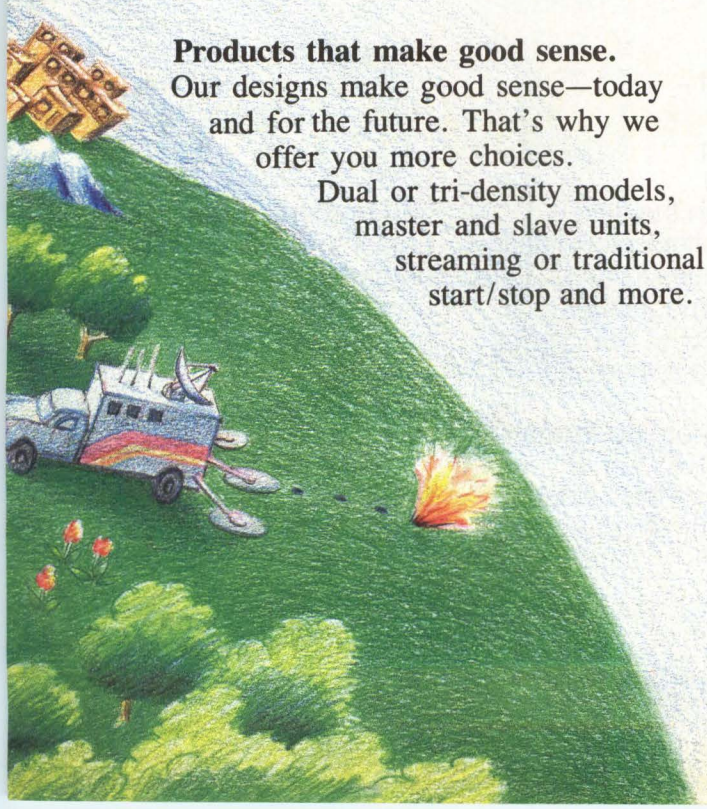

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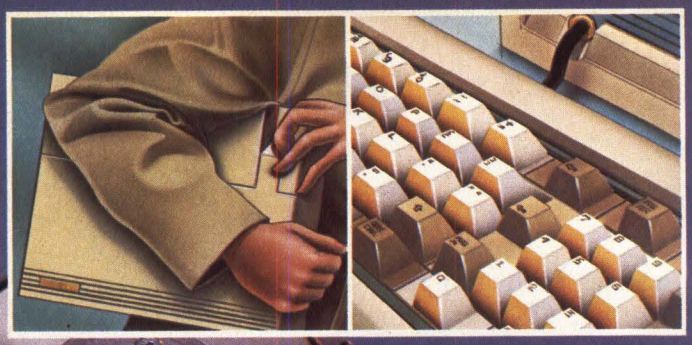

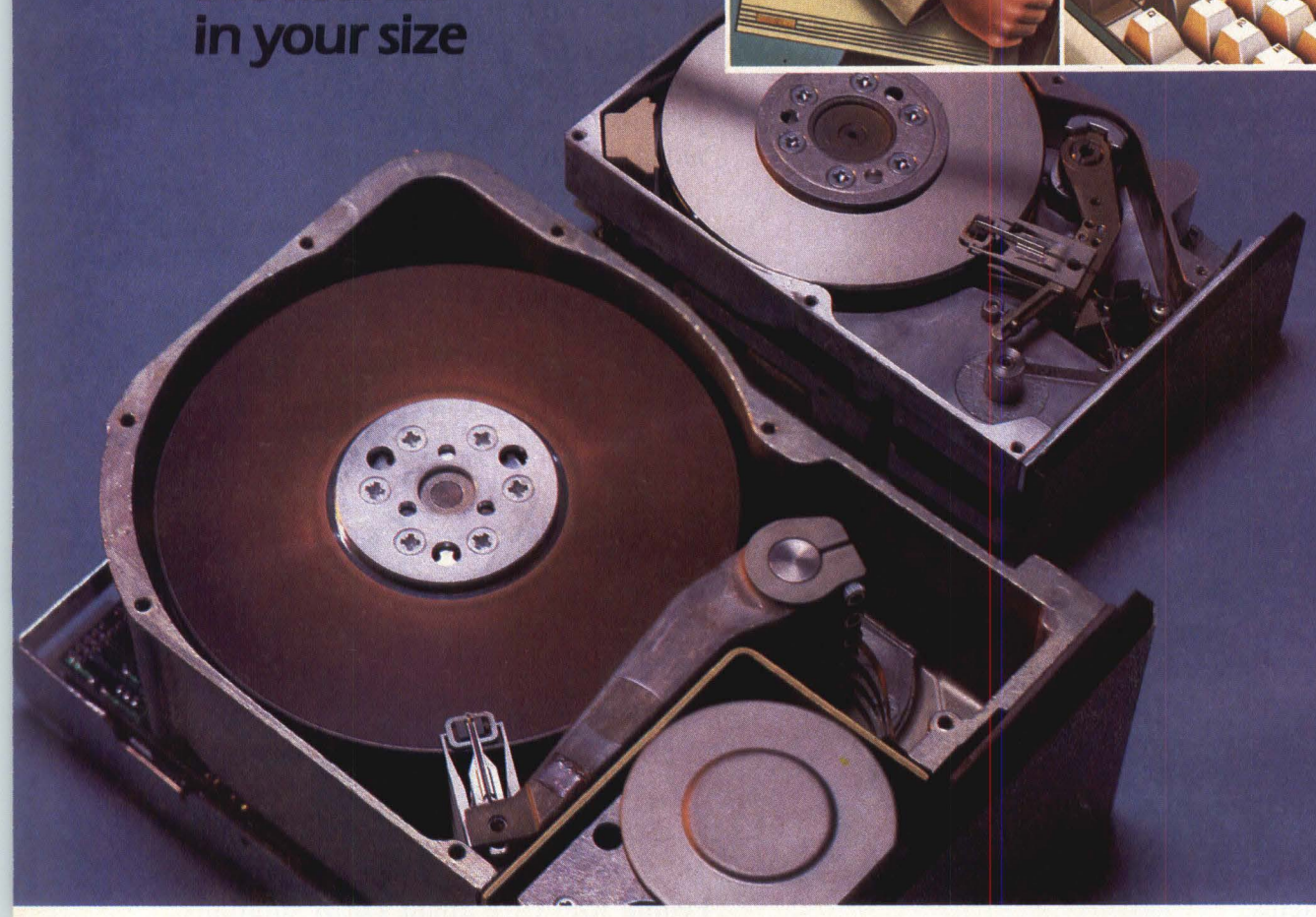

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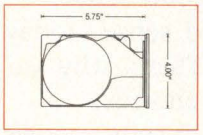
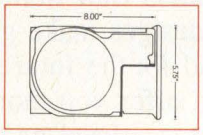


Our 3½" 350 Series drives are the acknowledged standard in this fast-emerging format. We're 100,000 drives ahead of the field, and currently shipping tens of thousands a month. They can be configured to fit right into a full- or half-height 5¼" slot—picking up lots of memory and shock protection while substantially cutting power and heat. Phone or write for our 200E and/or 350 Series data sheets and brochure.



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EDITORIAL

COMPUTER MARKET: DOWN BUT NOT OUT

Based on first-quarter financial reports and current marketplace conditions, the computer industry shows signs of a prolonged slump. After nearly four years of explosive growth rates—greater than 80 percent annually—several market factors have combined to beat rates down to less than 30 percent annually. In ordinary business markets, a sales deceleration still produces a healthy market. However, in the financially insecure computer industry, soft sales indicate that a user saturation level has been reached. The result? Economic chaos among many computer, peripheral and software manufacturers, with underfinanced companies going out of business on a weekly basis.

What factors caused the slowdown? And what do they hold in store for the next year or so? International Data Corp. (IDC), a Framingham, Mass.-based research company, lists these factors: the strong U.S. dollar overseas, side effects of new-product cycles, strategic or tactical weaknesses in leading vendors, an inevitable bust after an historical four-year boom and a softer national economy than that revealed by most standard indices.

Other analysts cite still different contributing effects, such as Japanese and Far Eastern imports, market and technology saturation, overstocked inventories, flat and depressed sales and the overbearing IBM omnipresence. Whatever the reasons, the repercussions have bludgeoned the industry with worker layoffs, production slowdowns, plant shutdowns, executive dismissals, lower earnings and, worst of all, company failures. And these repercussions have occurred to both small, struggling vendors and to the giants of the industry, such as IBM Corp., Wang Laboratories Inc., Apple Computer Inc., Texas Instruments and Intel Corp.

The near-term trends are equally gloomy. Dataquest Corp., a San Jose, Calif.-based market research company, predicts that some 350 computer manufacturers could dwindle down to fewer than 75 in a year.

The irony of the situation is that just a year ago, industry forecasters were projecting booming sales and growth. What happened to dampen the overly optimistic prophecies was probably "all of the above," plus the following: users who want computers already have them, users are still learning how to employ computers effectively in their daily jobs, users are still attempting to get comfortable with existing software and users are still adjusting their applications for optimum efficiency.

So, what's needed in the long term to convince the next, or more sales-stubborn, wave of users to enter the computer market in order to blunt this industry-wide slowdown? For one approach, vendors must not simply provide tools. Instead, they must also solve users' problems. Users want to add value to hardware and software. System integrators, therefore, must directly address the growth areas of data communications, micro-to-mainframe links, local area networks and office automation.

For another approach, *Business Week* says marketing will be the name of the game in 1985, and vendors who plan to survive had better listen to their customers. Still another approach involves business basics that are continually overlooked by many managers. Such basics encompass meaningful training, service, support and documentation.

In fact, a back-to-basics revolution is brewing, says authors Tom Peters and Nancy Austin. In their book, *A Passion for Excellence,* they claim that there are only two ways to create and sustain superior business performance over the long haul. First, take exceptional care of customers via superior service and superior product quality. Second, constantly innovate. In other words, organizations can attain excellence—and achieve business success—by doing a lot of little things well.

George V. Kotelly
Editor-in-Chief

We've been starting a

Introducing the new Genicom 4000.
The line printer that offers you
a big payoff, keeps things quiet and
refuses to break under pressure.

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BREAKPOINTS

VERBATIM DRIVE COMBINES OPTICAL AND MAGNETIC TECHNOLOGY

A prototype, 3½-inch, magneto-optic drive offering more than 40M bytes of (formatted) storage is expected to be shown by its developer, Verbatim Corp., Sunnyvale, Calif., at the National Computer Conference in Chicago next month. The drive, which Verbatim says should be available in evaluation models in early 1986, and produced in 1987, uses an optically assisted magnetic recording device. It offers capabilities similar to standard magnetic drives, but has greater capacity. The prototype uses a special cartridge-encased media.—*C. Warren*

TANDON MAY REDEFINE WINCHESTER PRICING

In entering the 3½-inch, 20M-byte Winchester market, Tandon Corp., Chatsworth, Calif., has established an aggressive pricing structure that may cause immediate industry-wide price cutting, say most analysts. The Tandon model TM362, a 20M-byte drive using two plated-media platters with a sputtered carbon overcoat, has an average access time of 80 msec. The drive has a rack-and-pinion actuator, a closed-loop servo and has a density of 804 tracks per inch. The company says pricing is $300 each for OEM orders exceeding 25,000 units per year. Although it has not been officially announced, the company also has a 3½-inch, 10M-byte drive planned for use by Atari Computer Inc. in the ST series of personal computers. The 10M-byte version sells for less than $100 in large OEM quantities.—*C. Warren*

TAIWANESE TO DEBUT $800 PC-COMPATIBLE PORTABLE FOR OEMs

A Taiwanese company that has been trying to clear a desktop IBM PC-compatible computer through U.S. customs agents and through IBM Corp. for the past year plans to exhibit a portable PC-compatible at next month's National Computer Conference in Chicago. Copam Electronics Corp., Taipei, plans to display the President, an 8088-based model sporting dual, 5¼-inch floppy drives with a slot for a 10M-byte or 20M-byte Winchester; an 80-column-by-25-line display with a 900-by-600-dot resolution; and MS-DOS 2.11. Copam, which had a prototype of the machine at last month's Hannover Fair in Hannover, West Germany, hopes to sell to U.S. OEMs. The price to OEMs will be about $800. The price to end users would be about $1,600, says Copam marketing manager Ken Yu.—*L. Valigra*

PICK OPERATING SYSTEM ON THE WAY FOR PC-AT

Version 1.3 of the Pick operating system should be ready for release for IBM Corp.'s PC-AT by the end of this summer. The multiuser operating system from Pick Systems, Irvine, Calif., will sell for $495, the same price the company charges for its package that runs on the IBM PC/XT. Other XT compatibles that Pick claims will run Version 1.3 include AT&T Co.'s 6300, Compaq Computer Corp.'s Plus and DeskPro, ITT Corp.'s ITT-XTRA, Sperry Corp.'s PC, and NCR Corp.'s NCR-PC4.—*M. Seither*

BREAKPOINTS

HARRIS TO ANNOUNCE RISC, ECL SUPERMINIS

In an effort to increase its presence in technical markets, Harris Corp., Fort Lauderdale, Fla., should this month introduce two high-performance superminicomputers: the 7-million-instructions-per-second (MIPS) HCX-7 and the 5-MIPS Harris 1200. The UNIX-based HCX-7 is the first system from a major minicomputer manufacturer to use the reduced instruction set computer (RISC) architecture, which is said to be more efficient than conventional architectures. The 1200, designed for real-time applications under Harris' VUE operating system, uses advanced emitter-coupled logic (ECL) circuits and a 288K-byte, secondary cache memory to boost performance by 55 percent over the previous top-of-the-line 1000, according to company sources. Prices for the 1200 begin at $294,000.—*D. Bright*

YUGOSLAVIAN SOFTWARE TO COMPETE IN U.S.

Iskra Electronics Inc., Farmingdale, New York, the U.S. subsidiary of the Yugoslavian electronics manufacturer, Iskra, of Ljubljana, is introducing software for most Digital Equipment Corp. machines. Products include a program-development package for non-programmers that will be sold in the United States under the name Formation for between $1,400 and $9,000 for single users, depending on the size of the DEC host machine. A family of Iskra packages that includes a multiuser database management system, a data dictionary and a COBOL program generator will be sold in the United States under the name of Vitrage.—*K. Jones*

TECH FILES: A QUICK LOOK AT INDUSTRY DEVELOPMENTS

PRINTER FILES: Ricoh Company Ltd., Tokyo, plans to make a color, thermal-transfer printer available in the United States by the end of this year. Priced at less than $400, the TP2051C prints characters in black or in as many as seven colors, all with 180-dot-per-inch resolution. The dot-matrix printer produces copy in three modes at three different speeds: draft copy at 80 characters per second (cps), near-letter quality at 50 cps and letter quality at 30 cps. A parallel interface is standard; an RS232 interface, optional. The TP2051C prints on plain paper, thermal paper or transparencies.—*L. Valigra*

MICRO FILES: Quadram Corp., Norcross, Ga., recently gave a breath of life to IBM Corp.'s discontinued PCjr computer by introducing several new products last month at the Comdex show in Atlanta. The Quadjr. expansion chassis, priced at $695, snaps onto the side of the PCjr and supports a 360K-byte floppy disk drive. The $275 Quadjr. memory board, which slips into the expansion chassis, adds 128K bytes of memory and is socketed to house as much as 384K bytes more. This would give the PCjr 512K bytes of memory—enough to run business packages such as Lotus Development Corp.'s 1-2-3 integrated software. Another snap-on product, the QuadMEMjr. box, adds

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

Console configuration supports future SMDs without PROM changes.

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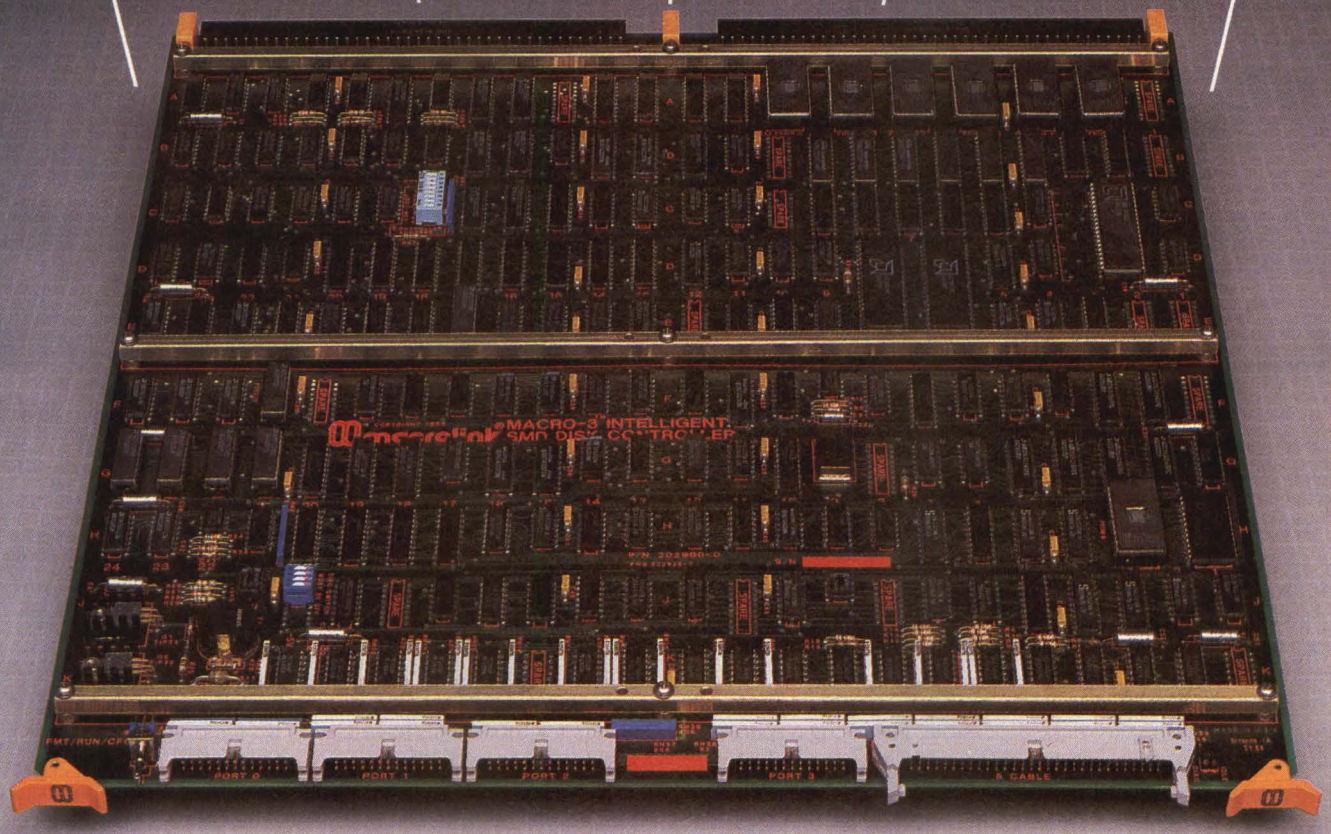

You're ready for the new generation of high performance SMD disk drives with the MACRO-3. High speed drives (over 2MB/Sec) are no problem. Only the MACRO-3 SMD controller offers full emulation of P-E disk systems, and supports advanced drives like the Eagle & CDC's FSD and XMD on any 3200 CPU. It can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

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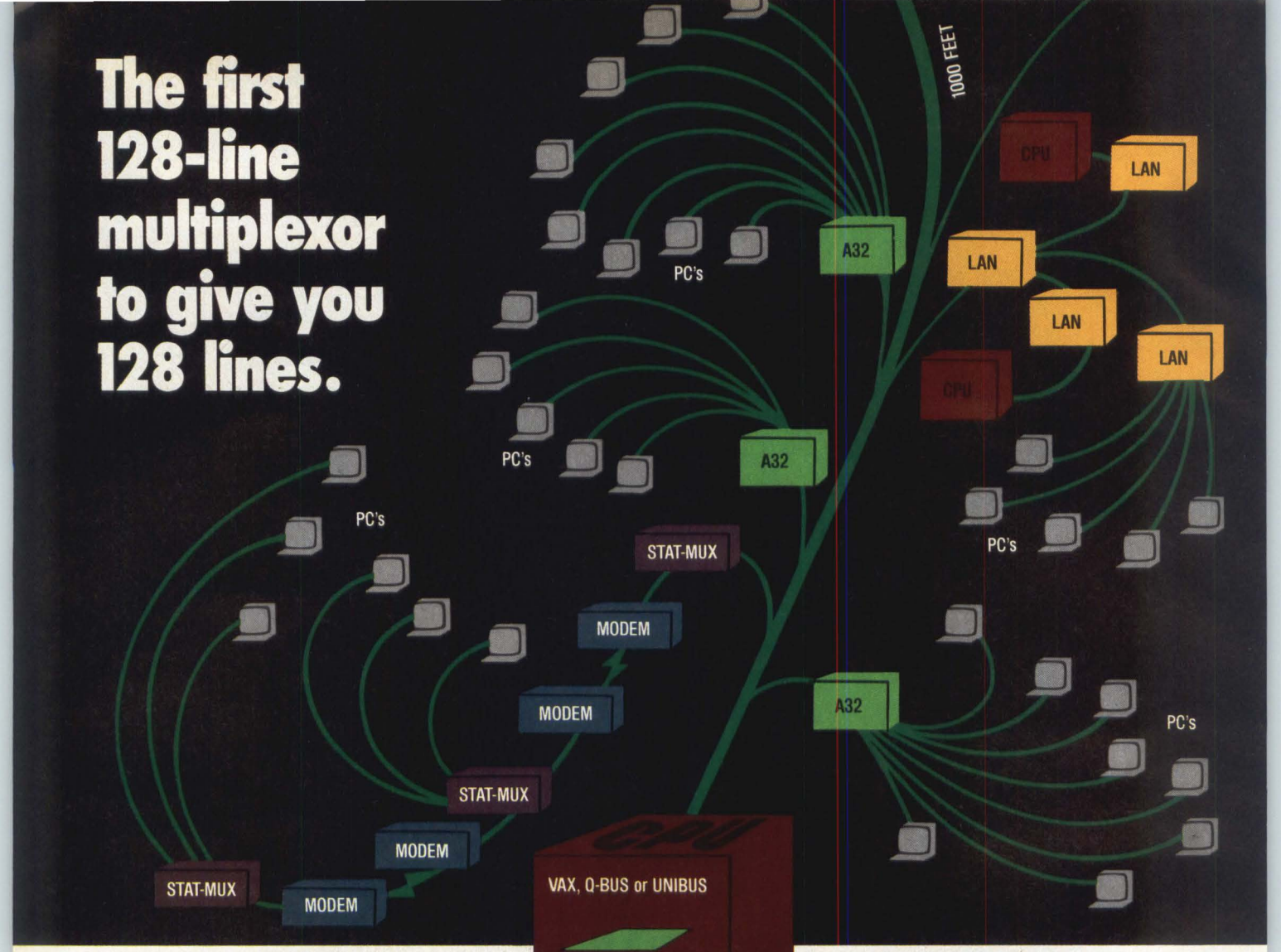

Now up to 128 asynchronous serial communication devices, from as far away as 1,000 feet, can communicate with DEC's* VAX, Q-bus and Unibus* computers.

MDB's new DMF Series Multiplexor was developed because we know systems designers need more efficient ways to control statistical multiplexors, LAN's, dynamic asynchronous terminal line switches and interprocessor links, in the new data communications world.

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The host board uses the 29116 ultra-high performance 16-bit, 100 nanosecond microprocessor, 104 bit wide micro-word, and special logic structures, for the fastest DMF emulation available.

User versatility counts too. The DMF Multiplexor offers such unequalled through-put advantages as the capability to select silo or DMA transfers automatically; and with 16, 18 or 22 bit addressing, the designer can choose the best configuration for the DEC system used. Also, it has its own optimized software drivers for those who have DEC's RSTS/E and RSX11-M+* operating systems.

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from 128K bytes to 512K bytes to the system. It is priced at $275 for 128K bytes, $675 for 256K bytes, and $995 for 512K bytes. All three products are available now.—*L. Valigra*

NOTES FROM OVERSEAS: A group of Control Data Corp. disk-drive-media veterans has secured $12 million from Rodime Plc. and Citicorp Venture Capital to seed one of the most highly leveraged British high-technology start-up companies ever. The newcomer, called **Data Magnetics Ltd.,** plans to develop and manufacture 3½-inch and 5¼-inch thin-film-media hard disk drives to be used with office personal computers. The company plans to ship its first product next year. Reportedly, there also are plans to develop large disks for mainframe computers. These drives would store as much as 2G bytes of data. Data Magnetics may even work with a Japanese company to offer optical drives, sources say. The company plans to sell mostly to European computer makers.—*M. O'Gara*

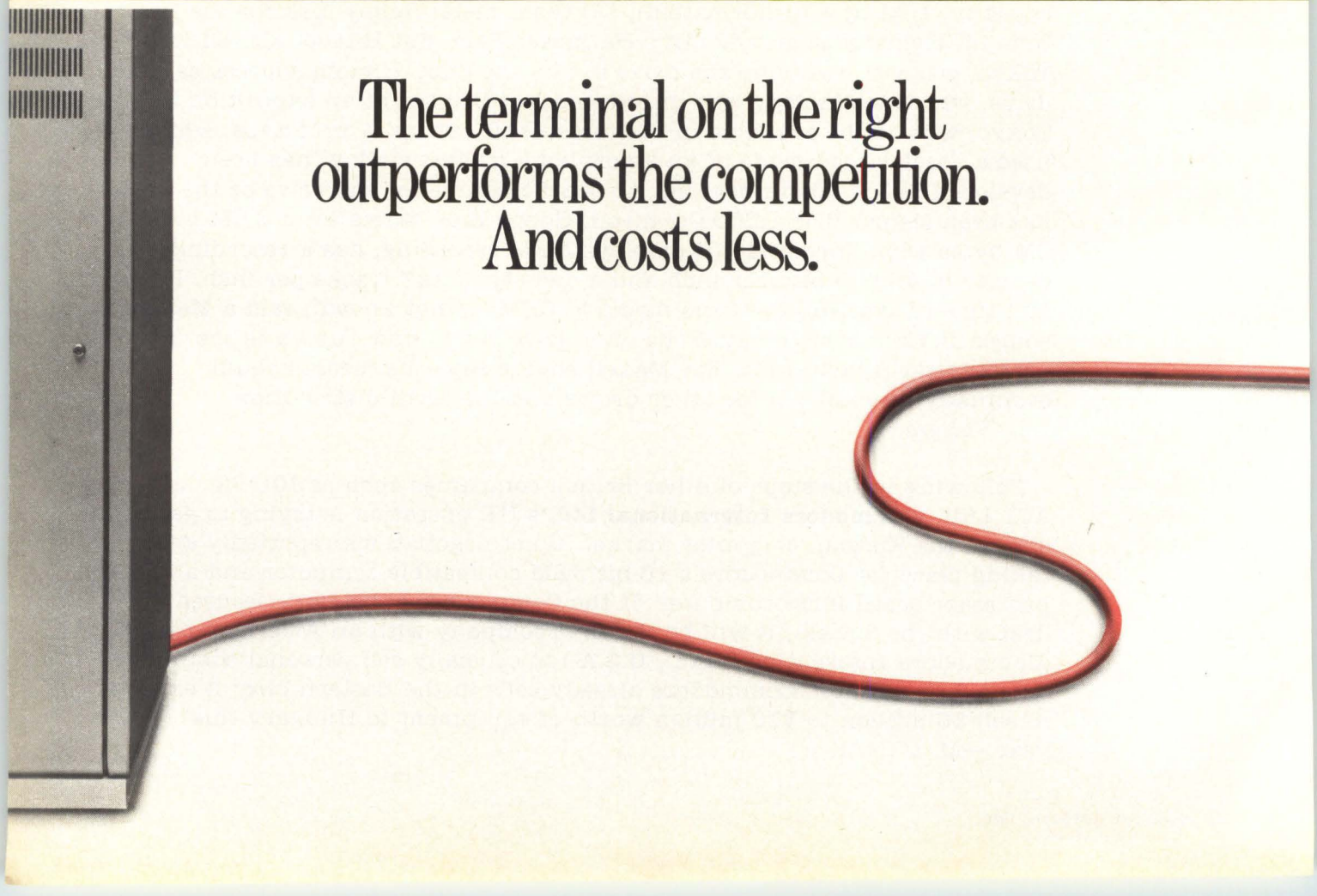
Maxell Europe GmbH, Düsseldorf, West Germany, displayed a high-capacity, 10M-byte (unformatted), 5¼-inch, metal floppy disk for the first time in Germany at last month's Hannover Fair. But Hitachi Maxell Ltd., Tokyo, was still readying the drive to run the disk. Hitachi sources say the drive, whose technology was introduced last October at an exposition in Tokyo, will not be available in the foreseeable future. A prototype, which uses a special head made of an amorphous magnetic alloy, has been developed in the laboratory, but no second source for the drive or the media has been signed. The 1,500-Oe, metal, floppy disk stores from 6.5M bytes to 8M bytes when formatted. It employs MFM recording, has a recording density of 40,365 bits per inch and a density of 127 tracks per inch. Price and time of availability of the media to OEMs is not known, said a Maxell source at Hannover, because the only drive it will now run on is the prototypical Hitachi unit. The Maxell source says the media should eventually be available for other drives and for retail distribution.
—*L. Valigra*

Following in the steps of other British companies such as ICL Plc. and ACT Ltd., **Commodore International Ltd.'s** UK operation is trying to get a slice of the Russian computer market. Quiet negotiations reportedly are taking place for Commodore's 16-bit, IBM-compatible computer and a Z8000 processor-based microcomputer. If the Commodore subsidiary secures a deal with the Soviets, it will be the first company with an American parent, (Commodore International Ltd., U.S.A.) to officially sell personal computers to the Soviet Union. Commodore already sells in the Eastern bloc; it expects to sell $5 million to $10 million worth of equipment to Hungary this year.—*M. O'Gara*

BREAKPOINTS

Although Japan's Fifth Generation computer project is still in the early stages of its 10-year plan, the Japanese already are envisioning a so-called **Sixth Generation** computer project. An advisory group within the government's Science and Technology Agency wants Japanese computer researchers to develop a machine that can understand and process natural human speech and form images. The Fifth Generation project focuses on inference-based logic processes. The group wants the new, basic research to include physiology, psychology, linguistics and logic, in order to determine how humans translate sensory information into thought.—*I. Kakehashi*

NEC Corp., Tokyo, has acquired Honeywell Information Systems Japan Inc. and has renamed it NEC Computer Systems Ltd. NEC and Honeywell have had cross-licensing arrangements for the past 23 years. The new company will be Honeywell's sole computer sales-and-service operation in Japan. The terms of the acquisition were not disclosed, but the



arrangement provides NEC with 360 former Honeywell employees—including 70 system engineers—and Honeywell's customer base. NEC hopes that sales to those customers will be worth more than $38 million over the next year.—*I. Kakehashi*

Sources at **Convergent Technologies Inc.'s** European offices say the company plans to announce this month an 80286-based version of its N-GEN workstation. Delivery schedules are not known. Another possible newcomer, they say, is a product called "Mighty Frame," which would support eight to 16 users and fit between the MC68010-based Miniframe and the multiple-MC68010/multiple-80186-based Megaframe in Convergent's product lineup. Another product reportedly being developed in the United States by Convergent is the Megaframe 2, which houses the company's proprietary CTOS operating system in firmware while still running UNIX System V.—*M. O'Gara*

The computer on the left doesn't care about the price.

A computer is born to perform. No matter what the price.

You, however, have practicalities to think about. Making your computer perform the way it's meant to is one. Watching costs is another. And you have to blend the two to create the most valuable, cost effective system possible.

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And because the 220+'s price is in direct contrast to its high performance, you get the best value for your money. So although the computer doesn't care about the cost, you don't have to think about it, either.

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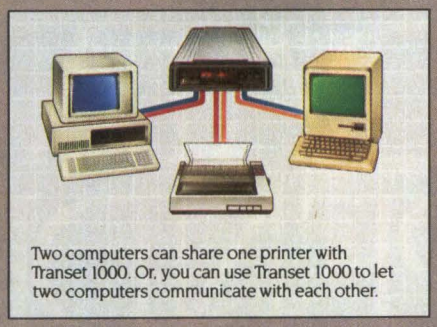
Transet 1000™ The print buffer, communications buffer, port expander, printer sharer and I/O switcher. All in one.

Anyone with a personal computer and one or more peripherals has faced the all-too-familiar dilemma. You need your computer to do an important job. But you're forced to wait for the system to finish one job (printing, communicating, whatever) before you can go on to the next one. Or you need to stop what you're doing to switch cables when you want to use another peripheral.

Wait no more. Now Hayes introduces an innovative new device that lets you perform many jobs—at the same time—independent of your computer. Transet 1000. It works with a wide range of systems and configurations. And it allows you to continually expand your system as your needs grow.

Transet 1000 frees your computer from waiting on your printer or modem—so you and your computer can go on to another task. It even lets you print out documents in pre-set formats without having to go back into your computer. At the same time, Transet 1000 can operate unattended mailbox communications—24 hours a day—even if your computer is turned off.



Two computers can share one printer with Transet 1000. Or, you can use Transet 1000 to let two computers communicate with each other.

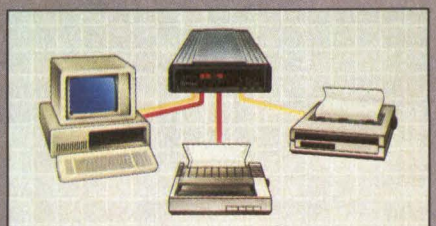
In addition, Transet 1000 is a port expander and software-controlled I/O switcher. Now files can be easily directed and redirected to different peripherals, without physically changing cable connections.

Even while printing, Transet 1000 acts as a communications buffer and 24-hour mailbox. And I/O switching lets you route information among peripherals, without switching cables.

Transet 1000 contains a standalone microprocessor, and comes with 128K of memory. It operates with any RS-232 interface computer, and has optional accessory kits available for the IBM® PC and PC XT, Macintosh™ and Apple® IIc. Kits contain the necessary host cable, a user guide and menu-driven software that lets you graphically set up or customize port parameters and printing formats. Cables available for IBM PC AT, other computers and peripherals.

Like all Hayes products, Transet 1000 combines sophisticated capabilities with easy operation. Just as Hayes set the standard in personal computer communications, now Hayes is taking the lead in computer task management.

Contact your authorized Hayes dealer to see how Transet 1000 can help you get a lot more productivity out of your computer system—without tying up your computer or you.



Transet 1000 allows printing on both a dot matrix printer and letter quality printer, while freeing your computer for other tasks.

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When In The Course Of Business Events . . .

OEMs designing business systems face two new realities. One, data processing is becoming more distributed—more individualized work units, defined by job function and application, performed by more people in more places, demanding more independence.

The second reality? Winchesters. This prevailing storage technology is headed in a direction that's just the opposite of data independence—tying users to shared storage systems, large or desk-top.

Slavery By Any Name . . .

The central issue is no longer just more data. It's *more data dynamics.* And Winchesters aren't really dynamic at all. Consider "wait your turn" access, or the need for lots of user "system savvy." Consider time-consuming backup and restore. And consider the ever-present risk of expensive head crashes.

Now consider the IOMEGA alternative.

IOMEGA's Distributed Data Storage: Freedom Of Information.

Our family of data management/storage systems matches the distributed data processing reality with a new reality: *distributed data storage*—with systems whose reliability and specs often exceed Winchester's, particularly in access times and transfer rates, and with cost-per-megabyte figures that Winchesters simply can't figure.

	IOMEGA BETA 5	IOMEGA ALPHA 10/10H	TYPICAL WINCHESTER
Formatted Capacity	5.0 Mbytes per cartridge	10.0 Mbytes per cartridge	10.0 Mbytes fixed
Data Transfer Rate	5.0 Mbits/Sec	9.0 Mbits/Sec	5.0 Mbits/Sec
Average Access Time	50 msec includes settling	35 msec includes settling	85 msec
Form Factor	5.25"	8"/8" Half Height	5.25"

The IOMEGA cartridge is the key. Now download data and software to a 5- or 10-megabyte cartridge, then manipulate, update, and upload conveniently and efficiently. The result is a total enterprise solution that can store applications, complex programs, or data sets—all of which can then be passed along to others without networking. And when you need more storage, you use more cartridges, not more hardware.

Accept No Alternatives.

IOMEGA's distributed data storage solutions—full and half-height 8-inch 10-megabyte and a 5¼-inch 5-megabyte versions—give OEMs Winchester performance and reliability with floppy convenience and cost-efficiency. They are proven, risk-free solutions. And IOMEGA's cartridges are the only ones that are truly rugged, fully interchangeable, and inexpensive. Now OEMs gain the *freedom of designed-in freedom.* The freedom today's customers require.

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CIRCLE NO. 13 ON INQUIRY CARD

IOMEGA HAS REMOVED CAPACITY AS THE MASS STORAGE ISSUE.

AT&T bets on VARs for success of UNIX PC

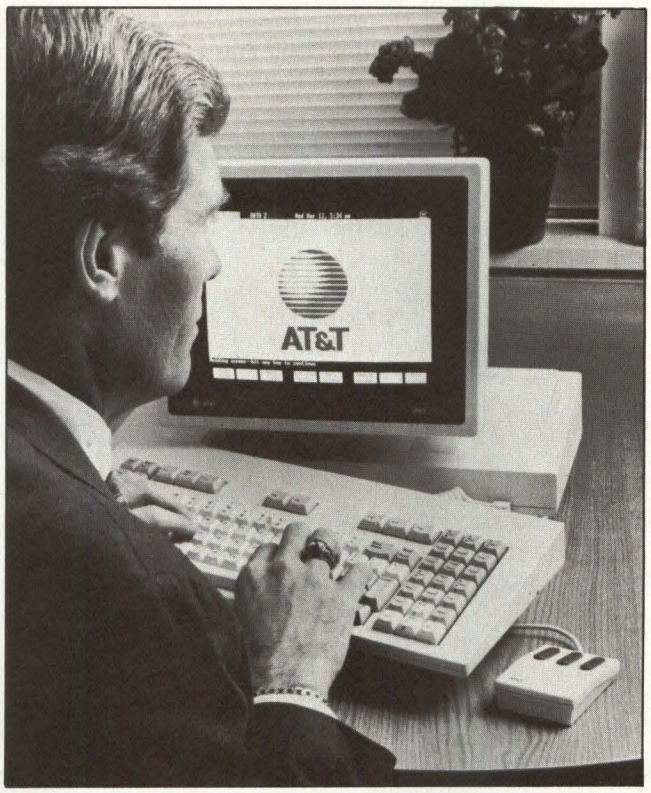
Stephen J. Shaw
Washington Editor

Apparently conceding the mass desktop market for personal computers to IBM Corp., AT&T Co. is pursuing niche markets through value-added resellers for its new UNIX PC microcomputer. At the same time, AT&T is actively courting software developers to support the UNIX operating system and to port increasing numbers of popular application software to UNIX.

Disappointing sales of the PC 6300, estimated at 20,000 units in 1984, coupled with a lack of widespread acceptance of the UNIX operating system by end users, are forcing AT&T to rethink its ambitions of recreating the success of the IBM PC, according to analysts.

Consequently, AT&T is taking a different marketing tack with the UNIX PC. The company has established relationships with 52 VARs serving more than 60 regional and vertical industry segments and is actively pursuing more.

"The VARs will be effective for niche markets and are a critical element in our distribution strategy," comments Richard Holbrook, president of large business systems for AT&T Information Systems (ATTIS).



AT&T's new UNIX PC, *which includes a mouse cursor controller and menu and window displays, competes head-on against IBM's PC-AT, which runs XENIX.*

Software hunt is on

The writing of software-interface specifications for the UNIX PC has been turned over to independent and third-party software developers in an attempt to spur the development of more application packages. In addition, AT&T has been quick to release hardware specifications for the UNIX PC to create what company executives call the "AT&T-compatible market."

"We realize we're not overburdened with a plethora of [UNIX-based] application software," concedes Charles Redmond, general manager for computer systems at ATTIS. "VARs are a critically important area for us because it centers our strategy on acceptance of UNIX in the marketplace."

AT&T provided additional evidence that it is aware of the relative dearth of UNIX application software when it included 28 packages in its spring announcement of the UNIX PC. Half of those, however, are aimed at programming and development applications. Among the remainder are Multiplan, a spreadsheet program from Microsoft Corp., and the popular dBASE III database-management package from Ashton-Tate.

At a New York press briefing for the new products, AT&T computer sys-

tems president James D. Edwards made a point of introducing executives from various software-development companies, including Bill Gates, Microsoft president, and officials from Ashton-Tate, Santa Cruz Operation Inc. and others.

Edwards promised that the number of software packages for the UNIX PC would double this summer. Six application centers and hot-line numbers have been established specifically for VARs to work with AT&T programmers in developing additional software.

AT&T needs more software variety

A greater variety of application packages must reach VARs quickly for the UNIX PC to succeed, analysts say. Although the UNIX System V operating system offers multitasking, multiuser capability, it faces stiff market competition from more established systems such as the Altos Computer Systems 586, the Convergent Technologies Inc. Miniframe, the NCR Corp. Tower XP and the Perkin-Elmer Corp. 7358.

"If the UNIX PC is going to do well in the market, extremely well, AT&T has got to pull it together by the end of the summer and make additional introductions of popular application software," says James Sullivan, senior analyst with research company Yates Ventures, Palo Alto, Calif.

As AT&T admits, the UNIX PC is aimed squarely at the IBM PC-AT market. In benchmark tests performed by Yates, the UNIX PC outscored the PC-AT by 520 points out of a possible total of 1,500 points, weighted across a variety of operating parameters.

Sullivan estimates that AT&T will realize 25 percent of its UNIX PC sales through VARs. Another 10 percent of sales will be achieved through AT&T's master distributors, Ducommun Data Systems Inc., Cypress, Calif., and Unicore Inc., Austin, Texas. Ducommun and Unicore act as resellers of AT&T equipment to VARs projected to move less than $1 million worth of AT&T computer equipment annually. Larger VARs are handled directly by ATTIS.

Sullivan also predicts that 10 percent

A glimpse of AT&T's UNIX personal computer:

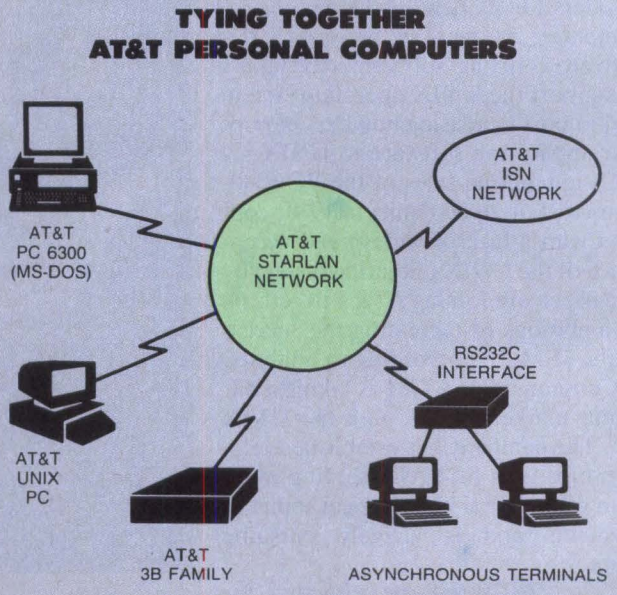
AT&T Information Systems has unveiled the latest addition to its young computer family, the UNIX PC model 7300, offering voice and data features in a desktop package starting at $5,095. Taking aim at IBM Corp., AT&T Co. executives claim the UNIX PC offers better performance for $900 less than the price of an IBM PC-AT.

Manufactured by Convergent Technologies Inc., Santa Clara, Calif., to AT&T's design, the UNIX PC incorporates a 10-MHz Motorola Inc. MC68010 CPU, the UNIX System V operating system and a mouse to enter commands and perform screen functions. Apparently for fear that not supporting the ubiquitous DOS operating systems would be suicidal, AT&T designed the UNIX PC to support the MS-DOS 2.1 and PC-DOS 2.0 or 2.1 operating systems.

The 7300's on-board 512K bytes of RAM are organized into a 4M-byte virtual-memory system. A 10M-byte hard disk drive and a 0.5M-byte floppy disk drive are standard. A 20M-byte hard disk and a 1M-byte floppy disk drive are also available.

AT&T claims that UNIX's "unfriendliness" toward new users has been eliminated with the addition of several software enhancements, including a user-interface system that shields the operator from the complex UNIX command structure. But the user interface "adds a big shell and is visibly slow," comments James Sullivan, senior analyst with research organization Yates Ventures, Santa Clara, Calif.

The mouse lets users enter data and select system options from on-screen icons. Files can be shared and other data transmitted through a built-in, 300- to 1,200-bit-per-second modem.



The Starlan local network *ties computers using both UNIX and MS-DOS operating systems.*

Two telephone lines can be connected to the personal computer with ordinary modular telephone jacks in the rear of the processor. A communications-manager board-level system allows users to control a variety of telephone activities automatically. These include message services such as tracking incoming and outgoing calls with a call-history file and use of an on-line phone directory.

Voice and data signals can be transmitted simulta-

of sales of the UNIX PC will be by retail computer outlets. According to AT&T, more than 1,000 computer specialty retailers are now authorized to sell AT&T computers. The company anticipates that an additional 600 stores will be signed by the end of this year.

Approximately half of the UNIX PC's sales will be derived from ATTIS' 7,000-person direct sales force located in 180 branch offices around the country. This group recently was reorganized into three new divisions: large business systems, general business systems and computer systems. It will sell to large Fortune 2,000 companies aiming toward system sales of $25 million to $30 million.

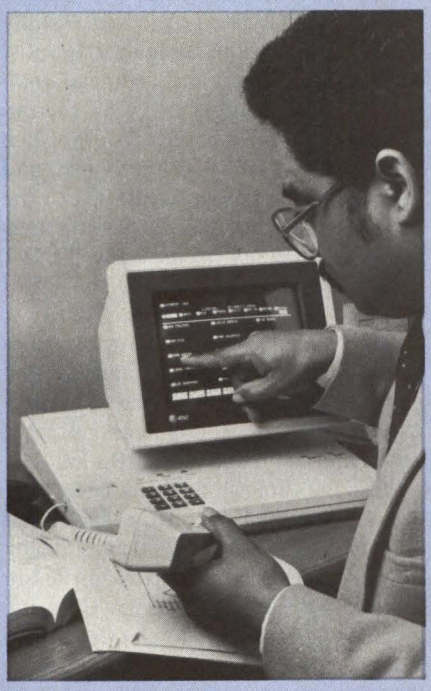
Convergent Technologies, Santa Clara, Calif., will manufacture 45,000 UNIX PCs for ATTIS during the remainder of this year, predicts Sullivan. Approximately 30,000 units will be sold through all distribution channels.

According to a survey of 2,000 VARs and system integrators recently completed by Natick, Mass., research company Venture Development Corp. (VDC), the overall demand for UNIX will increase among VARs from 24.7 percent to 75.2 percent during the next two years. The market through VARs for all personal computers is expected to rise from $2.23 billion in 1985 to $5.22 billion in 1989.

VDC analyst Sharon Kern estimates that AT&T ranked fourth in market share for 1984 in the shipment of all microcomputers to the VAR segment, behind IBM, Convergent and Digital Equipment Corp. "AT&T moved between 5 percent and 10 percent of the total shipped through VARs," she says.

AT&T hopes to do better than that this year with the UNIX PC. "We've already received orders for several thousand UNIX PCs," says AT&T's Holbrook. Although Holbrook acknowledges that last year's sales of the 6300 did not live up to expectations, he stated at the New York briefing on the UNIX PC that AT&T sold more microcomputers during the first two months of this year than during all of 1984. □

A 'friendly' challenge to the PC-AT



AT&T's personal terminal *combines voice and data communications on a terminal equipped with a telephone handset and a touch screen.*

neously on two telephone lines. Communications is supported with other PC 7300s, other UNIX-based workstations, MS-DOS and CP/M workstations, UNIX-based or IBM host mainframes and other asynchronous hosts or database services. Interconnection with host computers can be accomplished by responding to on-screen prompts. Users of AT&T's PC 6300 can upgrade their systems to the new PC with expansion cards.

Market analyst Jean Yates, president of Yates Ventures, is optimistic that the new UNIX PC will bolster AT&T's microcomputer sales. "By the end of 1985, AT&T will be No. 2—or No. 3 at least—in personal computer sales," Yates told attendees at a recent Washington computer conference.

She predicted that AT&T would sell approximately 60,000 UNIX PCs, and more than 200,000 6300s by the end of this year.

Along with the UNIX PC, ATTIS has announced additional hardware and software packages. These include:

- The AT&T personal terminal, a voice- and data-communications terminal equipped with a telephone handset and a touch screen. The terminal runs off the System 75 or System 85 private branch exchange and features a four-line, digital telephone, a speakerphone, an auto dialer and a data terminal with built-in calculator and calendar functions. The terminal will be available starting in May at $1,795.
- The Starlan local network for personal computers. The network links computers using both UNIX and MS-DOS operating systems. A typical configuration to link a UNIX-based computer and an MS-DOS machine would sell for approximately $1,500. The network will be available in the fourth quarter of this year.
- A total of 28 application-software packages for the UNIX PC. These include Ashton-Tate's dBASE III database-management system, Microsoft Corp.'s Multiplan spreadsheet and Word word-processing system, graphics packages and a number of programming tools.

IBM PC expert systems breed new VAR markets

Michael Tucker, Associate Editor

Expert systems, once confined to very expensive LISP- and Prolog-based machines, are starting to show up on the IBM Corp. PCs of shoestring entrepreneurs.

Expert systems are one of the many branches of artificial intelligence. Basically, they're programs that simulate the problem-solving techniques of human experts. They're usually divided into a knowledge base (the actual information an expert programmer imparts to a system) and an inference engine (the part of a program which applies that information to draw conclusions).

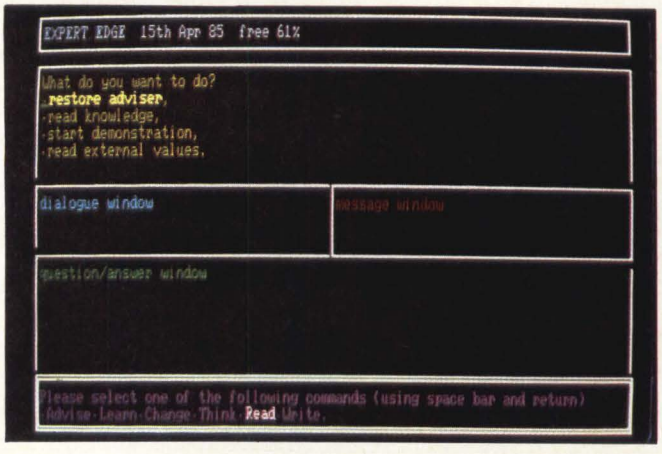
In the last few months, a number of inexpensive expert-system shells, or generators, have been introduced. Some of the newest include KDS from KDS Corp., Wilmette, Ill.; Expert Edge, from Human Edge Software Corp., Palo Alto, Calif.; and RuleMaster, from Radian Corp., Austin, Texas. KDS and Expert Edge cost under $1,000. If such products should prove successful they could offer value-added resellers an entirely new software market.

KDS is a powerful shell in a tiny package. It allows a developer to build an expert system simply by entering case histories in natural language. The company says KDS can produce 16,000 rules from up to 4,096 case histories and yet run on any IBM PC or compatible without a hard disk. KDS manages this feat of compression partly by being written entirely in Assembly language and partly by being divided into three parts.

Rather than bundling the expert shell, inference engine and knowledge base into a single, large program, KDS Corp. makes each component a single, smaller piece of software. Developers would buy a Development System, at a cost of up to $795, which they would use to produce Knowledge Modules, the actual expert-system shell. They would then market these Knowledge Modules to users, who, in turn, must purchase a KDS Corp. inference engine, called a Playback Module, for $495. The Playback Module would then use the information in the Knowledge Module to draw conclusions and give advice.

In effect, only KDS Corp. sells KDS software, while the developer sells pure information. This means that the user must buy both a Knowlege Module from a developer and a Playback Module from KDS Corp. Although involved, this process eliminates the need for licensing agreements.

Human Edge has been selling one expert-system shell, Expert Ease, since 1984. Now, they've purchased the right to market a second shell, Expert Edge from Helix Expert Systems, London.



Expert Edge, *from Human Edge, allows developers to build expert systems for the IBM PC. Users say it's possible to build simple systems in only a few hours.*

Expert Edge, or Tess as it's known in the United Kingdom, allows developers to build expert systems by entering the set of rules they use to arrive at particular decisions. It is priced at $795 for an IBM PC or compatible.

Users say that with Tess, no formal computer training is required in order to build simple expert systems in only a few hours. Helix officals, however, say that to make Expert Edge really useful, a developer would almost certainly need a knowledge engineer (an individual trained in extracting and coding information).

Radian masters the shell game

RuleMaster, from Radian, is meant for industrial-scale applications—meaning it has been used successfully in such applications as fault diagnosis, weather prediction and chemical analysis. It was written in C to run on multiuser, UNIX-based systems such as those from Perkin-Elmer Corp. and Gould Inc. For those applications, the package is priced at $25,000. Rulemaster costs $5,000 in its IBM PC/XT version and $15,000 for the IBM PC-AT version.

RuleMaster automatically induces rules from examples in natural language supplied by an expert. Alternately, knowledge engineers, using a command language called Radial, can write code directly to Rulemaster.

Like Expert Edge, RuleMaster has roots in Great Britain. It was developed in association with professor Donald Miche of Edinburgh University's Turing Institute. Miche developed Expert Ease, Human Edge's first entry into the expert-shell market.

Some observers, however, doubt that any expert system running on existing personal computers can really handle serious problems. Dr. Bruce B. Johnson, a partner with consultants Arthur Andersen Co., Chicago, notes, "We haven't seen one [expert system] yet on a personal computer that will handle real-world problems. They're basically toys in that you have to pick a

problem that fits the system."

Still, IBM PC expert systems are finding users. The Chicago office of the accounting company Price Waterhouse has recently purchased KDS to assist some of its accountants in determining what is taxable income for some corporations. "We've even had people asking about such mundane things as setting up an expert system on how to run a city park," says KDS Corp. president Barbara Wallace.

VAR strategies for the expert system market have already been worked out—in theory. Developers would either be experts or hire experts in a certain field—say, industrial-chemical analysis or growth-fund stock behavior. They would then purchase an expert-shell package, sit down with the human expert and gradually produce a program that mimicked the expert's thinking when confronted with certain select problems. □

Tandem introduces low-end fault-tolerant system

Mike Seither
Associate Western Editor

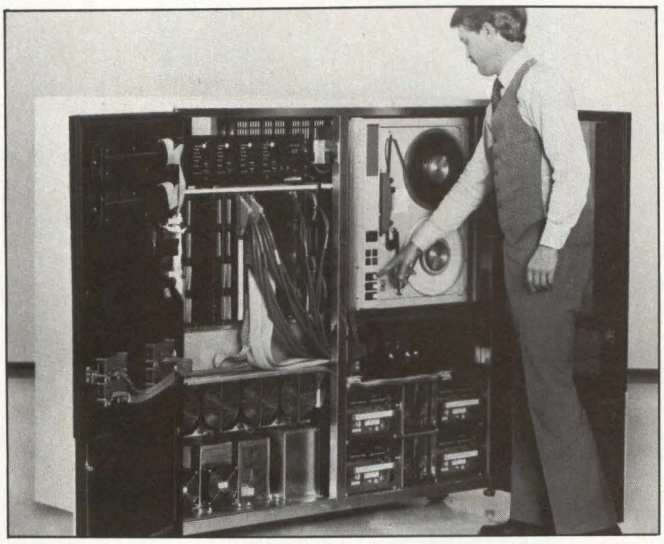
Tandem Computers Inc., Cupertino, Calif., the leading manufacturer of fault-tolerant computers, has moved into the low-end of the market with a new, compact system designed for remote transaction processing.

By offering a system that can be installed easily at the department level, the company hopes to garner business, not only from its existing customer base but also from smaller companies that can grow to need bigger Tandem systems.

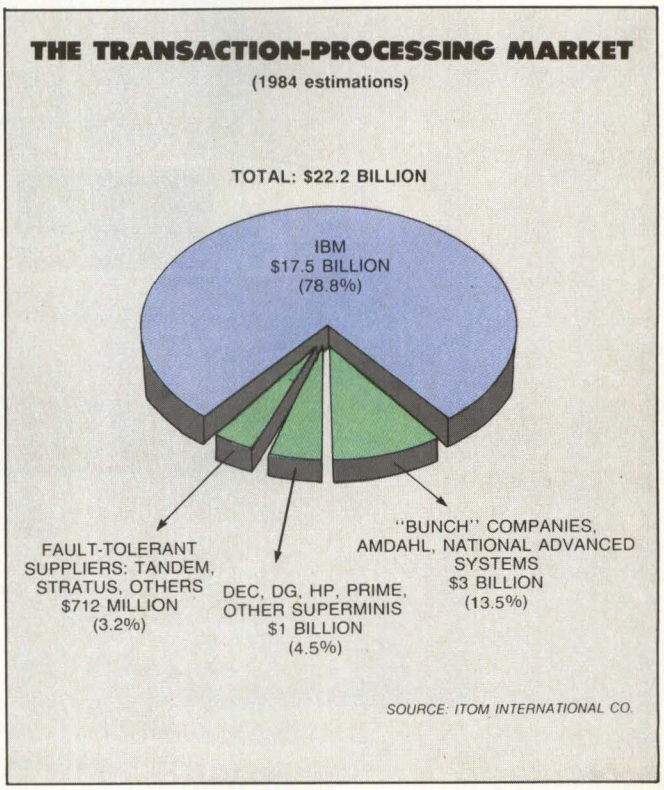
And to help peddle its new machine —the NonStop EXT—Tandem has instituted a reseller program that will for the first time allow OEMs to sell in the same markets as Tandem's end-user sales force. Tandem officials hope this arrangement will help the company penetrate smaller segments of certain markets, especially retailing and finance, at less than the cost associated with direct sales.

The EXT, priced at $120,000 and capable of operating in an office environment rather than in a computer room, is compatible with other Tandem computers and software and can function as part of a large Tandem network, according to the company.

"One of the barriers we've had with our [midrange] NonStop II is that, although it can be priced as low as $150,000, it still requires a computer room," says Gerald D. Held, Tan-



Two Winchester disk drives *are standard equipment on the NonStop EXT, but there is room in the cabinet for a total of four, as shown.*



Although Tandem *is the leading manufacturer of fault-tolerant systems (fiscal year 1984 sales: $533 million), IBM still controls the lion's share of the transaction-processing market.*

EMULEX IMPROVES AND TAPE BACKUP BY

Emulex sets the pace with three great storage subsystems for the full range of DEC QBus and Unibus systems. Whether you need Winchester disk, cartridge disk, ¼" streaming tape, or a combination unit, you'll be a step ahead with Emulex.

INTRODUCING VAULT.™

Emulex rises above the competition with the Vault.™ This 70-MByte tape subsystem is built around the CDC Sentinel ¼" cartridge tape streamer and uses Emulex's own TC05 (QBus) or TC15 (Unibus) tape coupler to interface with your system. The Vault is totally software transparent to standard TS11 software. So this compact tape unit looks just like a big ½" TS11 subsystem to your operating system and diagnostics.

Vault comes complete with power supply in a single compact cabinet. It's the perfect backup unit for smaller QBus systems such as the MICRO/PDP-11 and MICRO/VAX.

PRESENTING SABRE.™

SABRE™ is a sharp solution for LSI users who need more storage and backup. It packs 31.2 MBytes of main storage onto a 5¼" Winchester and 10.4 MBytes of backup onto a removable 8" cartridge disk.

And since SABRE is an exact RL02 emulation, all existing operating and diagnostic software can be used as is.

SABRE is 5¼" high and slips into any 19" RETMA enclosure. A desktop version is also available. Both come complete with power supply, host adapter and connecting cables.

SABRE needs only one-eighth the space and one-quarter the power of four RL02s. And it eliminates the need for a separate system bootstrap, bus terminator and clock control board.

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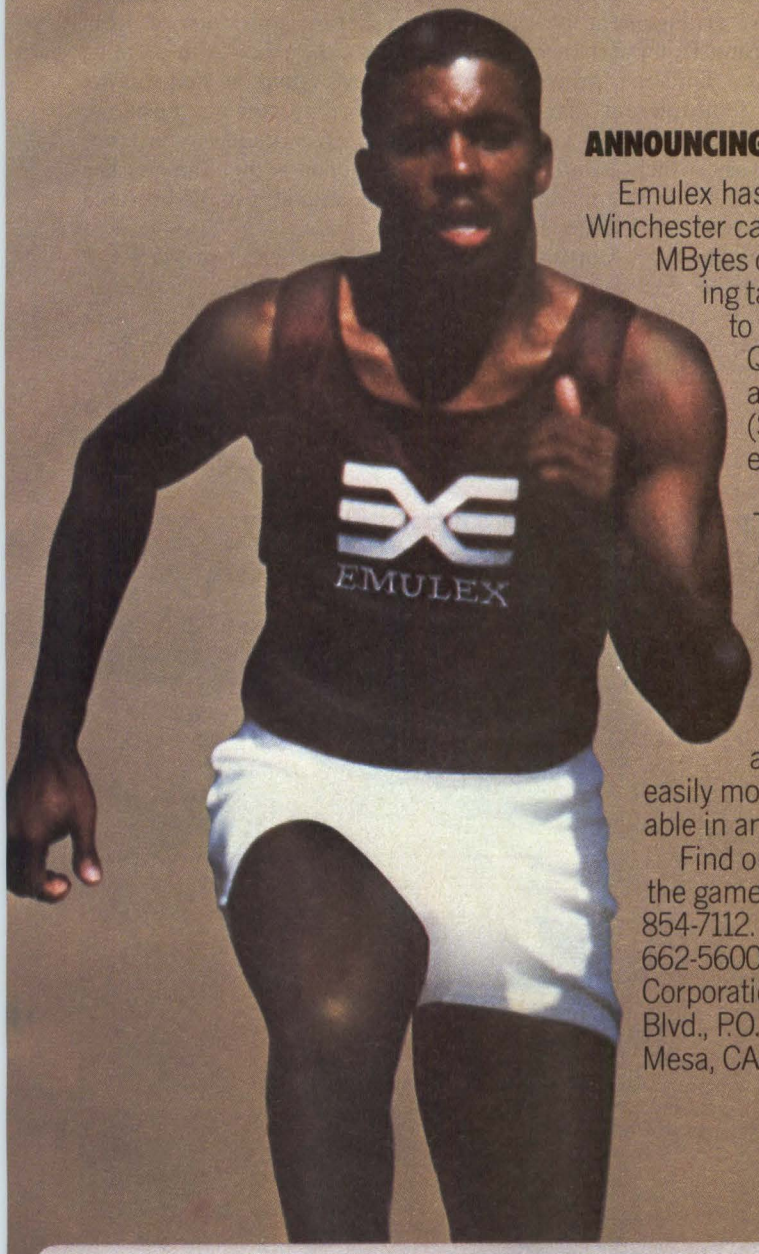
DEC DISK STORAGE LEAPS AND BOUNDS.



ANNOUNCING MEDLEY.™

Emulex has another winning combination with the Medley™ Winchester cartridge tape subsystem. It gives you either 35 or 110 MBytes of formatted storage and up to 70 MBytes of streaming tape backup. The Medley is fully software transparent to the operating system and diagnostic software of QBus and Unibus CPUs. And it uses the powerful and versatile Small Computer System Interface (SCSI) which keeps your options open for peripheral expansion.

Medley is interfaced to the system with a TC05/TC15 tape coupler and a UC02 (QBus) or UC12 (Unibus) host adapter. By using the Mass Storage Control Protocol (MSCP), the UC02 and UC12 allow the operating system to utilize the precise characteristics of the Winchester disk drive without patches or modifications to the operating system.

For convenience, Medley's disk drive, tape drive and power supply all fit into an attractive cabinet that easily mounts in a standard 19" rack. The Medley is also available in an attractive desktop version.

Find out how Emulex subsystems can keep you ahead of the game. Call toll-free (800) 854-7112. In California (714) 662-5600. Or write Emulex Corporation, 3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, CA 92626.

EMULEX

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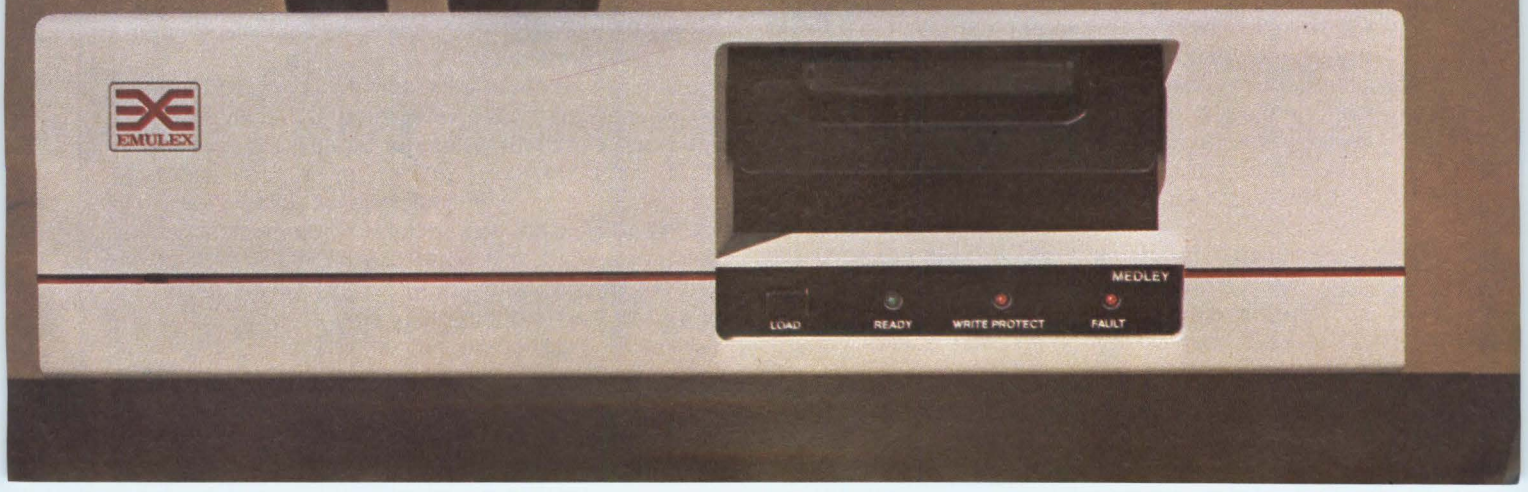
CIRCLE NO. 14 ON INQUIRY CARD



dem's director of strategic planning. "Air conditioning, raised floors and special power can add $50,000 to a system's total cost. The EXT offers customers on-line transaction processing for the cost of only the system itself."

The system comes in a single cabinet that occupies 11.8 square feet of floor space, stands 5.5 feet high and is narrow enough (31 inches) to be wheeled through standard doorways. Processors, disk drives, power supplies, backup batteries and cooling equipment are all inside the cabinet.

Tandem announced the EXT just weeks after IBM Corp. announced System 88, the first fault-tolerant line of computers to bear Big Blue's logo. The three IBM machines are the offspring of an OEM arrangement between IBM and Stratus Computer Inc. of Marlboro, Mass., Tandem's prime competitor in the fault-tolerant market.

IBM does not say which Stratus computers will make up the System 88 line. They are expected to be available in limited quantities this year. But industry analysts believe they are the low-end Stratus FT200, built with Motorola Inc. MC68000 microprocessors, and the XA400 and XA600 mid- and high-end computers that were introduced last year and use newer 68010 virtual-memory processors.

"It is a misconception that IBM is entering the Tandem marketplace," says Omri Serlin, president of Itom International Co., a Los Altos, Calif., market research company that follows the transaction-processing business. Serlin says it's the other way around. "What's happened is that Tandem has become large enough for IBM to take notice."

Serlin says that IBM had $17.5 billion in transaction-processing sales in 1984. Tandem's 1984 revenues were $533 million, up 27 percent from $418 million in 1983. "That shows you who's leading and who's coming up," says Serlin.

Despite Tandem's healthy growth,

Stratus repackages, cuts price of entry-level computer

In a move to stay competitive at the low end of the fault-tolerant computer market, Stratus Computer Inc., Marlboro, Mass., has repackaged its entry-level machine and cut the price by $45,000.

The new FT250, a modified version of the Stratus FT200 system, comes with 8M bytes of main memory, two 143M-byte (unformatted) disk drives, a 1,600/3,200 bit-per-inch tape drive and a fault-tolerant communications subsystem.

Also included in the FT250's $115,000 selling price are five software packages. In addition to the Stratus VOS operating system, transaction-processing facility and forms-management system, buyers receive a text-editing package and one of six languages: COBOL, FORTRAN, BASIC, C, Pascal or PL/1.

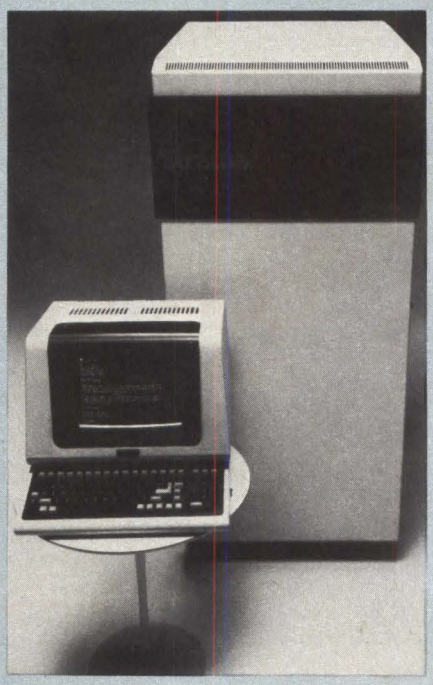
Stratus announced the FT250 within a few days of the introduction of a similarly-priced low-end machine —the NonStop EXT—by archrival Tandem Computers Inc. of Cupertino, Calif.

"What this shows is that the price war between Tandem and Stratus is reaching a new level of intensity," says Omri Serlin, president of Itom International Co., a Los Altos, Calif., research company that tracks the fault-tolerant computer market. "There is a very heated debate between them both over the relative performance of their two machines. In reality they are very comparable systems—in the range of 1 to 2 transactions per second."

Serlin adds that the FT250 is not a new Stratus machine. "It represents a pricing exercise," he says. "Stratus software has always been sold separately. Now they are offering a packaged system with the software bundled in."

The FT250 can operate in an office environment and is targeted at large organizations that need distributed network nodes, according to John Morgridge, vice president of marketing for Stratus. He says the FT250 can be used for a variety of "high availability" applications, such as a system for remote warehouses and distribution centers, a communications switch or a workstation controller.

According to Stratus, the FT250 is priced 28 percent lower than a comparably configured FT200 and is available for shipment immediately.



The FT250 *comes bundled with five software packages, including Stratus' VOS operating system, the transaction-processing facility and the forms-management system.*

THE FIRST INDUSTRIAL STRENGTH SUPERMICRO

The Universe 2400 is the first 32-bit supermicro computer built for demanding environments.

RUGGED VME PACKAGING

The tower model Universe 2400 has a steel enclosure, tough plastic outer panels, and a steel pedestal. VME-standard PC boards with screw-in mounts and gas-tight connectors help handle high temperature, vibration, and shock.

THE 32-BIT PATH TO 68020

With a 32-bit, 4KB cache and a 12.5MHz 68000 microprocessor, Universe 2400 runs with no wait states at 1.25 MIPS. And its 40MB, 32-bit VMEbus supports full 32-bit data transfers to 32-bit memories and disk channels, and provides a clean path to the 68020.

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Our 7-layer ISO-standard UniverseNet™ ties Universe systems into multi-vendor networks including Ethernet (802.3) and the General Motors MAP network (802.4), making the 2400 an ideal Computer-Integrated Manufacturing (CIM) platform.

UNIX SYSTEM V AND REAL TIME

UN/System V (derived from UNIX System V under AT&T license) gives you application compatibility, plus powerful real-time extensions, contiguous files, shared data, and record/file locking.

UNDER $6,000, QUANTITY 100

That includes 12-slot VME chassis, 512KB 32-bit RAM, 4 serial ports, 68000-based SCSI/SASI channel controller, 20MB Winchester, and floppy, in tower, rack, wall, or table mount models. For details, contact Charles River Data Systems, 983 Concord St., Framingham, MA 01701, (617) 626-1000.

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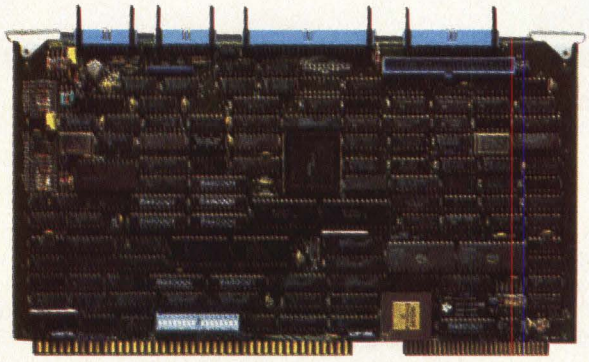
CIRCLE NO. 15 ON INQUIRY CARD

"With the Interphase Storager,™ I can make a 5¼" hard disk perform like an 8" disk."

Frank Emser
Manager Hardware Development
Paradyne Corporation

The Interphase Storager Multibus™ controller can give a 5¼" Winchester disk capabilities never before possible. Storager not only gets more performance from existing ST506 drives, but also supports the new ESDI and ST412HP interfaces for more power and capacity than ever before. And since Storager can control two Winchester disks, four ¼" tapes (QIC-02), and two 3½", 5¼" or 8" floppies, the same controller can be used for every storage need.

Storager features 1:1 interleave, with concurrent disk and tape transfers and simultaneous disk and bus transfers for speed and high performance. And Storager's unique "virtual buffer" architecture with UNIX™-optimized intelligent caching can reduce or eliminate disk rotational latency and overcome data overrun/underrun problems of FIFO-based controllers. Plus, for the very first time on a controller, Storager has an *on-board* 68000 CPU.



The Storager controller is the latest product in Interphase's line of high-performance Multibus controllers. Interphase also offers Multibus controllers for SMD disks, local area networks and video monitors. Plus powerful disk controllers for the IBM® PC. They're all backed by a great customer support team that works full time with Interphase customers to assure that our products work the way they should — in the system.

Find out how Storager can make a 5¼" disk perform like an 8" disk. Call Interphase today at (214) 350-9000.

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CIRCLE NO. 16 ON INQUIRY CARD

Serlin says the company should be worried about what is happening at the low end. One problem is with Tandem's NonStop I Plus, the original NonStop computer the company refurbishes then resells for as little as $55,000 after discounts. That machine is not completely compatible with the NonStop II ($180,000) or the top-of-the-line NonStop TXP ($300,000). Furthermore, the NonStop I Plus won't run a critical program—SNAX. That's Tandem's interface to IBM's Systems Network Architecture (SNA).

Analyst Peter Lowber of the Yankee Group, a Boston market research outfit, says that more than half of Tandem's customers use the fault-tolerant machines as a front end to IBM database machines for transaction processing.

Lowber says the EXT does not constitute a radical move on Tandem's part. "They're simply repackaging the same NonStop architecture and making it easier to install in smaller operational sites. But it's still good for Tandem to become more competitive with Stratus at the low-end."

The EXT architecture combines multiple parallel processors, a dual inter-processor communications bus and shared power supplies to prevent a single malfunction, or component failure, from disrupting operations.

The basic NonStop EXT comes with two processors and 4M bytes of main memory, which can be expanded to 16M bytes; two 8-inch Winchester disk drives with 168M bytes of unformatted capacity (there is room inside the cabinet for another pair of identical drives); a diagnostic service and operations processor; battery backup to protect the contents of main memory for an hour; a tape drive and controller; synchronous and asynchronous controllers; and a Tandem 6530 terminal.

The EXT comes with three Tandem software packages: the Guardian operating system, Encompass for relational database management and Expand for networking.

Tandem plans to introduce in August a two-processor expansion chassis with 4M bytes of main memory that will sell for $100,000. That unit will have the same disk storage capacity as the EXT unit, 16 powered I/O slots, battery backup and connections to the EXT's inter-processor bus and service and operations processor.

However, Serlin doubts that the expansion unit will catch on with customers. "By the time you add it, the price/performance [ratio] goes to pot. You might as well have put in a standard NonStop II from day one," he says.

Seeks smaller customers

Gerald L. Peterson, Tandem's vice president of product management and international sales and marketing, says the NonStop EXT will appeal more to smaller customers than do the company's other products. Tandem's NonStop II and TXP are now used by large banks, stock exchanges, financial institutions, department store chains, oil companies and automobile manufacturers.

"In banking, for instance, we see the EXT opening up a second tier of business in medium-size institutions," Peterson says. "Today we sell to the top 100 banks. The EXT will get us into the next lower level of 200 or 300 banks."

A key part of Tandem's strategy in reaching that lower tier is the company's new reseller program, which will be restricted to EXT sales only.

Under that program, Tandem will work with selected resellers who will be allowed to sell in such markets as communications, manufacturing, retailing and banking, areas now served exclusively by Tandem sales personnel.

"This will be a new channel of distribution that will allow us to get at those markets we haven't been geared up for," says Peterson. But he emphasizes that Tandem will open up the program to only a few OEMs. "We want to feel comfortable with the solution they are offering," Peterson says, adding that Tandem will continue its present OEM program that allows resellers to market NonStop II and TXP computers in specialized markets not served by Tandem sales personnel.

Tandem faces tough job

Analyst Serlin believes that the EXT will further Tandem's strategy of cultivating "annuity accounts" by getting customers to network in a small way and grow into large systems. "They've landed some big accounts over the last couple of years that can use small remote nodes in their networks," says Serlin. "The EXT was motivated by the demands of large customers."

But Serlin and other observers say Tandem may have its work cut out for it in the transaction-processing market.

"Now that IBM has a fault-tolerant machine, it will have a negative impact on Tandem," says Serlin. "People who might have liked Stratus in the past but passed them up because of corporate credibility may look twice now that the same equipment has the IBM logo."

Exactly how similar that equipment is, IBM won't say, except to point out that some hardware and software enhancements have been made to the Stratus computers.

"Since Stratus is a competitor, both as a manufacturer and an OEM supplier, we don't want to make a point-by-point comparison of the machines," says Paul Neumann, a spokesman for IBM's Information Systems Group in Rye Brook, N.Y.

Strategic planner Held of Tandem doesn't discount the IBM threat. "We consider IBM a competitor in 99 out of 100 deals," he says. "But the System 88 is an old product. We've been competing with it in the marketplace for a couple of years." □

EPSON BUILDS PRINTER FACTORY IN CHINA

Reflecting China's new policy of opening the country to foreign capital, Epson Corp., Hirooka, Japan, is building a $15 million factory in the Shenzhen Special Economic Zone near Hong Kong. The plant, one of the first wholly owned enterprises permitted in the zone, will be used for manufacturing printer mechanisms. The initial production capacity will begin in July, and production capacity will be 50,000 mechanisms.

Phoenix coprocessor expands IBM PC umbrella

Lori Valigra, Senior Editor

Phoenix Software Associates Ltd. should by now have embellished its IBM Corp. PC-compatible tools by supplying designs for coprocessor boards. Design licensees would make the boards, which will help companies build interim computers until they can ready a single-processor-based PC-AT-compatible. The boards also would enable companies to bring non-IBM computers under the IBM umbrella.

Under the plan, the Norwood, Mass., software company, which has completed MS-DOS ports for many major PC-compatible manufacturers, will supply the designs as part of a package including a ROM basic input/output system, GW BASIC and MS-DOS integration software, PC-DOS utilities and the choice of a coprocessor board, video board or motherboard design.

An Intel Corp. 8086 and 80286 coprocessor board, for example, will make a computer based on a Motorola Inc. MC68000, National Semiconductor Inc. 16016/32032, or Western Electric Co. 32000 processor compatible with either IBM's PC/XT or PC-AT. The board and software will let UNIX and MS-DOS operating systems, for example, run cooperatively. The coprocessor boards also can take over a host system and run PC programs without UNIX. In that case, the host effectively serves as an I/O processor. Neil J. Colvin, Phoenix president, estimates it will cost a design licensee between $50 and $75 per unit to manufacture such a board.

Licensees will get a pre-manufactured, wire-wrapped board, schematics, firmware, a printed theory of operations, process-control software and all manufacturing instructions. Phoenix also will supply a recommended list of components. Colvin says the license agreement prevents the manufacturer from modifying the design without Phoenix's permission. The manufacturer can, however, freely change some aspects of the board, such as its form factor or by making it four layers instead of two.

Design customized

In this way, Phoenix maintains quality control over the board, and control over the basic design. The design is then customized. Colvin explains that Phoenix now is working on four MC68000 board designs, for which 75 percent of the software is identical. He says it takes 16 to 20 weeks to design such boards.

Colvin says that little memory is needed in the coprocessor to run the compatible software, because the substantial amount of code needed to mesh the two processors is placed in a host processor, such as an MC68000. In a UNIX-based computer, the MC68000 runs as a multiprocessed task under the operating system, as does the PC-compatible processor.

The coprocessor boards are targeted at companies needing to add PC access to non-PC-environment products. For example, Colvin says there are about 200 graphics workstations now marketed that are based on the MC68000. If the users want to run a PC program such as Lotus Development Corp.'s popular 1-2-3 integrated package, they would add the PC mode to their machine via the board. PC processor and MC68000 modes are accessed by a software switch.

Colvin says Phoenix is adding value to existing workstations by adding PC capability. He says customers generally are happy with their MC68000-based computers. He claims that while many National Semiconductor processor-based machines are about six months away from introduction, "those manufacturers already are looking at PC compatibility as an add-on [feature]."

For so-called "friendly" (i.e., Intel-processor) environments, Phoenix is offering PC-compatible manufacturers a short-term solution until they can design and produce a PC-AT-compatible machine that doesn't have a dual personality. The price for Phoenix's compatibility package in a hostile, or non-Intel-processor, environment is about $1 million, while in a friendly environment it would be $700,000 to $750,000.

Retail version available

Phoenix will sell some of the boards on a retail basis through its Phoenix Computer Products Corp. affiliate. The first board, called Pfaster286, was scheduled for introduction last month. While this board is not intended to provide complete PC-AT-compatibility, it triples the speed of MS-DOS 2.0, 2.1 or 3.0 on an IBM PC or PC/XT, claims Phoenix.

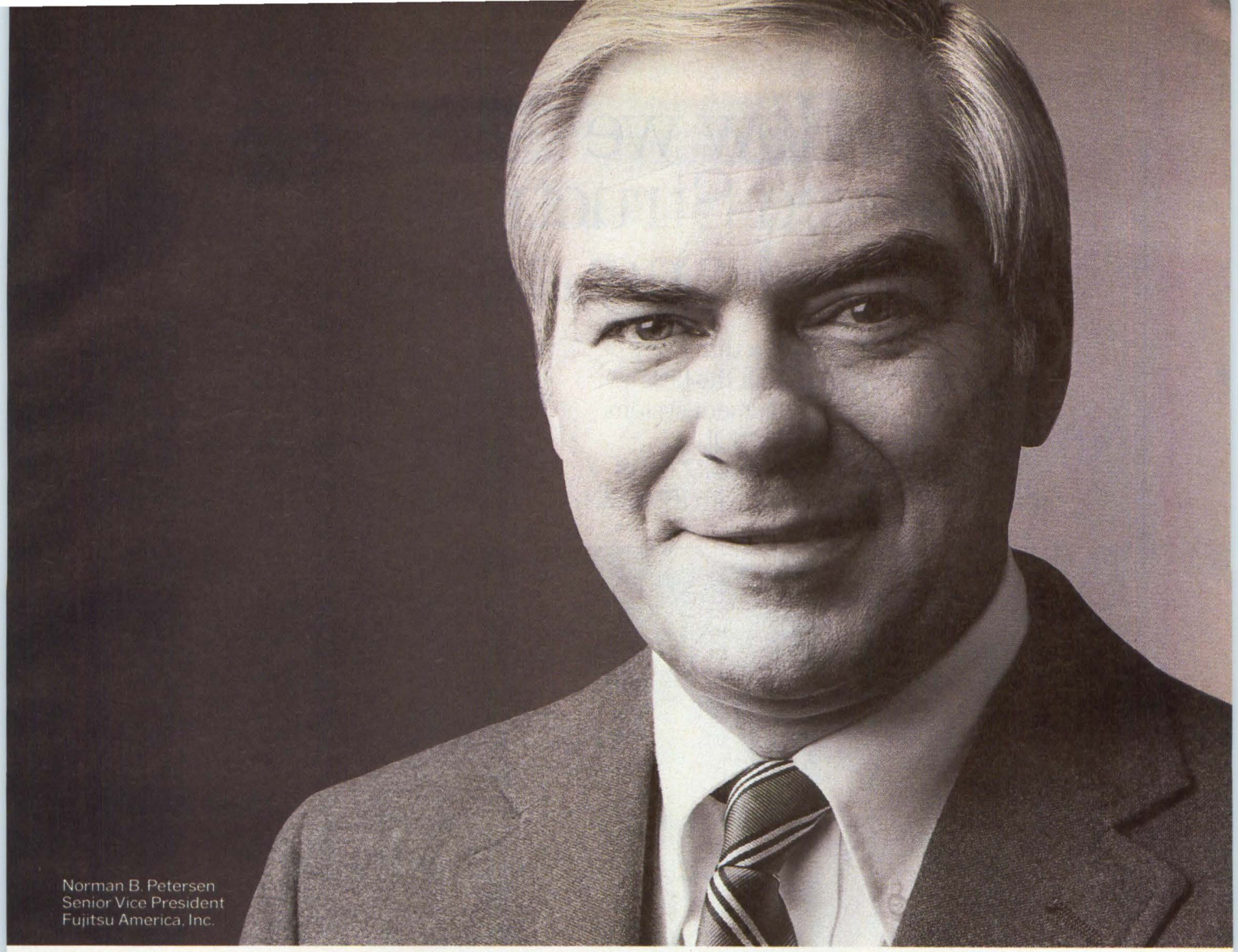
Pfaster286 includes a PC-AT ROM (MMS, March, Page 34), an 80286 CPU, a socket for an optional 80287 math coprocessor, 1M byte of RAM (expandable to 2M bytes using 256K bit RAM chips), 16K bytes of electron-

HOW PFASTER286 WORKS

boot up PC **coprocessor mode**	boot up PC **native mode**
80286	8088
high-speed PC/XT/-AT operation	standard PC/XT operation
80286 performs high-speed memory and processing tasks, the host system's 8088 performs I/O tasks, optional 80287 handles math functions	8088 performs all system functions, optional 8087 handles math functions

Source: Phoenix Software Associates Ltd.

With Phoenix's Pfaster286 *coprocessor board installed, a host system's 8088 chip can perform I/O tasks for the 80286, or function as the CPU.*



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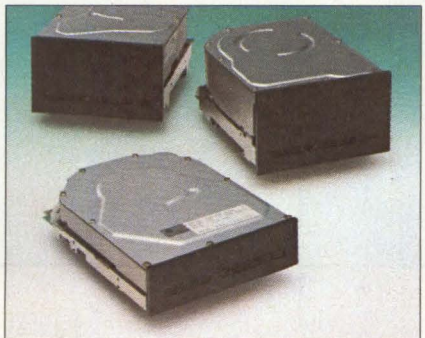

MODEL	M2241	M2242	M2243
CAPACITY (MB) Unformatted	31	55	86
AVERAGE POSITIONING TIME (msec)	33	33	33
TRANSFER RATE (KB/sec)	625	625	625
INTERFACE	ST506/ SA4000	ST506/ SA4000	ST506/ SA4000
POSITIONING METHOD	Rotary Voice Coil	Rotary Voice Coil	Rotary Voice Coil

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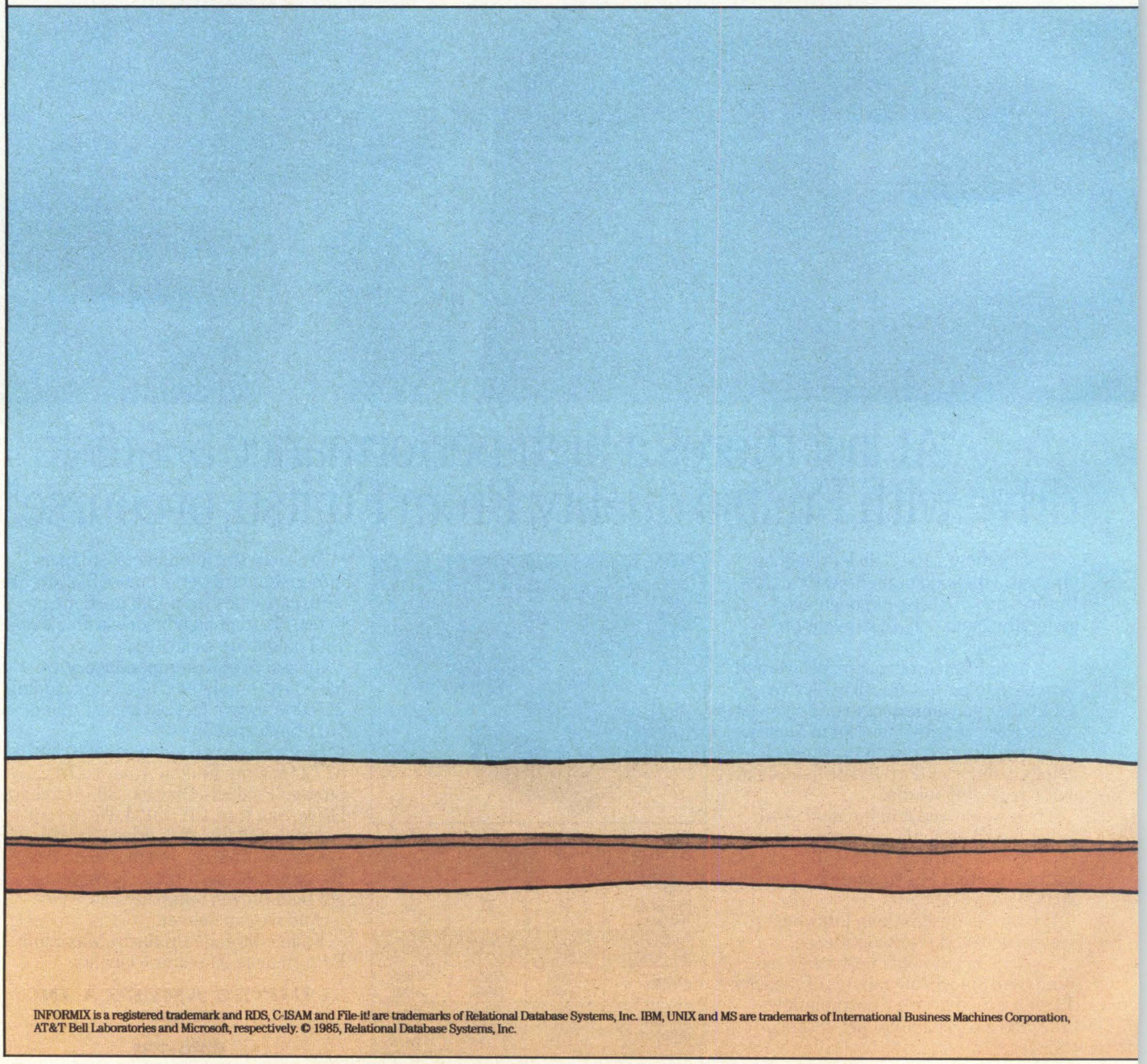

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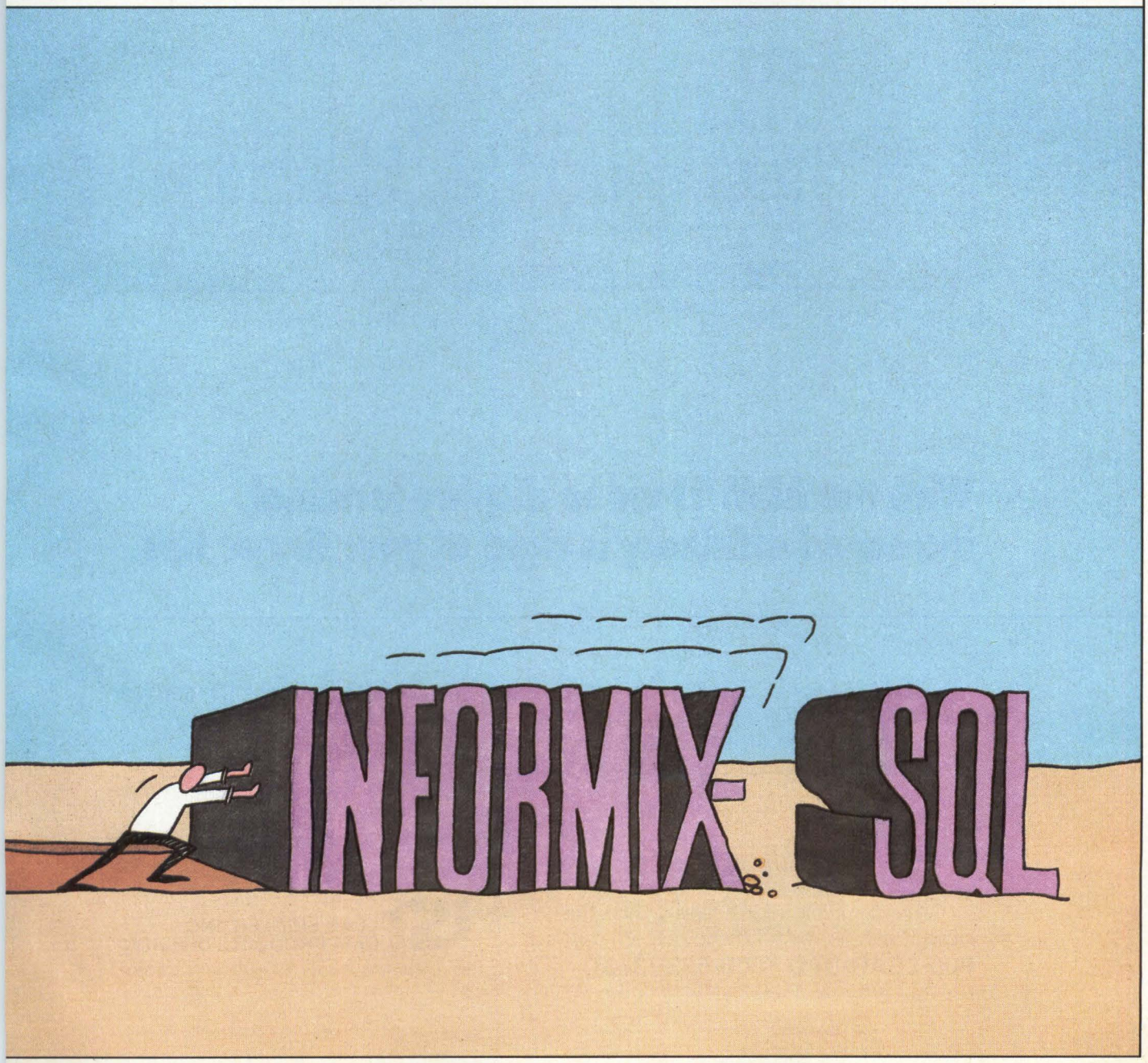

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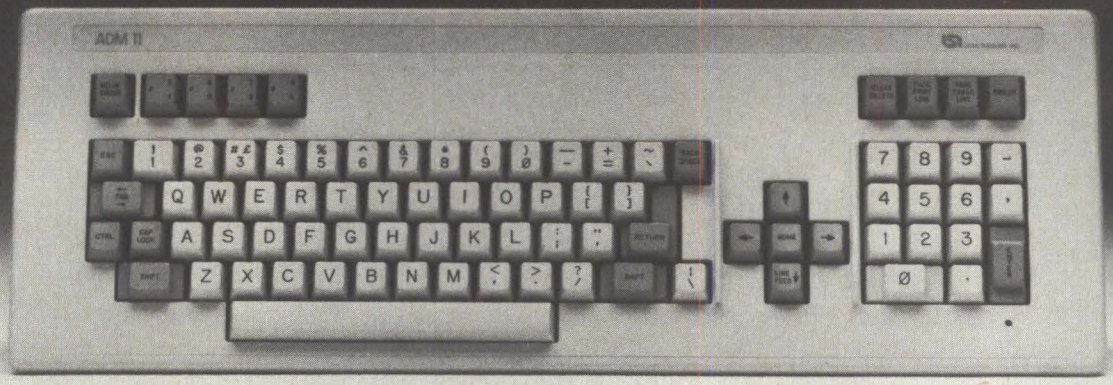
EFFICIENCY EXPERT.



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ically programmable ROM (expandable to 256K bytes) and support for eight levels of interrupts and four direct-memory access channels. The board fits into any long slot in a computer's chassis. Phoenix says Pfaster286 can be used with most programs written for the Intel 8088. But some programs may not run at the same speed and may encounter problems in critical timing loops if run at 80286 speeds. The board is priced at $2,395.

The coprocessor scheme had its roots in a portable computer, the Otrona Corp. Attaché, that Phoenix helped make PC-compatible three years ago. The Attaché bears little resemblance to IBM's PC, having a different processor, keyboard and monitor. Phoenix created a coprocessor board and software to essentially trick the system into operating like a PC.

At the same time it announced its coprocessor design strategy, Phoenix introduced a design for an advanced video board. This product takes low-end IBM video compatibility (320-by-200-dot resolution) and meshes it with a high-resolution 28-MHz monitor. Colvin says this gives users a high resolution picture (640 by 400 dots) when running low-resolution software, a capability not offered on IBM's basic PC. The board is said to be compatible with the Hercules monochrome graphics and Tecmar Graphics Master graphics add-in cards for the IBM PC. □

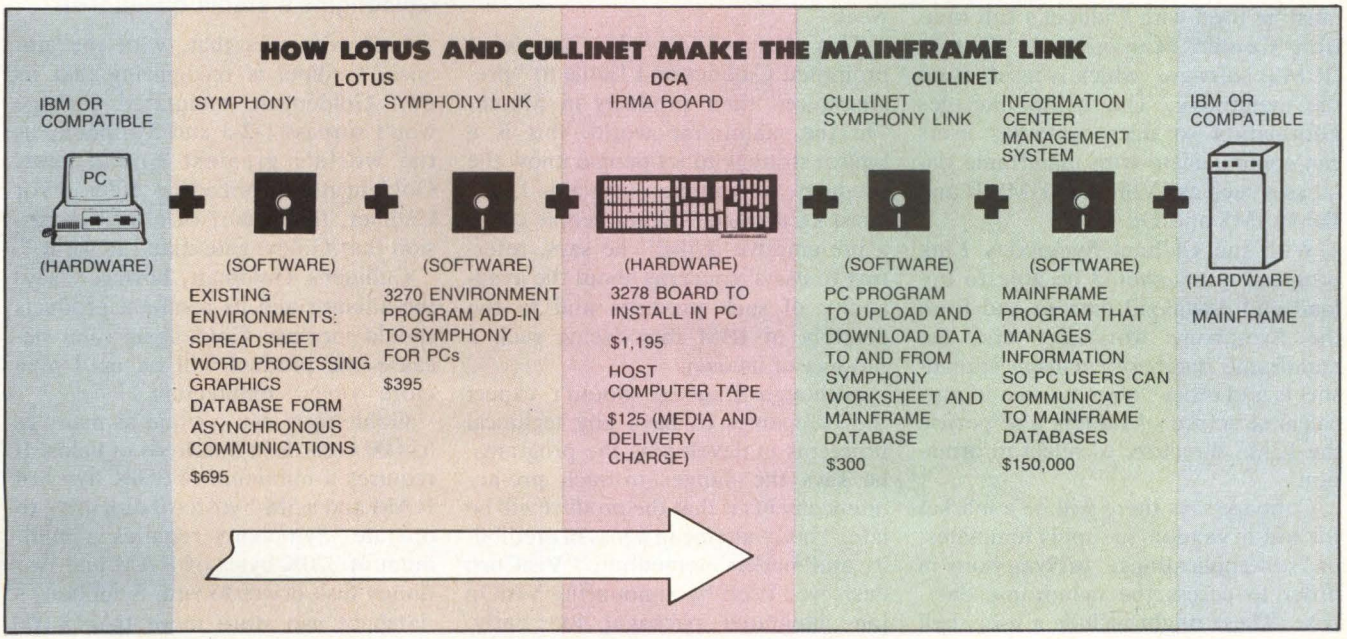
Lotus-Cullinet alliance plans micro-mainframe link

Lori Valigra, Senior Editor

Two software companies dominating opposite ends of the computer market have met halfway to bridge the gap between microcomputers and mainframes.

Lotus Development Corp., Cambridge, Mass., and Cullinet Software Inc., Westwood, Mass., are allying to produce programs connecting Lotus' Symphony and 1-2-3 personal computer software to Cullinet's database software running on IBM Corp. and compatible mainframes. Lotus' Symphony Link, which will work with a 3278 communications board, will be available first. Cullinet's Symphony Link, which will need Lotus' Symphony Link, the Symphony program, and the 3278 board to operate, will follow. The forthcoming software will let personal computer and mainframe owners transfer information between the two types of processors.

The alliance "is a move by both [companies] to keep them from losing sales," says Paul Cubbage, senior industry analyst for the Software Information Service at Dataquest Inc., a San Jose, Calif., market research operation. Cubbage suspects Cullinet has been losing some Fortune 1,000 business because its mainframe programs do not have a Symphony or 1-2-3 interface. He says 1-2-3 is the most prevalent integrated product in Fortune 1,000 companies, and estimates that, by the end of last year, Lotus had installed 675,000 1-2-3 programs and about 90,000 Symphony packages.



Tying an IBM PC or lookalike *to an IBM mainframe or compatible requires two Lotus programs, a DCA 3278 communications board, one PC and a mainframe software package from Cullinet.*

What Lotus gains from Cullinet is the mainframe link that has become critical to users in such large companies. "Lotus has recognized that microcomputer software managers without a micro-to-mainframe connection won't make it in the long run," Cubbage contends. Additionally, he points out that Symphony has not been as big a hit as 1-2-3 and the alliance may help push Symphony into the large accounts. "This is a defensive move to keep them from being locked out of bids" made by large corporations, he says.

Robert Lefkowits, an analyst with the Cupertino, Calif., market research company, Infocorp, agrees. "This gives Lotus a way into large corporations' MIS (management information systems) departments," says Lefkowits, asserting that Cullinet will promote Symphony through the company's direct sales force.

Cullinet adds own products

While the symbiotic relationship calls for the duo to develop Symphony Link packages to allow Symphony users to access mainframes, Cullinet also is developing the Cullinet Universal Link, to let 1-2-3 users communicate with a mainframe. Each product must be used with Cullinet's Information Center Management System (ICMS) software, which is resident on the mainframe. The ICMS manages information so microcomputer users can communicate with mainframe databases such as Cullinet's IDMS/R and IBM's IMS and DL/1.

With the Cullinet Symphony Link program, users should be able to upload and download data to and from the Symphony worksheet and the mainframe database, manage spreadsheets and other "objects" in a hierarchical structure of folders and peruse the ICMS directory to select information.

Cubbage says there will be a market for add-in vendors to supply templates, or "sub-applications," to Symphony in order to access the mainframe database. These might include a user shell for financial applications.

The Cullinet products, however, aren't expected to be available to users until the fourth quarter of this year and then only in beta-test versions. Cullinet's Universal Link and Symphony Link each will be priced at $300. ICMS is available now at $150,000 for a site license fee. Lotus' Symphony Link should be available by midsummer, along with the 3278 board for Symphony. That board is the result of a joint venture between Lotus and Digital Communications Associates Inc. (DCA), Norcross, Ga. The board is priced at $1,195, and the software is priced at $395.

Lefkowits says that as a rule of thumb, users are willing to buy a PC/3270-type mainframe link for double or triple what they would pay for a 3270 terminal alone. Alexander Crosett, manager of communications marketing at Lotus, says the price of the Cullinet-Lotus mainframe link will equal a 3270's price, or about $4,500. (This assumes that the $150,000 ICMS is already in place.)

Cullinet president Robert N. Goldman expects the joint effort to provide hundreds of thousands of personal computer users with access to IBM mainframes. Jim Manzi, president of Lotus, says customers ask about mainframe connections three to four times a week.

This demand may be just what prompted Cullinet and Lotus to "preannounce" their products in March. "In the mainframe world, this is a typical strategy to let people know the products are coming," explains Dataquest's Cubbage. "Other people call it a pre-emptive strike," he says, referring to users' concerns about the availability of such products and to the possibly of IBM introducing such a product of its own.

Although Cubbage doesn't expect the companies to have any technical problems in developing the programs, he says the danger in such pre-announcements is that the product will be late. This could mean a loss of credibility and market momentum. "VisiCorp destroyed itself by announcing VisiOn [an integrated package] too early. There's some real peril [in doing that]," he cautions.

Bringing mainframe and microcomputer orientations together may prove the highest hurdle. "The difficulties will be from coordinating two different companies and philosophies," says Cubbage.

The main problem with the alliance may lie in the dual origination of the products, says Lefkowits. He says MIS managers like to buy products from one vendor to get common sales support and service. At press time, Cullinet and Lotus intended to sell their products independently. Lotus' Crosett says his company wants to sell the products as a group, so the sales situation might change. For now, Cullinet plans to sell through its direct sales force and Lotus will sell through its authorized retailers. The 3278 board will be available from DCA. "It gets hairy, if the MIS director buys hundreds of thousands of products" from different vendors, he explains. "They [Cullinet and Lotus] will need some merging of the sales effort, if this is to be successful. I don't know what form that will take."

He expects the products to provide Cullinet and Lotus with 10 percent to 15 percent in added sales, because these are ancillary products.

Goldengate's status questioned

Lefkowits says that, with the alliance, Cullinet is recognizing that its own Goldengate integrated package won't surpass 1-2-3 and Symphony as the world's greatest spreadsheet. Goldengate is priced at $795. "For Cullinet, this is sort of a tacit admission that Goldengate didn't make it."

Cullinet's Goldman, however, says the alliance and its resultant products should increase Goldengate sales because the product will be used in a more "open" architecture.

Goldengate can contain as many as 65,000 records in hundreds of fields. It requires a minimum of 320K bytes of RAM and a 5M-byte hard disk drive to operate. Symphony requires a minimum of 320K bytes of RAM and two floppy disk drives to run. Symphony's database can store more than 8,000 records in as many as 256 fields. Its price is $695. □

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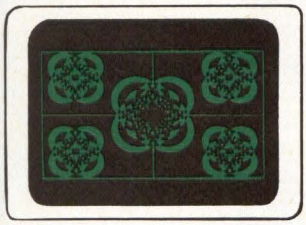

ERGO 340
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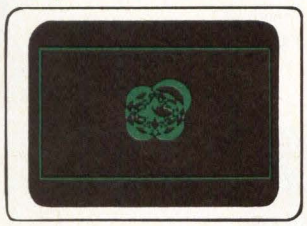

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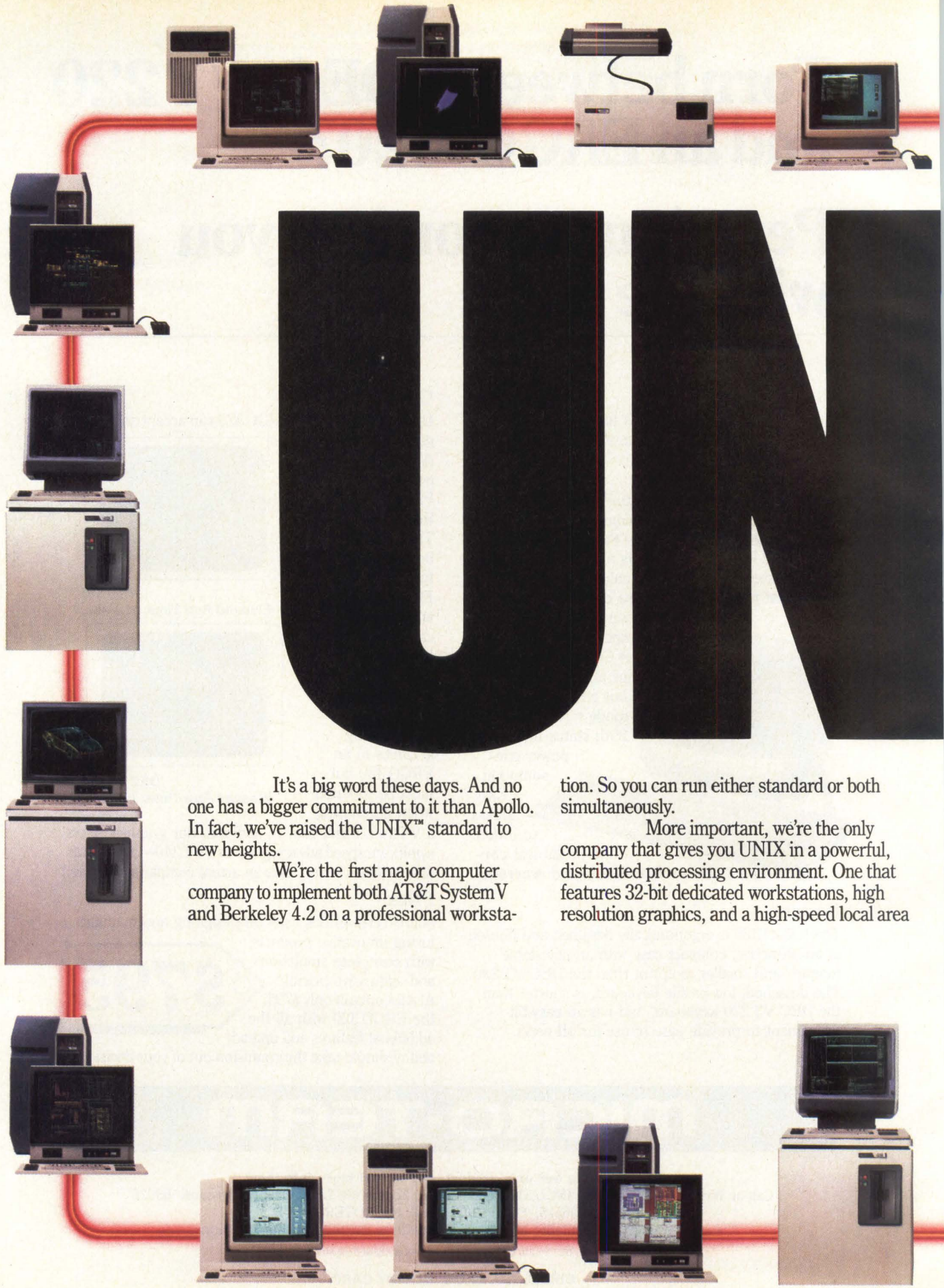

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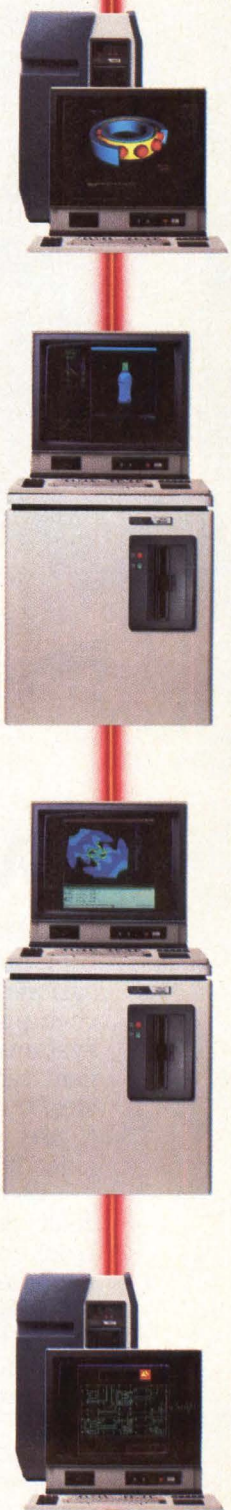

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CIRCLE NO. 22 ON INQUIRY CARD

First Japanese Comdex gives glimpse of progress

Charles Hintermeister
Taiwan Correspondent

Although Comdex Japan '85 may not open any doors for U.S. computer companies, it did give American visitors an opportunity to assess Japan's progress in the business and personal computing fields.

The chief purpose of holding Japan's first Comdex, according to Sheldon G. Adelson, president of the Interface Group of Needham, Mass., which sponsored the show, was to help U.S. computer companies penetrate the lucrative Japanese market. But Comdex Japan '85 turned out to be a primarily Japanese show. About three-quarters of the more than 200 exhibitors were Japanese, as were most of the visitors. A small number of companies from Southeast Asia, Canada, Sweden and West Germany were also present.

About 40,000 people visited 700 booths in 150,000 square feet of space at Tokyo's Harumi Exhibition Center during the show's three days, March 26-28. The exhibits-only admission fee of $25 did not seem to deter many Japanese, who are accustomed to attending shows free, according to a spokesman for the Interface Group. However, $80-per-day conference sessions were, for the most part, sparsely attended.

Dominated by Japanese

While IBM-Japan, AT&T International and a few other heavyweight U.S. companies put on prominent exhibits, the companies were somewhat overshadowed by displays put on by Brother International, Citizen Watch Co., C. Itoh Electronics Ltd., Epson Corp., NEC Corp., Sharp Electronics Corp. and Sony Corp., all Japanese.

Not surprisingly, the overall product emphasis was on what the Japanese are best known for—high-quality peripherals for the OEM market. There was particular stress on hard disk drives, high-capacity minifloppy, and microfloppy drives, terminals and printers in staggering array. Other major product areas at the show were 16-bit laptop computers, local area networks and software.

AT&T UNIX PC makes a splash

Among the U.S. companies at the show, AT&T International's booth drew some of the largest crowds. The exhibit, which included the 3B series of computers, UNIX software, digital switching applications and a videotex system, centered around the new AT&T UNIX PC, which was announced worldwide as Comdex Japan began.

The UNIX PC will be distributed in Japan by Ricoh Co. Ltd. and probably by Olivetti-Japan, says an AT&T spokesman. AT&T has already concluded an agreement with Ricoh to distribute AT&T's 3B series of computers in Japan. AT&T last year began purchasing high-speed facsimile copiers from Ricoh.

Another of the UNIX-based systems on display at the show was the 8120DX from Sharp. Running the Motorola Inc. MC68000 microprocessor, clocked at 10 MHz, the 8120DX provides 768K bytes of RAM, which can be expanded to 4M bytes. On-board storage devices include a 1M-byte floppy disk drive and a 5¼-inch hard disk drive, available in capacities of 10M, 20M, 40M or 60M bytes. The monitor displays 640 by 475 dots in text or graphic mode. The Sharp 8120DX retails in Japan for about $8,600.

Sheldon G. Adelson, *president of the Interface Group, which sponsored Comdex Japan, says the show was held in Japan to help U.S. companies penetrate the Japanese market.*

Hard disks abound

Japan's major players in hard disk manufacture all put on large exhibitions. Teac announced a half-height, 25M-byte, hard disk drive it says will go into production by this summer, and Fujitsu Ltd. displayed two 5¼-inch, half-height, hard disk drives, with unformatted storage capacities of 13.3M and 26.7M bytes. Fujitsu's M2233AH/BH and M2235AH/BH, which were unveiled at the show, will be available by the end of this year, according to a Fujitsu spokesman. Fujitsu AH models have an ST412 interface, while BH types use an SA4000 interface. The average posi-

tioning time for each model is 95 msec, and the data-transfer rate is 625K bytes per second. Fujitsu also displayed its 14-inch, five-platter, hard disk drive with an unformatted storage capacity of 671M bytes. Introduced in December 1984, the unit has an average positioning time of 27 msec and an OEM sample price of $11,500.

Nippon Peripherals Ltd. introduced three models to its line of hard disk drives. Nippon displayed a 3½-inch model—produced in single- or dual-platter versions—a 5¼-inch, 26M-byte, half-height drive and a 5¼-inch, 85M-byte drive. Each will be commercially available by this summer, according to a Nippon spokesman.

On the software side, a new relational database language called Database IV was introduced by Intelligence & Knowledge Engineering Inc. of Osaka, Japan. It is said to be capable of simultaneously processing nine files and runs under MS-DOS. Database IV is slated to be priced at $495 when it becomes available later this year. There is no relation between Database IV and dBASE II or with its maker, Ashton-Tate.

Telemedia Inc., part of the Computer Technology Group of Chicago, promoted its UNIX and C language training courses at the show. The company offers a variety of seminars and video-based training courses, which it believes have strong potential in Japan. According to a spokeswoman for Telemedia, UNIX training in Japan, whether in Japanese or English, is fairly backward. She says that considerable interest in the course was expressed by visitors to the show.

Nine-pound computer displayed

A number of laptop computers from both U.S. and Japanese vendors were introduced. The Ampere WS-1, produced by Ampere Inc., Tokyo, will be handled in the United States by Work Space Computer Inc., of Torrance, Calif. While most of the other laptops on display are MS-DOS-based, the Ampere system uses the multitasking BIG.DOS operating system and the APL programming language. The nine-pound unit runs on Motorola's MC68000 microprocessor, clocked at 8 MHz, and provides 128K bytes of ROM and 64K bytes of CMOS RAM, expandable to 448K bytes. A built-in microcassette for data, program or voice storage is provided, and an external 3½-inch, battery-powered microfloppy disk drive is optional.

Dr. Atsuyoshi Ouchi, *vice chairman of NEC Corp., says Japanese trade barriers must be observed by the Japanese as well as by foreigners.*

The bit-mapped, liquid-crystal screen displays 25 lines by 80 columns. The keyboard features 70 keys in an APL/ASCII layout and includes eight programmable function keys. The system's various interfaces include two RS232C serial ports, one with a built-in, 300-baud modem; a Centronics printer port; an external floppy or hard disk drive interface; an external system bus interface; a standard telephone modem connector; three slots for RAM, ROM or EPROM cartridges; an internal slot for a 192K-byte, static RAM card; and microphone and speaker jacks.

The Ampere WS-1, configured with 64K bytes of CMOS RAM, sells for $1,995. Samples should be available now. Volume production is expected to begin in July.

Most of the U.S. exhibitors at Comdex Japan said they are confident that they will be able to make their mark in the Japanese business-computing market. Asked whether Japan's trade barriers would seriously hinder the successful promotion of U.S. computer products in Japan, the Interface Group chairman Adelson asserted that it was "quite possible" that it would. He maintained that Japan's huge trade surplus with the United States makes it "quite clear to us that the Japanese have to go overboard if they want to continue trading with the United States. They have to go out of their way to bring U.S. products to Japan." Adelson said that Comdex Japan had many prominent members of the Japanese computer industry on its advisory board.

One member, Dr. Atsuyoshi Ouchi, vice chairman and representative director of NEC Corp., downplays the barriers. He says these barriers—endless red tape, labyrinthine customs procedures, etc.—must be observed by Japanese as well as by foreign companies, and the barriers do not in themselves favor either group. He points out, however, that U.S. companies trying to sell their products in Japan have often not taken the time to learn exactly what the Japanese want, or what would be the best way to sell to them. "For example," he says, "when Japanese companies export automobiles to the United States, they naturally put the steering wheel on the left side. But when U.S. car makers export cars to Japan, they don't place the steering wheel on the right side." □

TECHNOLOGY DRAWS BULK OF VENTURE CAPITAL

Venture capitalists still have large amounts of money to invest. Following the 1983 explosion of new capital commitments to a record $3.4 billion, 101 independent, private venture funds raised $3.2 billion in 1984, according to the *Venture Capital Journal,* Wellesley Hills, Mass. Both figures compare favorably with the $1.4 billion raised in 1982. Most of the 1984 monies come from pension funds, individual or family investments and insurance companies. Venture capitalists are expected to invest the bulk of their funds in technology-related companies. Californian investors got the most in commitments with $1.2 billion; next were New York ($649 million) and Massachusetts ($481 million).

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OVERHEARD OVERSEAS

British group challenges Intel's OpenNet standard

Denise Danks
European Contributor

While Intel Corp. was announcing its OpenNet strategy for microcomputer local area networks in March—with the blessing of IBM Corp. and Microsoft Corp.—the British Microcomputer Manufacturers Group (BMMG), Buntingford, England, was revealing plans to create a standard for economical LANs.

David Fraser, managing director of the British subsidiary of Microsoft, has already criticized the BMMG scheme, arguing that it is futile to fly in the face of IBM and Microsoft.

BMMG supporters, however, see the proposal not so much as a head-on OpenNet competitor but as a less expensive, more efficient alternative and also as one more means of preventing IBM domination in the LAN market.

Despite the controversy, some important microcomputer vendors are supporting the BMMG move. Apart from up to 10 BMMG members who build networks, significant non-BMMG members backing the initiative are Applied Computer Techniques Plc., Birmingham, England, Britain's largest microcomputer manufacturer, and Digital Microsystems Ltd., Reading, England. Digital Microsystems manufactures Hinet, the leading European LAN product.

The LAN standard proposals are a result of a feasibility study by Dr. Christopher Shelton of BMMG member Shelton Systems Ltd., London. Shelton worked with the Information Technology Standards Unit of Britain's Department of Industry. The BMMG is now seeking government endorsement and funding of £500,000 (about $625,000) to have off-the-shelf components available for network manufacturers within a year.

Computer consultant and director general of the BMMG, David Broad, says the feasibility study was commissioned because manufacturers were concerned over the glut of microcomputer designs on the market. Their view was that the lack of common standards in the market for 1M-bit-per-second (bps) to 2M-bps LANs and confusion over incompatible designs would discourage potential users and undermine the credibility of microcomputer manufacturers.

Patrick Johnstone, marketing director at Digital Microsystems, admits that his company joined BMMG's push for standards because it was designing a higher speed version of Hinet, a baseband LAN with a speed of 500K bps. The advent of British government funding was good timing, he concedes. More generally speaking, Johnstone says, "The whole objective is to get the manufacturing cost of a standard connection below that of Ethernet. A standard for electrical connection is highly desirable for large customers, particularly [those with] government contracts."

BMMG's Broad says another motivation behind the push for a standard is the real threat of IBM—as a single, dominant supplier—producing its own design and controlling the LAN market.

And, in Western Europe, this market is growing fast. According to a Eurocast report from IDC Europa Ltd., the number of installed baseband LANs was 21,400 in 1984, up from 2,330 in 1982. The market should grow annually by 72 percent until 1990, according to the report.

The BMMG initiative is all the more significant because Britain has 58 percent of the total installed broadband and baseband LANs. France and West Germany have 10 percent and 9 percent, respectively. Britain's baseband installed base should grow by 54 percent annually until 1990, predicts the report. France's installed base should experience an 89 percent annual growth rate, while West Germany's base should increase 81 percent a year.

While BMMG is initially proposing DR Net—networking software from Digital Research Inc., Pacific Grove, Calif.—running under Concurrent DOS, later versions will adopt open systems interconnection (OSI) protocols and support other operating systems, including MS-DOS and UNIX.

The proposed LAN would connect at least 64 stations in bus or star networks using carrier sense multiple access or token passing over coaxial cable at 250K to 2M bps. The hardware required will cost LAN manufacturers between $12 and $40 per connection and will be available in a year.

The BMMG proposal differs from OpenNet in that it excludes Ethernet, using DR Net instead. Shelton does not see the use of DR Net causing a clash of interests with users of OpenNet. "DR Net is a temporary vehicle [designed] to allow us to use Concurrent DOS and get the system working. Whether we'll integrate DR Net at the full transport or link layer of OSI we don't yet know," Shelton admits. "But, we will seek to decrease the use of DR Net and interface OSI straight into Concurrent DOS, MS-DOS, UNIX," or other operating systems.

Johnstone agrees. "We want an efficient, low-cost physical and software structure users will want. DR Net is the short term. It has several advantages over MS Net [Microsoft Networks] because under Concurrent DOS you can have PC-DOS emulation and you can run IBM software and a multiuser network. But it is only the first phase. It doesn't mean we can't go for the full OSI seven layers."

OpenNet is claimed to be a full definition of the International Standards Organization's OSI seven-layer communications model. Intel has adapted Ethernet chips and software so they not only support the lower levels of the OSI model but also the higher level network applications such as sharing hard-disk memory and electronic mail. Intel is initially supporting its own real-time operating system, iRMX, and Microsoft's XENIX and MS-DOS.

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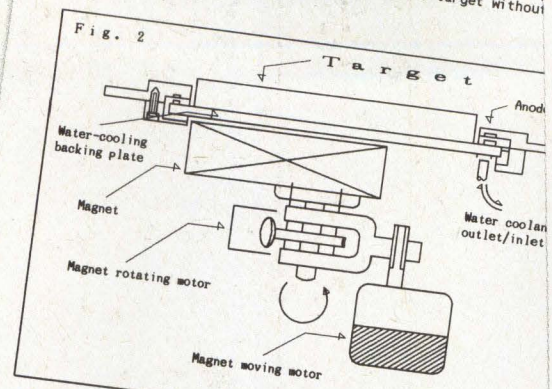

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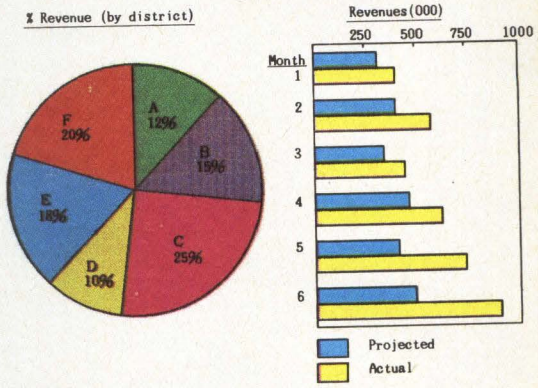

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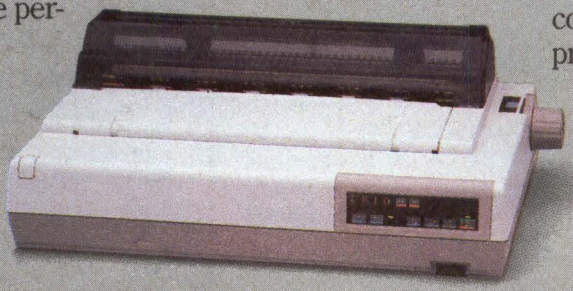

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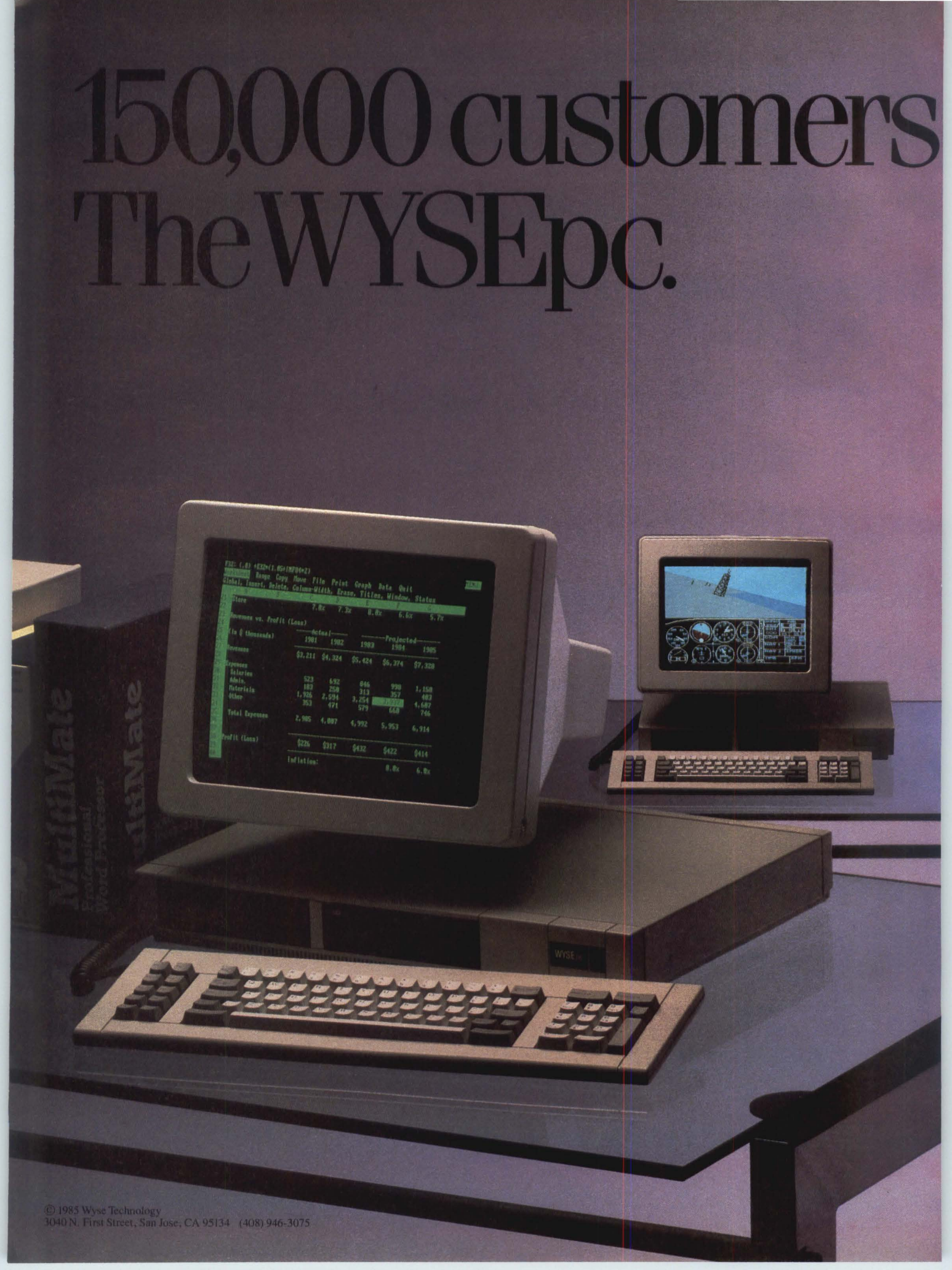

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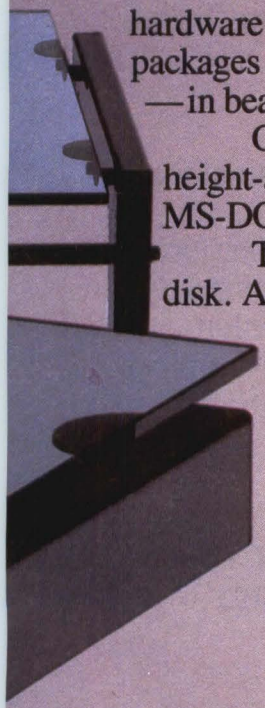

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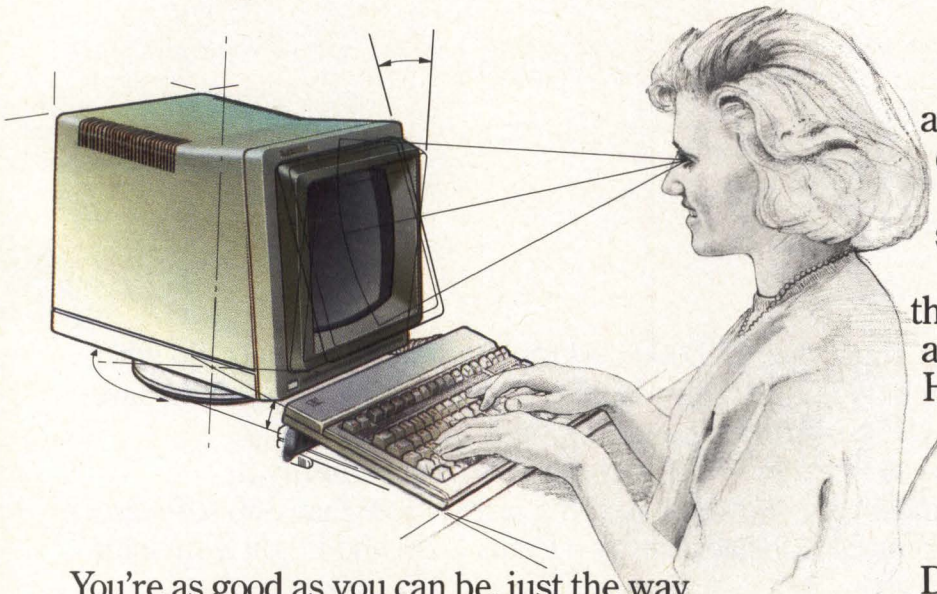

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CIRCLE NO. 27 ON INQUIRY CARD

INTERPRETER

An analysis of news, issues and trends affecting the computer industry

BUYERS LINE UP FOR ABANDONED COMPUTERS

Demand for discontinued or overstocked computers and parts is soaring as a result of industry shakeout

Lori Valigra, Senior Editor

When IBM Corp. recently announced plans to stop production of its PCjr personal computer, rumors spread rapidly that the company would sell the remaining computer inventory to a liquidator or auction it. An IBM spokesman says neither will happen. Nonetheless, the eagerness with which prospective buyers took up the rumor is a sign of the times. Intense competition is driving even the most powerful companies from cutthroat markets, and bargain sales are now in vogue.

Orphaned products are finding their way into new "distribution channels": electronic flea markets, auctions, liquidations and sales by scrap buyers, who scavenge components and resell them. Sometimes the technology for such products is sold by one company to another. For example, Computer Devices Inc., Burlington, Mass., one of the first companies to introduce an IBM PC-compatible portable computer, didn't have the funds to manufacture it and sold the technology rights to Prime Computer Inc., Natick, Mass.

Industry is its own largest consumer

With one exception—IBM's PCjr—discontinued products continue to be purchased by individuals and companies within the computer industry. The low prices, which after abandonment can be 30 percent or more off the original list price, still have not attracted members of the general public. The public seems to prefer brand-name products from large, financially stable companies. IBM's PCjr may be the first orphan to sell well outside the closed circle of the computer industry, mainly because IBM has made clear its intentions to continue "child support."

Tim Davis

Auctioneer Ross Dove *is becoming the "King of the Buzzword".*

"Discontinued products never get out to the general public. They [the public] can't handle support," explains Adolph "Sonny" Monosson, chairman of American Used Computer Co., Boston, a reseller of used equipment. Because of IBM's size, market momentum and reputation, its products are exceptions to that rule.

Osborne allayed fears

When Osborne Computer Corp. filed for Chapter 11 bankruptcy protection more than a year ago, the company was not sure whether it would liquidate or try to reorganize and repay its creditors. The uncertainty made Osborne personal computer users and any potential customers nervous. As a marketing move, the company

Tim Davis

Potential buyers *examine the goods at an auction of Convergent's Workslate division.*

signed Xerox Americare, Xerox Corp.'s large service organization, to continue the care and feeding of Osborne users.

"We felt we needed to relieve the fears of potential Osborne buyers," explains Michael Anthofer, controller at Osborne in Fremont, Calif. He says that signing on Xerox Americare helped foster consumer confidence. Now, after Osborne's reorganization, Xerox Americare and a group of others service more than 125,000 Osborne computers installed worldwide. More than 30 distributors in 80 foreign countries offer warranties and service.

When Osborne decided against liquidation, it retained an auctioneer to sell its fixed assets and some finished-goods inventory to help pay creditors. A series of 13 auctions have made Osborne a test case for high-technology auctioneering. Controller Anthofer explains that at the first two auctions, run by Ross-Dove Co., San Francisco, Osborne sold fixed assets, such as furniture and some used computers, but no finished goods or computer inventory. Those auctions brought in $1.4 million. But at the third auction, the company sold some inventory as well as used computers at close to retail prices. "We were surprised at how well the auction went. The auction place was packed," Anthofer says.

At the beginning of the auctions, Osborne had about 2,000 units sitting on the shelf. Ross-Dove and Osborne organized a seven-city tour, which resulted in the sale of 750 units and brought in about $450,000. The auctions, which had a rough start in Los Angeles, improved in each city. One of the more valuable lessons learned by Osborne was what price users were willing to pay for Osborne computers. What originally sold for more than $1,000 new brought in about $700 to $900 at the auctions. "During the auctions, we found the price at which products would move," says Anthofer. This helped the company sell 500 to 600 more units on its own after the auctions.

Anthofer says Osborne received more for complete computers than it did for a comparable sum of separately sold parts. This is because the CPU is proprietary and the disk drives, which are single-sided, double-density models, are in limited demand.

Ross-Dove received about 10 percent of the $450,000. The rest went to Osborne. Anthofer says high-technology auctions have become so popular on the West Coast that auctioneers are dropping their usual 10 percent to 12 percent charge to 5 percent to 7 percent just to handle an auction valued at $1.5 million.

Anthofer chose auctions over other alternatives because they bring in more money. For example, he had proposals from liquidators offering about 25 percent to 50 percent of what he could make from an auction. "For a $1,000 item, a liquidator will offer you $250 and resell it for $600. So why not hire an auctioneer to sell it for $600 and offer him [the auctioneer] 10 percent of what he sells?" Anthofer expects liquidators to be hurt, should auctions increase in popularity.

He estimates that there were more than 10 auctions after Osborne's. Convergent Technologies Inc.'s Workslate division, Santa Clara, Calif., and Gavilan Computer Corp., Campbell, Calif., were among two of the largest. Both Gavilan and the Workslate division are now defunct. The Gavilan auction was valued at $1 million. Convergent's was a multimillion-dollar event, partly because of pricey specialized equipment, such as surface-mount machines for semiconductors, required for Workslate's laptop, data-entry device.

More than 1,000 people attended the Workslate auction, at which 5,000 devices and peripherals, as well as capital equipment, were sold, says Ross Dove, a partner at Ross-Dove. Dove says the Workslates ranged in price from $165 to $300. One liquidator purchased about $400,000 worth.

Auctions can carry stigma

An auction is a typical solution used during a distress situation marked by an excess of unsold or discontinued items, explains Anthofer. "If cash is the consideration...then an auction is a very viable vehicle."

But for companies wishing to sell only overstock, an auction may bring with it an unlooked-for stigma. "The problem with auctioning is that it looks like a distress move. In our case, it isn't at all," explains Carolyn B. Kilbourne, manager of direct marketing for Metric Resources Co.,

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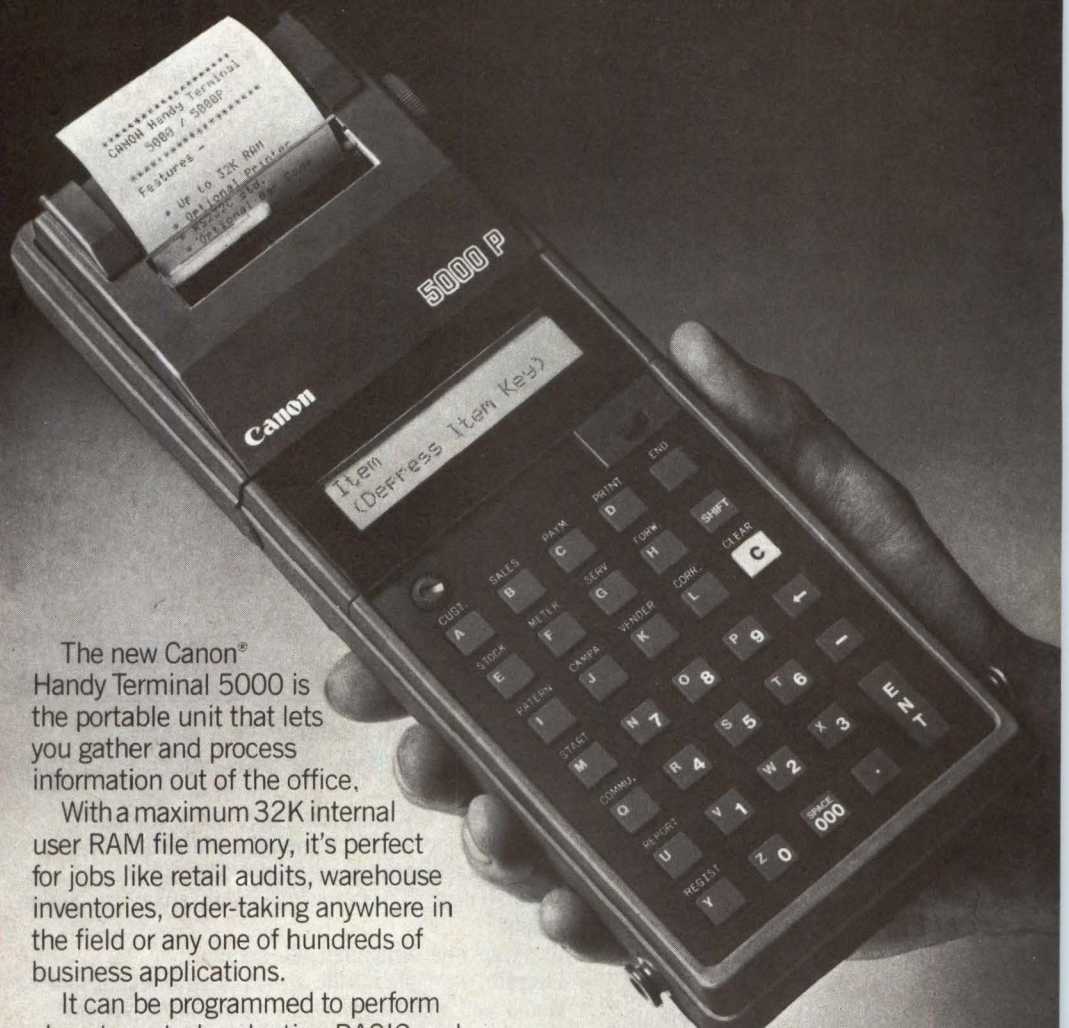

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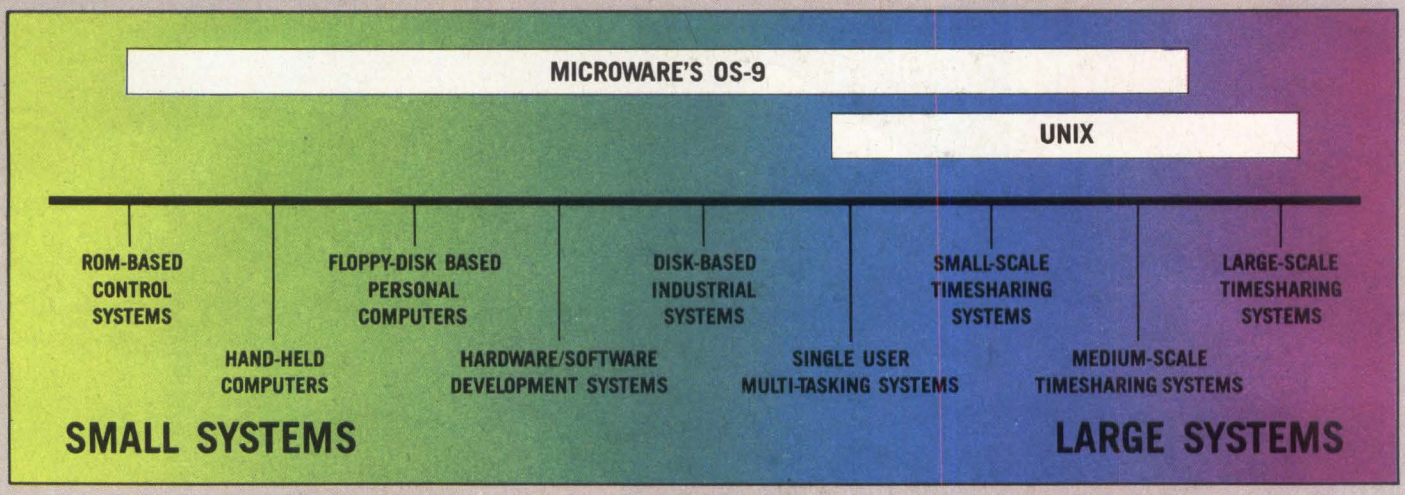

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Gaithersburg, Md. Metric Resources is a division of Leasametric Inc., Foster City, Calif., a computer and test equipment rental company. Metric Resources sells used or surplus equipment obtained from Leasametric.

Kilbourne says the need to trim inventory is typical of the computer rental market. According to Kilbourne, the company recently had more than $150 million in inventory and planned to auction off about 1 percent.

Another company that recently rid itself of excess inventory with Ross-Dove's help is ISI International, Sunnyvale, Calif. In March, ISI auctioned test equipment for old IBM computers.

"The equipment tied up our assets. The only convenient way to free up cash was to use an auction," explains Richard Barnes, vice president of operations at ISI. Barnes says selling the equipment himself would have been too time-consuming. ISI made several million dollars on the auction, selling about 10 percent of inventory excess. Barnes agrees with Kilbourne about the stigma of auctions but contends that the auction had nothing to do with the viability of his company.

Barnes says having an auction requires a three-pronged decision. He says the sponsoring company has to decide whether it can afford to let its inventory sit on a shelf, how much money it can expect to make and whether it wants to unload its goods in one fell swoop. "I don't recommend using an auction unless you have a lot of volume or a high value of goods or a combination thereof," he says. Because more goods draw more people willing to pay better prices, he says, it would have been better had he auctioned his test equipment in combination with another auction—for example, Gavilan's.

Newcomer quickly learns jargon

Though high-technology auctioning is new to Dove, whose company has been in business since 1937, he has adapted to computer industry products and jargon. His admirers say he has lost no time in mastering computerese. "Ross is quickly

Typical auctions are well-planned affairs

A well-conducted, high-technology auction is as programmed as any other serious enterprise in the computer world.

While moving computers and peripherals is a comparatively new venture for Ross-Dove Co., San Francisco, the auction house brings to it nearly 50 years of expertise in finding buyers and setting prices.

For starters, Ross-Dove and other auction professionals identify both clients and potential bidders well before the first item goes on the block.

One recent client, ISI International, Sunnyvale, Calif., wanted to release some money tied up in unsold computer testing equipment. ISI vice president of operations Richard Barnes recalls that 10 days to two weeks before the auction, Ross-Dove sent an announcement of the event to its own list of prospective attendees. Then, about a week later, Ross-Dove mailed the prospects a catalog describing the items to be auctioned. And, as a further inducement, potential buyers were invited to examine the goods two days before the auction.

The client is given the added assurance that serious buyers will attend; Ross-Dove requires that prospects pay a $100 to $150 registraton fee to take part in the bidding. The fee can be applied toward a purchase but is otherwise non-returnable. The registration lists also help Ross-Dove in compiling its prospects file.

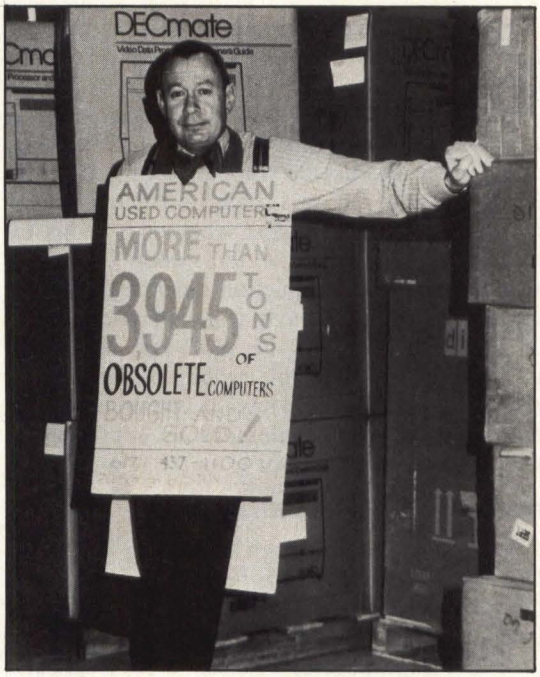
Computer auctions also resemble other such sales in that the fever of competition between buyers sometimes drives up prices.

Brian Gamberg, president of Cory Components, a Venice, Calif., parts dealer, insists that the bidders often go to the auction hall with a firm price ceiling in mind. But Gamberg admits that the ceiling often gives way under rising pressure. Often, too, he says, a bidder will go above a self-imposed limit simply to justify time and effort already expended.

Referring to a Gavilan Computer Corp. auction he attended, Gamberg says, "We were amazed at the people who went there to make money on a retail basis. They wanted to by an [IBM Corp.] PC for $2,000 and resell it for $3,000. But they were sorely displeased" and wound up buying machines for $3,900 that they could have purchased new for $3,800.

Gamberg says the high prices kept him from buying any machines. Still, he maintains, just about everything at an auction will find a buyer.

At that same auction, he says, he bought 60 crates of thermal paper, in its original packaging. He paid $6,000 for $62,000 worth of paper, hoping to resell it for about $31,000 to sellers of thermal printers and typewriters. Gamberg found, however, that every such company he went to had all the paper it needed. Now, he says, he is looking to sell his "windfall" for scrap at $11 to $22 a ream. "It's an embarrassment," he concedes.



American Used Computer's "Sonny" Monosson *says discontinued products, perhaps with the exception of IBM's PCjr, seldom get out to the general public.*

becoming the 'King of the Buzzword,'" says one company official who retained Dove's services.

ISI's Barnes says auctions still are mostly a West Coast phenomenon because of the entrepreneurial spirit there. "There is a higher start-up and turnover rate [than on the East Coast]. Companies go belly-up, and, therefore, there's a need for Ross-Dove's type of service," he explains.

Auctions can be frenzied

The frenzy of buyers looking for good deals at an auction sometimes makes for almost indefensible buying decisions.

Barnes explains that some items go for nearly retail value. "I had some IBM Personal Computer inventory. For some strange reason, people are willing to pay almost store value for PCs at an auction. It can't be anything but the [brand] name." He says first-time buyers are the ones usually caught up in what he calls "auction mania."

Brian Gamberg, president of Cory Components Inc., Venice, Calif., who buys and resells computer parts, notices the same phenomenon. He went to the Gavilan auction with orders in hand for about 25 IBM PC/XTs. Gavilan was a high-volume user of IBM microcomputers, he explains. But soon after the bidding began, he says, the units reached a price which would have been imprudent to pay.

Part of the reason for the general increase in prices is that more people are attending auctions. The more attendees, the greater the demand and the higher the price. Gamberg explains that he used to pool resources with other companies to buy equipment, which kept prices to each company lower. But, he explains, while an auction valued at $5 million would have drawn 50 buyers last September, the equivalent auction would have drawn 250 buyers by last November, driving prices up. "This is great for the people who own the material [being auctioned], but it's bad for guys like me," says Gamberg.

Slim pickin's for scavengers

Though most manufacturing companies sell off "scrap" parts regularly, newer models of computers have not yet become candidates for the junk heap or targets for scavengers. Osborne's Anthofer says he does not know of anyone's buying computers and stripping them down to remove memory chips and other parts.

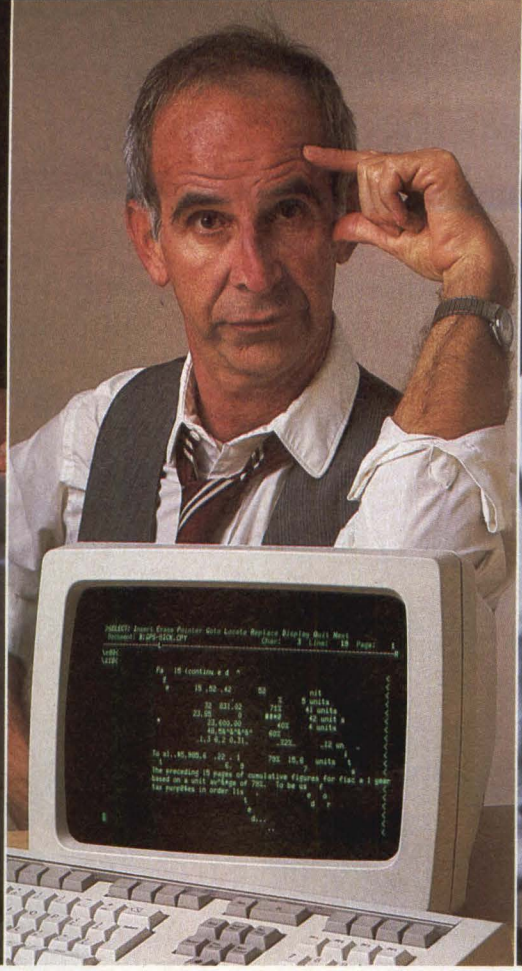
If Gamberg does purchase a completed assembly, he resells it to a maintenance, repair and overhaul organization. Some of these organizations are being started by former employees of defunct companies who continue to service the company's products. Gamberg says he knows of two such people servicing Gavilan computers.

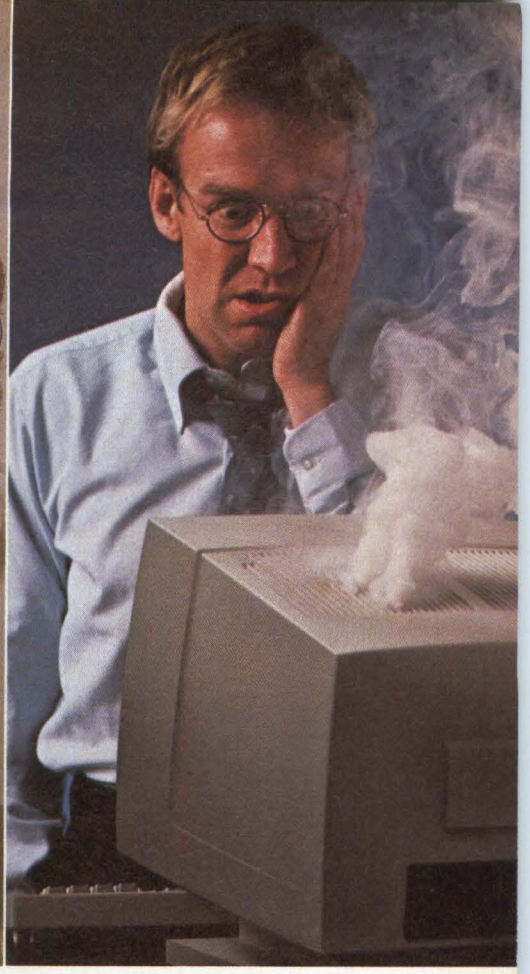
Nevertheless, many old computers are sold for scrap. Twice a year, American Used Computer's Monosson calls in Taiwanese scrap dealers who work out of New York. He says he sells a 30,000-pound truckload of computers for 15 cents to 35 cents a pound, depending on the value of the components in the computers. The parts are reused in Taiwan. He says there is no customs duty on the scrap, which has included Digital Equipment Corp. PDP-6, PDP-9 and PDP-12 computers and older IBM 360 mainframes.

Another profitable way of moving old equipment is to run a one-week sale. Monosson's company is near several major universities, so he held a one-week sale on equipment such as DEC 11/150s and microcomputers. The systems sold for $50 or $100 each, he says.

Monosson maintains that there still is a healthy demand for used equipment, "and 1985 will be one of the best years ever for the used market." He says American Used Computer sells used equipment in technical markets, in which users don't require much support and will repair their own equipment. □

Interest Quotient (Circle One)
High 450 Medium 451 Low 452





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

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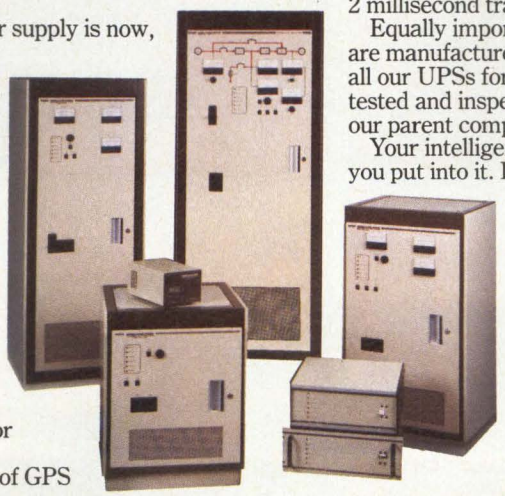

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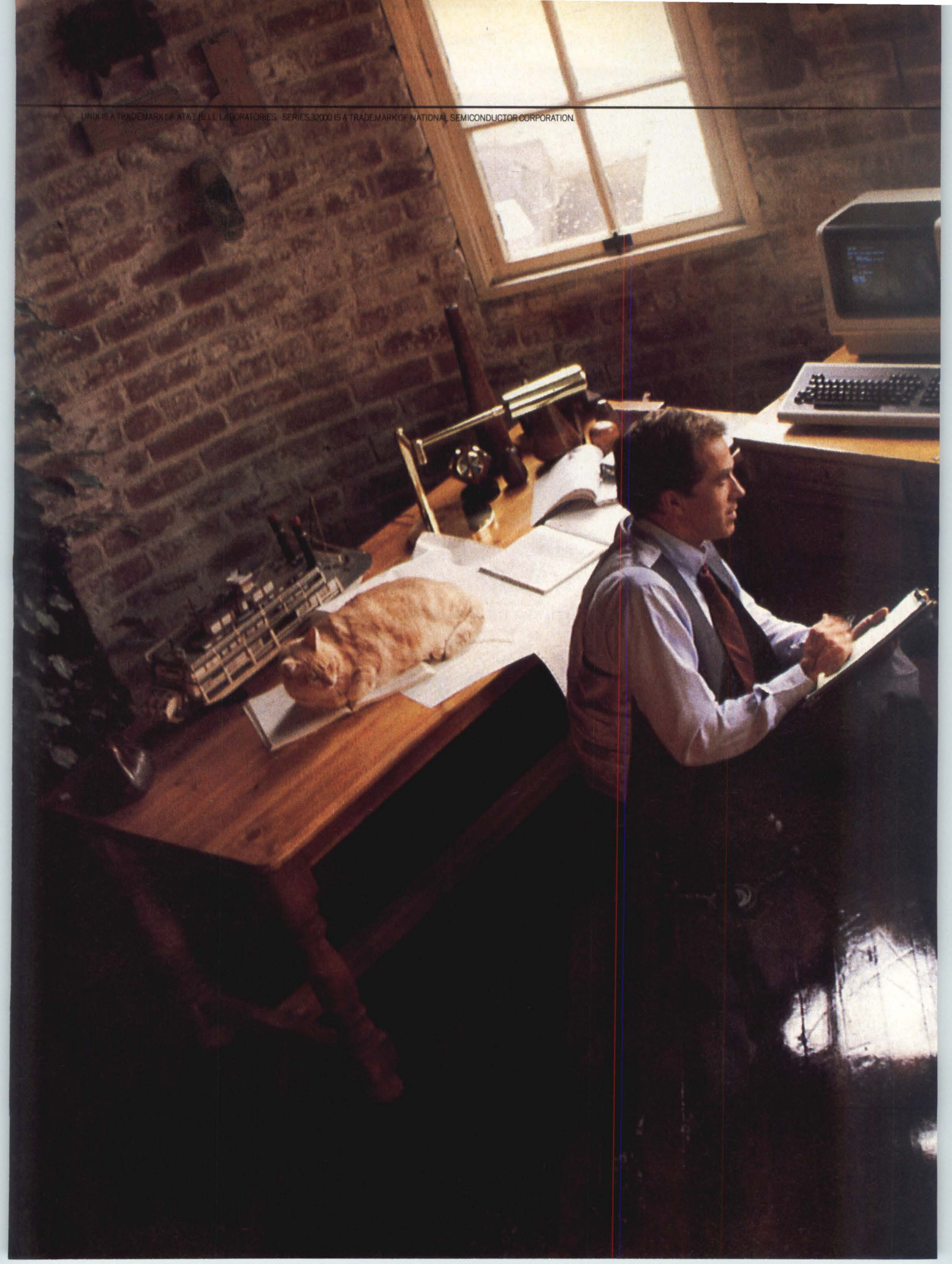

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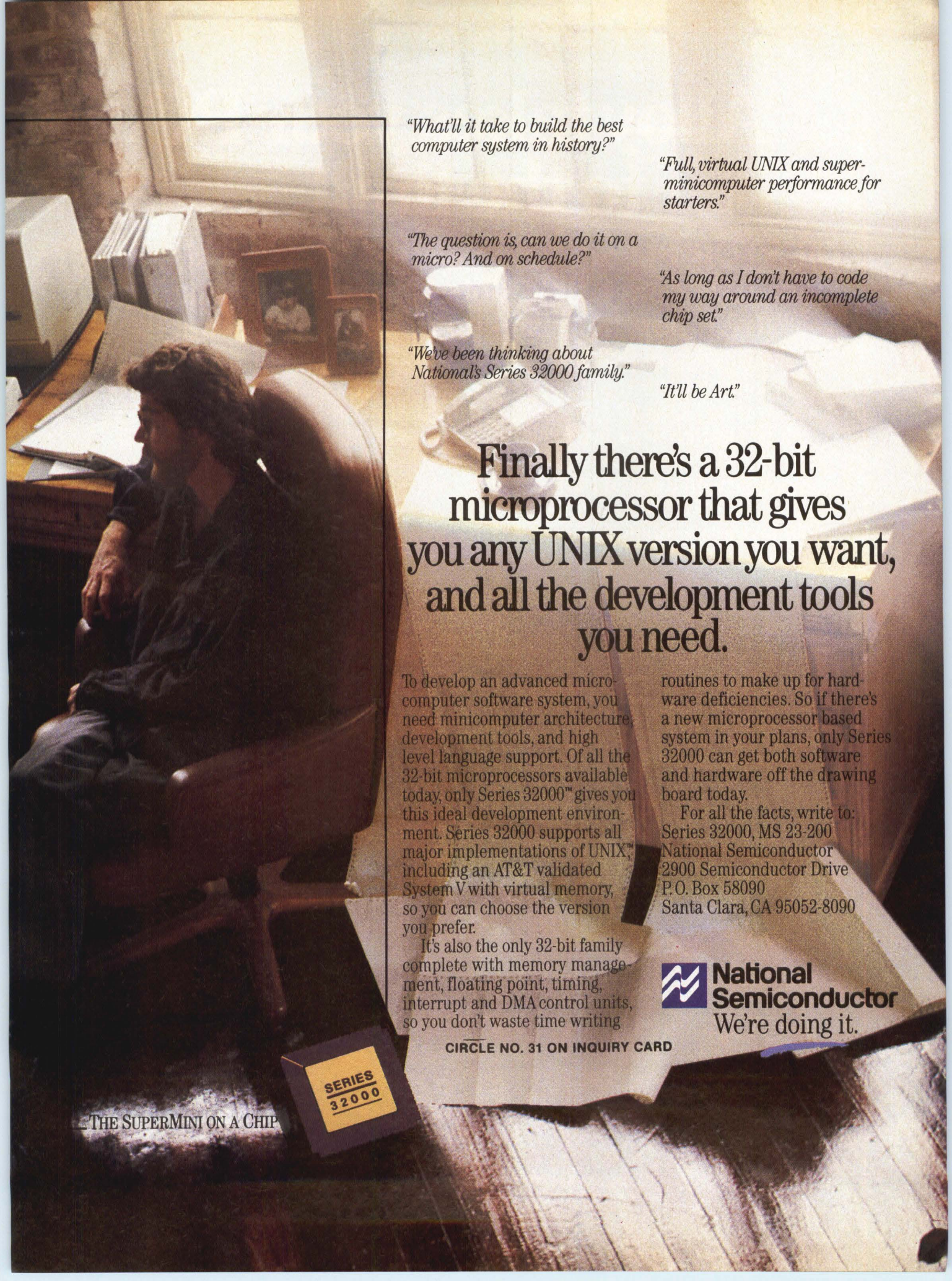
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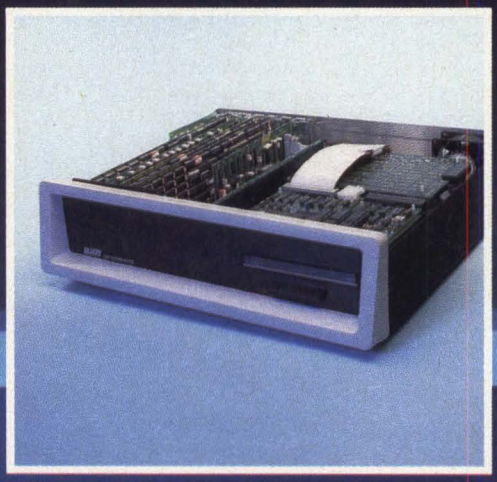

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CIRCLE NO. 32 ON INQUIRY CARD

MULTIPROCESSOR TECHNOLOGY MEANS MORE MUSCLE, LESS FAT

When structured in a multiple configuration, high-performance, low-cost, off-the-shelf microprocessors help streamline computer architecture

Lynn Haber, Associate Editor

Tandem Computers Inc. calls it non-fat architecture—a multiprocessor system that allows users to add computing power incrementally.

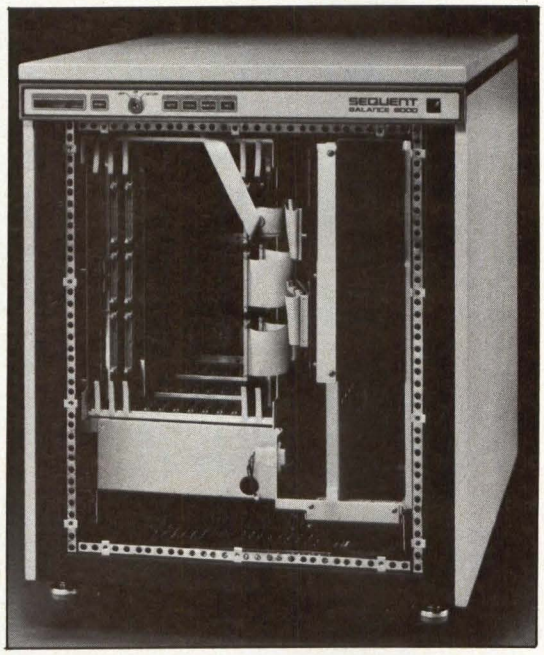
The Cupertino, Calif., manufacturer of 32-bit fault-tolerant systems contends that, with conventional computer architectures, users often have no choice but to buy more system power than needed and "grow into it," causing waste and inefficiency at the outset.

Most computing employs the von Neumann architecture, a design based on a single processing unit that allows only one task to execute at a time. Computing speed, therefore, depends on the performance of the processor chip.

On the other hand, multiprocessing architectures, which string together many microprocessors, can process various, unrelated tasks simultaneously. What is driving this market, according to Omri Serlin, president of Itom International Co., a research and consulting company in Los Altos, Calif., is the availability of new, powerful, low-cost, 32-bit microprocessors.

New possibilities abound

In addition to the availability of 32-bit microprocessors, increased floating-point performance and expanded addressing ranges have also contributed to the development of multicomputing, according to John Payne, director of strategic product development at National Semiconductor Corp., Santa Clara, Calif. "Multicomputers bridge the gap between 16-bit personal computers and superminicomputers based upon emitter-coupled-logic circuitry," he explains.



Sequent's Balance 8000 *multiprocessor is a minimally configured system. Shown here is a single CPU board, memory boards, a small computer systems interface, an Ethernet-control board, Multibus adapter.*

With the advent of standard 32-bit microprocessors, system integrators can now couple processors in a tightly or loosely fashioned arrangement.

Generally, in a loosely coupled microprocessor architecture, each processor possesses its own memory and communicates with other processors via messages. In contrast, a tightly coupled architecture contains multiple processors that have access to a common memory system.

One advantage of a tightly coupled system, according to Serlin, is load balancing—a system function that allows an incoming task to be

distributed to the next available processor.

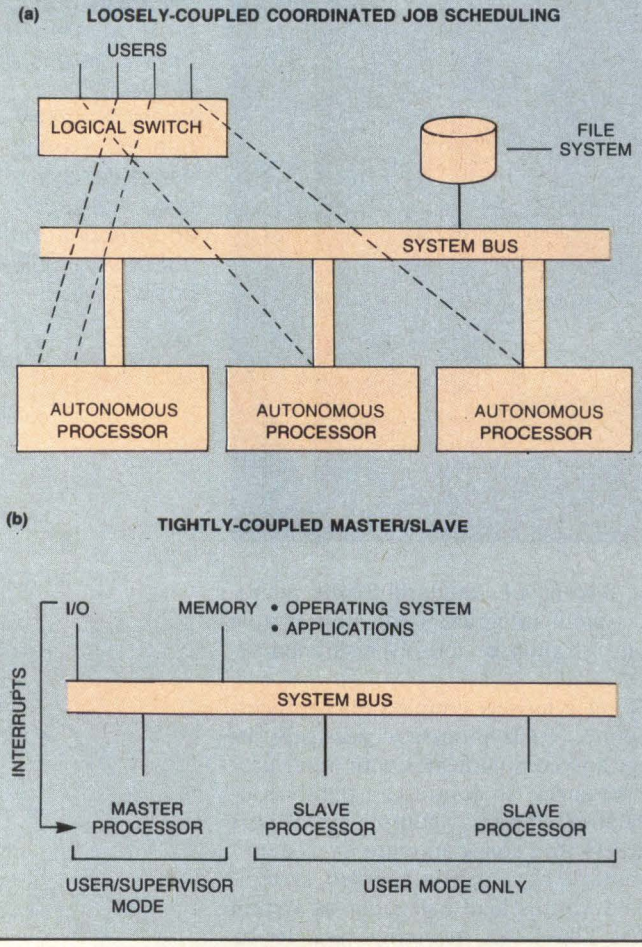
Unlike loosely coupled systems, which behave much like a supermarket checkout system where shoppers wait in several lines until a clerk is available, tightly coupled systems behave more like a bank arrangement. In this setting, custom-

The multiprocessing spectrum

Gary Fielland, Sequent Computer System Inc.

Multiprocessing offers the promise of providing performance enhancements over single-processor architecture but is a difficult technology to master. The reason? A full spectrum of multiprocessor structures exists, ranging from loosely coupled to tightly coupled. The most loosely coupled structures center on computer networks, the connection of many computers, often at a long distance from one another. At the other end of the spectrum are tightly coupled systems —specialized function multiprocessors or multicomputing.

HOW TWO DIFFERENT IMPLEMENTATIONS OF MULTIPROCESSOR ARCHITECTURE WORK



Multicomputing has been available for several years. In this approach, the application architect statically partitions the application and loads, often into ROM, the program partitions onto each board, which is a complete single-board computer, often with special-purpose hardware.

The classic multiprocessor case involves a system made up of two or more general-purpose processors, each of equal capability. In this setup, three scheduling structures are identifiable—coordinated-job, master/slave and homogeneous.

In the coordinated-job-scheduling approach (a), also called loosely coupled multiprocessing, each processor is relatively autonomous and has private access to its own interrupt system, primary storage, and, frequently, secondary storage. Each processor also has its own copy of the operating system code and data. Jobs enter the multiprocessing system and are assigned to a processor subsystem by a centralized, scheduling-policy manager, based on a variety of criteria including relative loads on the component processor subsystems. Once assigned, the job maintains its association with its processor subsystem until terminated.

In the master/slave approach (b), also called tightly coupled multiprocessing, all memory is accessible to all processors. In this technique, one processor is distinguished, usually by software, as the master, while all the others are slaves. Slaves are limited to executing "user-mode" processes. The master executes all "supervisor-mode" codes, usually in addition to executing user-mode codes. Master/slave systems are relatively simple to implement and have the potential to support parallel programmed applications.

In a general multiprocessor system, all resources, including memory, I/O devices and interrupt systems, are equally accessible to all processors. Memory and I/O devices are dynamically assigned to processes, not permanently hard-wired to processors. In this form of tightly coupled multiprocessing, processes are assigned to processors as determined by the process scheduler, with a pool of one or more processors available for scheduling. Thus, it is called a processor pool architecture.

Gary Fielland is director of advanced development at Sequent Computer Systems Inc., Portland, Ore.

ers wait in a single line for the next available teller. From a more mechanical point of view, the single-line approach allows no processor to be idle as long as the queue is full, nor does any one processor have a backup of tasks.

From both manufacturers' and users' points of view, economy is the primary benefit of multiprocessing systems. What's more, these systems can be reconfigured to satisfy a wide range of performance requirements. Initially, a start-up system usually incorporates a few processors. As the work load increases, it's a simple matter to plug in additional processors.

In more traditional computing arrangements, users must replace a system when the processing power no longer meets the extended application requirements. Or, as in Tandem's view, users must initially purchase a bigger and more expensive machine than needed.

From a system integrator's point of view, multiprocessor computers mandate only a small subset of components from which a host of systems are configured. This fact, according to Serlin, leads to savings in manufacturing, training and spare parts.

Stumbling blocks lie in wait

Compatibility is one of the key problems to overcome in order for these products to gain general market acceptance, says Serlin. "I contend that the major marketing problem facing these manufacturers is not price/performance or features, but how to sell what is essentially a non-compatible product into an environment that demands compatibility," he claims.

For established computer manufacturers such as IBM Corp. and Digital Equipment Corp., which already have huge investments in architectures and software, moving away from such investments means alienating their customer base and losing much of their investment.

Serlin maintains that, rather than risk what they have established, large computer manufacturers will work within the existing hardware and software frameworks and eventually offer customers loosely coupled systems.

For such multicomputer system manufacturers as Sequent Computer Systems Inc., Portland, Ore., and Encore Computer Corp., Wellesley Hills, Mass., as well as for a handful of companies that design products based on a multiprocessing architecture, implementing external compatibility with the UNIX operating system—a de facto industry standard—appears to be a way of getting around the issue of compatibility.

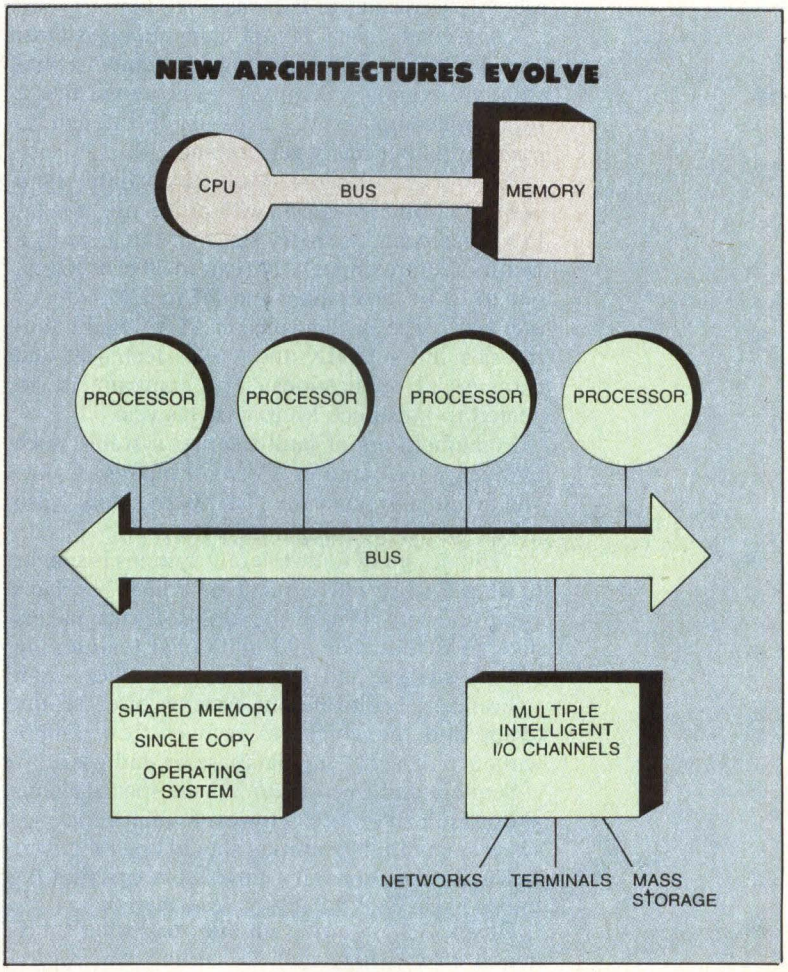
"No doubt these companies are hoping that UNIX will be adopted as a worldwide standard," says Serlin. "In the meantime, they can ameliorate objections to using non-standard architectures."

In markets such as banking, brokerage and manufacturing, where there are substantial investments in IBM equipment, manufacturers of multiprocessing systems must offer compatibility to IBM's Systems Network Architecture. Offering software that makes multicomputers appear, within the IBM system, as an IBM host proves a necessary tactic for companies hoping to attract these strong markets.

Another approach taken by some multicomputer manufacturers, involves offering database query languages similar to those used by IBM, as an additional way to satisfy users' requirements.

In September 1984, Sequent introduced a Berkeley UNIX Version 4.2-based, 32-bit computer family for technical OEMs. According to Ron Parsons, technical marketing manager at Sequent, the company's Balance 8000 computer

As opposed to von Neumann architecture *(top), a design based on a single processing unit that allows only one task to take place at a time, Encore's Multimax is based on a tightly coupled multiprocessor architecture (bottom) that incorporates a pool of 32-bit processors.*



system is based on a pool of two to 12 National Semiconductor series 32000 processors.

Sequent also offers a PC-Interface, manufactured by Locus Computing Corp., a PC-DOS-to-UNIX software-application bridge that reportedly provides transparent interaction between PC-DOS applications and Balance 8000's UNIX file system over a distributed network.

Convenience for OEMs

Parsons believes that the most apparent benefits of these systems are a good price/performance ratio and expandability. This type of architecture is very convenient for OEMs trying to plan a yearlong development cycle. "Often, while system integrators are developing software, they discover that more CPU power is required. Multiprocessing architecture is a simple solution to that sort of problem," Parsons says.

For typical multistream, computer-intensive applications, system performance should range from 5 million to 7 million instructions per second, according to Parsons.

Encore subsidiary Hydra Computer Systems, Natick, Mass., is developing Multimax, a machine the company claims is "as economical as a superminicomputer yet expandable enough to match a mainframe's performance."

According to Encore, Multimax is based on a pool of 32-bit processors, with processing power, I/O capacity and memory size that can grow by a factor of approximately 10 (two to 20 processors, one to 10 I/O computers and 4M to 32M bytes of memory). The system runs on AT&T Bell Laboratories Inc.'s UNIX and serves technical and commercial applications. The company is expected to introduce Multimax this year.

Manufacturers of fault-tolerant systems, such as Synapse Computer Corp., Milpitas, Calif., and Sequoia Systems Inc., Marlboro, Mass., also utilize multiprocessing architectures.

"The design of fault-tolerant systems is similar to what Encore and Sequent are doing," explains Itom's Serlin. "Where the fault-tolerant makers diverge is that they add additional features, in both hardware and software, to support fault tolerance." Fault-tolerant systems offer redundancy and the ability to recover from failure without impacting the database or end user.

Sequent and Encore don't make special claims about fault tolerance. However, multiprocessor systems continue operating should one processor fail, with the remaining processors carrying the entire work load.

Businesses requiring on-line, real-time transaction processing, such as airline reservation systems and banking, favor multiprocessing architecture. Additionally, the scientific and technical communities rely on powerful processing ability and fast processing speed.

Serlin believes that multiprocessing is currently more of a technology than a market but that the prospects for these products are good. "The inherent advantages of this type of architecture are so great that the market cannot ignore them," he asserts.

On-line transaction processing, a market that generated some $22.5 billion in 1984, according to industry analysts, is the largest identifiable market using multiprocessing-based systems.

With the exception of Tandem and Stratus Computer Inc., Marlboro, Mass., fault-tolerant manufacturers have suffered tough financial times. "I think this will be a difficult market to penetrate in the foreseeable future," says Serlin, "but I've little doubt that, over the long term, users and investors will realize the advantages of this architecture."

Although multiprocessor architectures can run tasks in parallel—more than one task at a time—true parallelism, or breaking down a single problem into many tasks, requires special software and support.

According to National Semiconductor's Payne, not much language support exists for parallel processing, but a lot of research is under way. "We're at a watershed point. Over the next five years, we'll see this happen."

Sequent's Parsons believes that it will take one to two years for the market for these products to heat up. During this time, manufacturers must educate users via literature, seminars, articles and training.

Payne also believes that there's practically no limit to the performance these machines can offer. He sees the technology moving toward integrating more functions and reducing the amount of board space needed to implement a given system. "System integrators will pack more and more into the same box," he says. "The biggest concern will be the availability of software to support parallel processing."

The superminicomputer and mainframe markets, however, are not expected to disappear as a result of multicomputing. "There will still be a need for high-performance, raw computing power," says Payne. "But, the growth in this industry will come primarily from multicomputers." □

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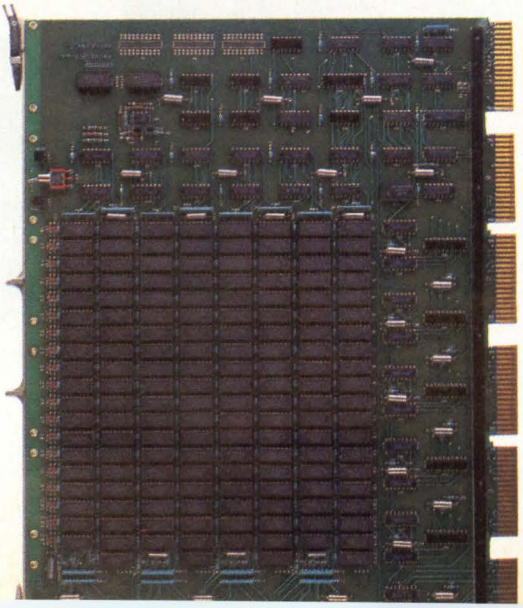

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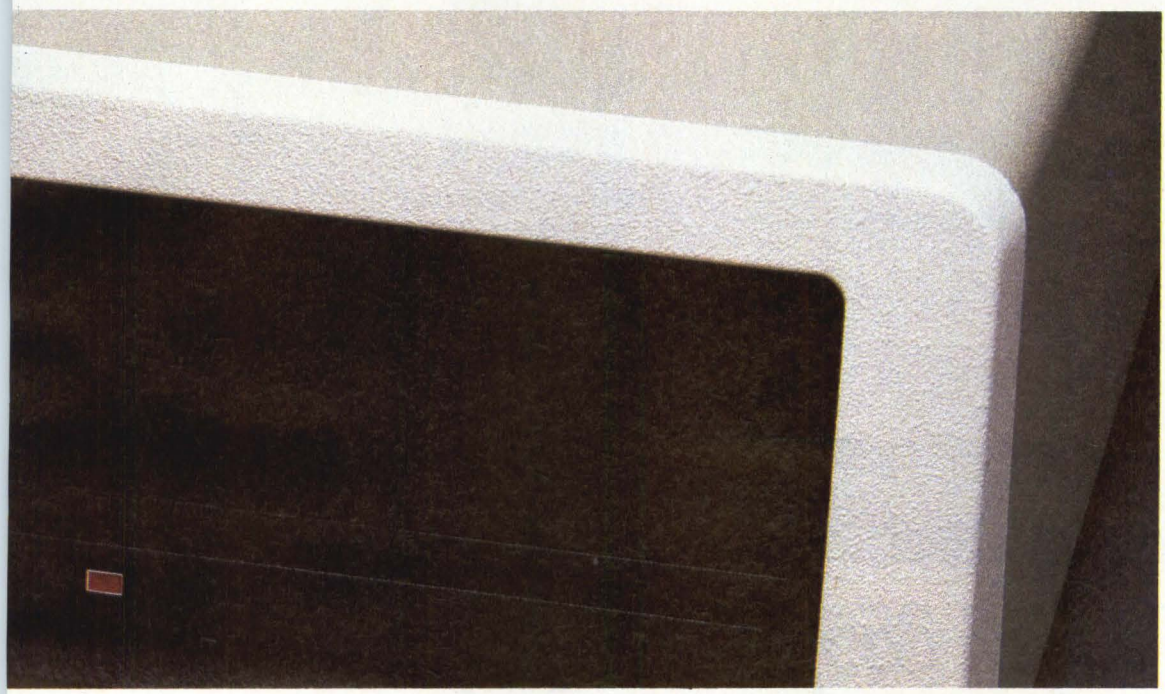

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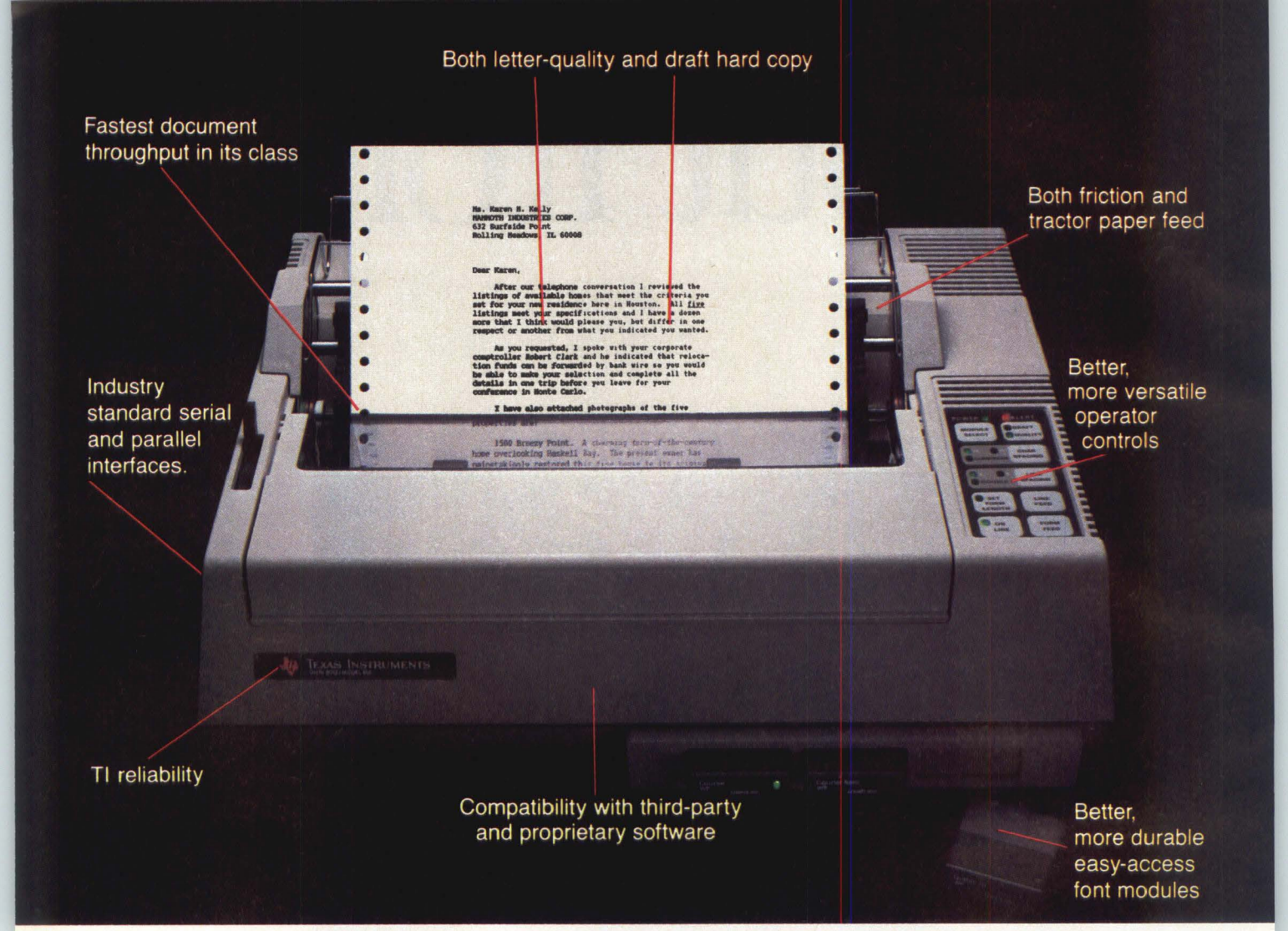

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Feature for feature, no other microprinter can match the versatility, compatibility, reliability and productivity of the OMNI 800* Model 855 microprinter. Here's why.

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Hardware Compatible. The TI 855 microprinter is compatible with all major PC hardware. And it provides both serial RS232C subset and "Centronics-type" parallel as standard interfaces.

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LAW OFFICE IMPLEMENTS MULTIUSER MICRO, DBMS

Multiuser microcomputer and advanced DBMS provide multifile client management and accounting capabilities to law offices

Gene Kadish
Legal Technologies Inc.

Since most law firms planning to computerize also plan to expand and already require a large amount of mass storage, they should consider multiuser systems. A standalone personal computer would be overburdened from the start.

Last year, one law firm's search for a suitable multiuser system led to a customized solution in which several hardware and software components were integrated to cover all aspects of office management and operation. Because minicomputer power is not necessary for most small- and medium-sized law firms and because there are only a few options for small multiuser microcomputer configurations, the law firm easily narrowed its choices.

The firm wanted cost-effective, easy-to-use software that addressed a lawyer's unique needs. As for hardware, the selected equipment had to be fast, expandable, flexible and powerful enough for the application. And, because the lawyers were concerned about short-term obsolescence, they wanted a system that would remain up-to-date for several years. In addition, they wanted proven and debugged, multiuser, multitasking capability.

To help them in their search, the lawyers hired consulting company Legal Technologies Inc., Trevose, Pa., which evaluated several hardware systems. The consulting company, which eventually became an OEM for Convergent Technologies Inc., Santa Clara, Calif., configured a system called the Paper Chaser. It comprises hardware and word-processing software from Convergent, the reQuest database-management system from System Automation Software Inc., Silver Spring, Md., an appointment calendar from DYDX Inc., Tempe, Ariz., and accounting software from Applied System Technologies, North Wales, Pa.

Legal Technologies' Paper Chaser system *for law firms combines Convergent Technologies' hardware and System Automation's reQuest DBMS to provide master case and client management, docket control, calendaring and "tickler" files.*

Based on Intel Corp.'s 80186 and Motorola Inc.'s 68010 microprocessors, the Convergent microcomputers provide true multiuser, multitasking architecture and distributed intelligence. In addition, new Convergent products are compatible with older ones, and older hardware can be upgraded.

After analyzing virtually every law-firm-management software package then available, Legal Technologies found that most packages had been developed for a specific law firm, then repackaged and marketed for general use. Others had been watered down to fit a common denomina-

Under a custom menu 'umbrella,' reQuest displays all the options available for an application.

tor and thus were not strictly applicable to the lawyers' needs. To use them, the firm would have had to change its procedures to fit the package.

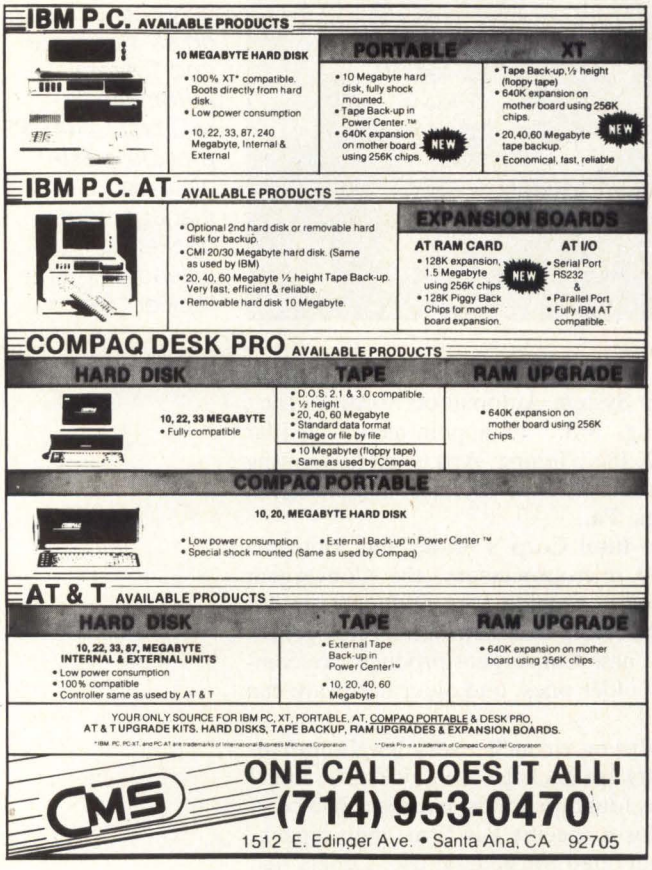
Despite these drawbacks, the firm could not afford to hire programmers to write appropriate programs from scratch. To serve the application's needs and to stay within the firm's budget, Legal Technologies determined that a strong, flexible and user-friendly DBMS program was necessary. After analyzing the database programs on the market, the company chose System Automation's reQuest. A relational DBMS, reQuest provides multiuser, multifile capabilities, and it extends computer, file, program and field security beyond that normally available under Convergent Technologies' operating system (CTOS).

Because each legal office has unique needs depending upon field of law, type of billing and operating procedures and each of these variables requires its own fields of information, Legal Technologies has configured solutions based on reQuest for most legal specialties. These include master case and client management, docket control, calendaring and "tickler" files. For legal accounting, available applications include timekeeping and billing for hourly, straight and contingent fees; reimbursable expenses; receipts/accounts receivable; disbursements/accounts payable; and general ledger.

Under a custom menu "umbrella," reQuest displays all the options available for an application. All reQuest commands are embedded in this menu, making the program easy to use. Users can transfer data directly among key programs, allowing report, statement and document flexibility. For example, users can transfer data from reQuest to the word-processing program by merging fields to the existing documents or by creating documents. Users can also transfer data from the DBMS to the Multiplan electronic spreadsheet package developed by Microsoft Corp., from the word processor to electronic mail and from the terminal emulator to the word processor.

The reQuest DBMS automatically converts data from mainframe databases to reQuest formats and allows reports to be generated directly from the menu. It also maintains directories of reports and forms created during system use. It provides multilevel security, maintaining a list of valid users and providing each with a password. In addition, it provides separate security classifications for retrievals and updates, and it limits access to data fields.

The non-procedural reQuest system uses English-language commands and provides menus, prompts, error messages and embedded "help" functions. A feature called Question Mark Processing lists user-defined fields, valid values and report/entry formats. In addition to CTOS, reQuest is compatible with the MS-DOS and PC-DOS operating systems. Besides Convergent Technologies' hardware, it also runs on the IBM Corp. PC/XT; the NCR Corp. Worksaver system; workstations from Burroughs Corp., Gould Inc., Prime Computer Inc. and Raytheon Data Systems; and the Hewlett-Packard Co. HP150 TouchScreen personal computer. □



CIRCLE NO. 35 ON INQUIRY CARD

Gene Kadish is president and founder of Legal Technologies Inc., a consulting company and a Convergent Technologies Inc. OEM. Previously, he founded Kadish Research & Analysis, a retail consulting concern.

Interest Quotient (Circle One)
High 456 Medium 457 Low 458

Other terminals will hide their screens in shame

When you see TAB's new E-32 Display Terminal

The video qualities of this new Smart Ergonomic Terminal are the finest available. TAB's high resolution, non-glare, 15-inch green screen produces crisp, readable characters in both 80 and 132 column modes.

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Ergonomics that make your customers comfortable. The E-32 screen tilts and swivels on its base for ideal viewing. A detached, lightweight keyboard features sculptured, stepped keys—and a low profile for hand, arm and back comfort.

Compatible with most computers in the industry. The E-32 is fully ANSI 3.64 compatible and communication compatible with DEC VT 52*, VT 100* and VT 132* terminals. Uniquely, it can memorize over 50 set-up parameters for each of three different computers, to be recalled at the touch of a key.

A terminal that adapts to your application. It was designed to be flexible for change. Keys can be added, moved or removed. In addition to a variety of character and line attributes, the E-32 has eight soft function keys that control more than 100 parameters of set-up and operation.

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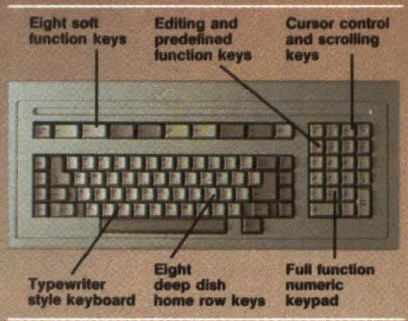
Select the options your customers need. Options include amber or white CRT, memory expansion to 4 pages, serial and parallel print ports, internal modem and composite video.



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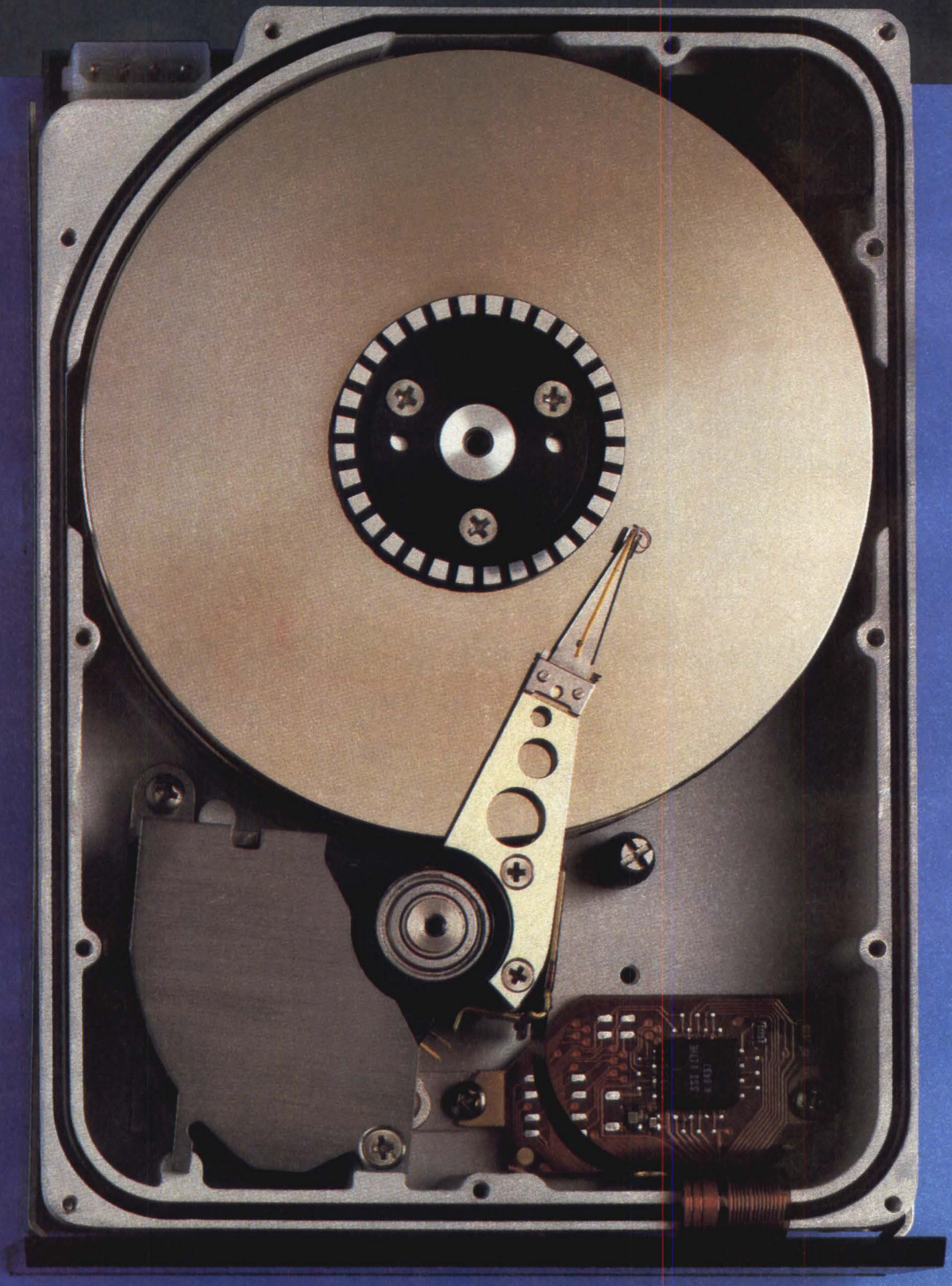
Our brain



child.

Announcing the Q200™ intelligent disk drive.

The first half-high, 5¼-inch disk drive with the brains and the capacity (53 and 80MB, formatted) to outwit high costs now, and in generations of systems yet to come. And the first disk drive smart enough to step beyond simply enhancing peripheral functionality, to improving total system performance.

We combined the drive and controller as a fully functional mass storage unit to give you a number of advantages. Controller/drive interfacing problems are eliminated, and it takes a lot less time to test and integrate a single component.

The Q200 has its own media defect and error-handling capability, so it not only recognizes errors, but is clever enough to correct them itself. That means a major savings of time and work at your end, with no defect mapping to worry about.

With the SCSI interface, the Q200 breaks through the limits of existing drive technology, into a new way of thinking about system architecture as a whole. Your system no longer has to be designed and redesigned to accommodate a mixed bag of peripheral interfaces. System upgrades will no longer mean expensive hardware and software overhauls.

And like every Quantum drive that's come before it, our latest brain child was born to run longer, on less power, with fewer parts. This lean breeding not only delivers more in your system, but makes it possible for us to deliver the Q200 to you in very high volumes. At prices that will make this baby look very, very smart, indeed.

Please call us for more information. Quantum Corporation, 1804 McCarthy Boulevard, Milpitas, CA 95035, (408) 262-1100. TWX 910-338-2203. Eastern Regional Sales Office: Salem, NH (603) 893-2672. Western Regional Sales Office: Santa Clara, CA (408) 980-8555. European Sales Office: Frankfurt, West Germany 069-666-6167. Quantum products are distributed in the United States and Canada by Arrow Electronics.

Quantum

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To get the world's most advanced 50 CPS daisywheel printer, you'll have to pay less.

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TeleVideo

Printers

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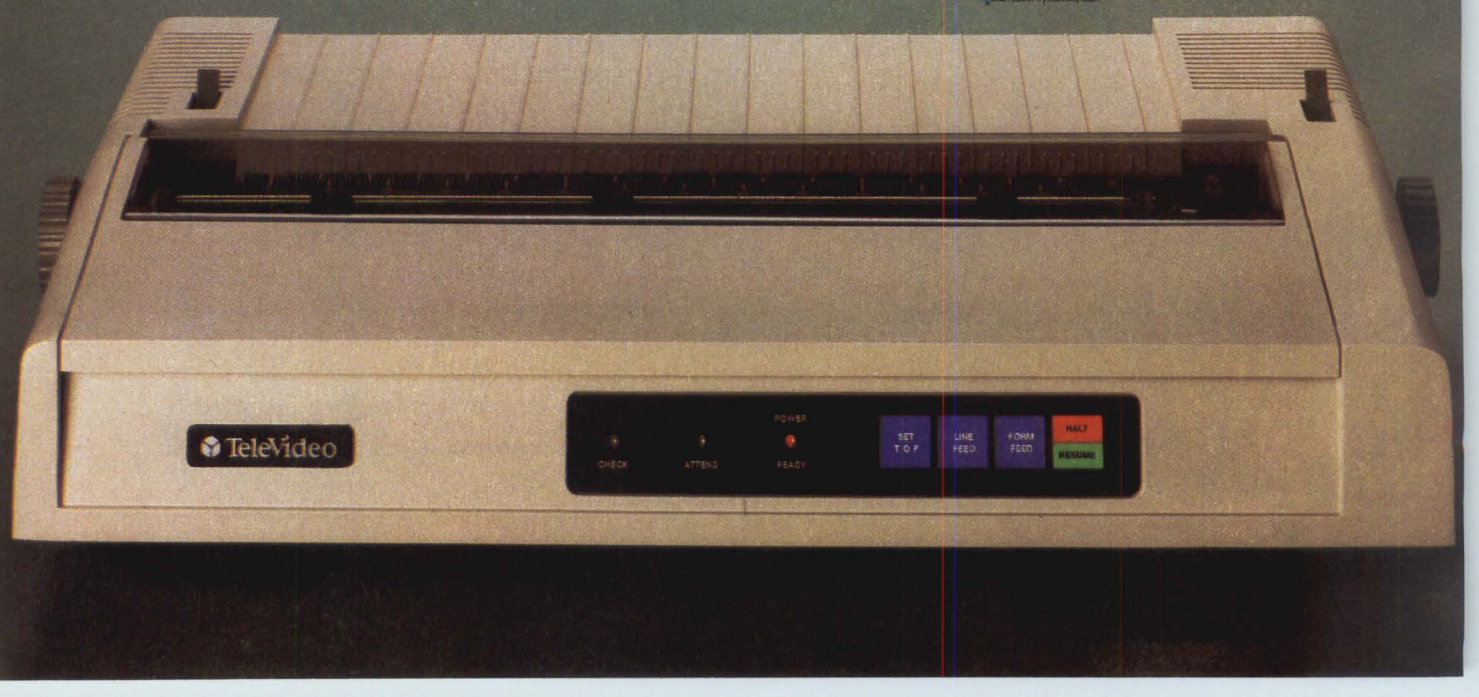


VERTICAL MARKET INTEGRATOR

NETWORKED PCs IMPROVE HOSPITAL'S HEALTH

Using a microcomputer network, a small hospital automates admissions, discharges, pharmacy transactions and even patient diagnoses

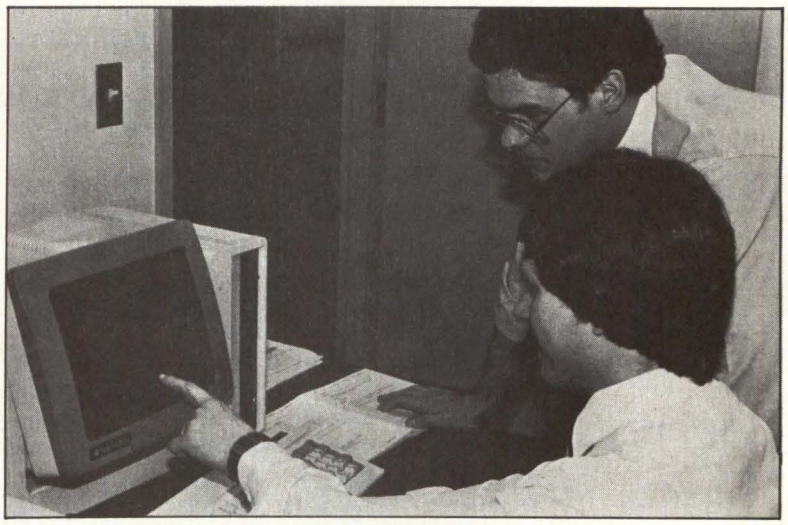
Robert A. Sehr

Whidbey General Hospital is a 50-bed facility in the island community of Coupeville, Wash., some 40 miles north of Seattle across Puget Sound. Until recently, the hospital had limited health-care resources. When the people of the community needed extensive care, they would go to a hospital on the mainland.

Yet, this small-town hospital is experimenting with using a network of IBM Corp.-compatible PCs to serve its patients with an efficiency nearing that provided by the minicomputers typically used in larger hospitals. The hospital is acting as a beta test site for a hospital-management system configured by Medical Management Information Systems Inc. (MMIS), Seattle, an OEM for TeleVideo Systems Inc., Sunnyvale, Calif. The system, based on the TeleVideo Personal Mini/16 (PM/16) microcomputer network system, tracks doctors, patients, pharmacy operations and medical records. "A system like this would usually cost at least $1 million—more than we could afford," says Whidbey General's assistant administrator, Robert Maxwell. "By using a microcomputer, we can install it for one-tenth the cost [of a minicomputer]."

Network updates hospital

Whidbey General decided to buy the PM/16 after the service bureau that had been doing the hospital's bookkeeping went out of business a year ago. When that happened, hospital administrators had to decide whether to find another service bureau or buy a computer system. They decided to buy a computer system—and they wanted one that did more than just accounting—because they believed that such a system would be more cost-effective than using a service bureau. In addition to considering cost, the hospital needed a system that offered efficient order entry, database management and file security.

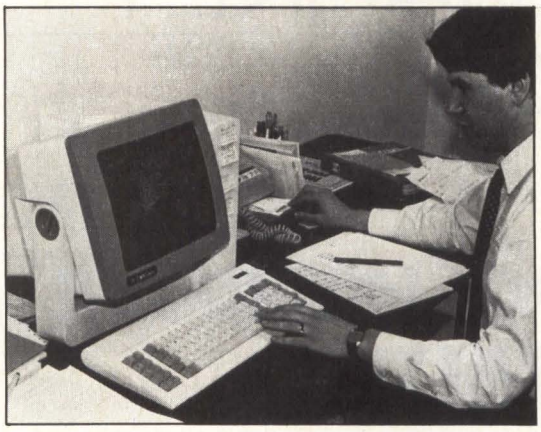


At Whidbey General, *personnel use a TeleVideo PM/16 to track patients' diagnoses and progress.*

The hospital administrators came across the MMIS-configured PM/16 after evaluating supermicrocomputers and minicomputers, and found in the PM/16 the solution they had been looking for—a low-cost hospital-management system. What's more, the system's interface card allows users to network PCs inexpensively—another important factor in Whidbey General's decision. For its part, MMIS saw Whidbey General as the beta test site it had been looking for to "fine tune" the system.

The centerpiece of the network, the 16-bit, multiuser PM/16, uses a dedicated file server with a 40M-byte hard disk and a 740K-byte floppy disk. With the $99 PM interface card from TeleVideo, users can connect as many as 16 IBM PCs or compatibles or as many as eight diskless

Using Data Access' Dataflex *database-management system, the PM/16 tracks patient admissions and discharges, medical records and surgeon and operating-room scheduling.*



workstations to the server. The PM/16 uses TeleVideo's InfoShare operating system, a customized version of Novell Inc.'s NetWare that runs multiuser applications, thus allowing more than one user at a time to work with a shared file. InfoShare can run programs written in MAI/Basic Four Business Products Corp.'s Business BASIC and Ryan-McFarland Corp.'s RM/COBOL, as well as single-user applications for the IBM PC.

Whidbey General is using two PM/16s connected to 15 diskless workstations. Eventually, the hospital will increase the number of workstations to 20. The PM/16 can generate most hospital functions using the Dataflex database-management system developed by Data Access Corp., Miami, and customized by Whidbey General employees and MMIS. The customized version provides such functions as patient admissions and discharges, medical-records tracking and surgeon and operating-room scheduling. Dataflex also maintains pharmacy inventories, generates pharmacy records, tracks the location of patient charts and generates physicians' personnel records for administrative files.

Order entry aids accounting

Using Dataflex's order-entry system, hospital personnel can track requests for lab work from the time a physician or nurse enters the requests until the laboratory performs the work. Within minutes after the lab reports the results of a test, the system makes these results available to doctors on their terminals or on printouts. The system automatically flags abnormal test results, so doctors can quickly spot and treat serious maladies. Before the installation of the PM/16, hospital personnel had to hand-deliver the lab requests and reports to the various departments in the hospital. "It used to take days for the reports to make their rounds from request to billing," says assistant administrator Maxwell.

The Dataflex system automatically generates a billing file for the accounting department and a hard-copy bill for the patient. The PM/16 communicates with an IBM System/36 minicomputer, which tracks accounts receivable and accounts payable. Hospital administrators plan to buy a third PM/16 file server eventually to take over the accounting function currently performed by the System/36.

Whidbey General administrators expected some "computerphobia" among the staff. To combat this, they phased in the system department by department, enabling the administrators and users to learn from experience. So far, the hospital staff has been pleased with the system, Maxwell says. Once users familiarize themselves with the system, most of them like its speed and efficiency. The nursing staff in particular appreciates the system because it has taken over some of their clerical responsibilities, freeing them for the more important task of caring for patients.

The nurses also have more time to make decisions concerning patient care. For example, one of the nurses worked with MMIS to plan the PM/16's patient-care database software. A modern equivalent of a typical hospital chart, the patient-care system tracks prescribed tests and medication for each patient. The software writers did not alter the Dataflex software except to create records and fields.

Because the patient-care records contain confidential information, it was important that the PM/16 provide adequate file security. Improper access to a multiuser system in a hospital could cause medication mistakes or even a patient's death. In the PM/16s, the InfoShare operating system provides true file- and record-locking capability. Using passwords and flags, it restricts access by preventing certain users from reading or writing to a file or record. As a result, only doctors might have access to some records, while only pharmacists might have access to others. Still other records would be accessible to all authorized system users. In addition, the PM/16 does not partition disks, so users need not flag a set amount of space.

The PM/16 server alone sells for $8,995. An expansion unit, including eight diskless workstations, adds $4,995 to the price. □

Robert A. Sehr, a former associate editor for *Mini-Micro Systems* magazine, is now a free-lance writer based in Sunnyvale, Calif.

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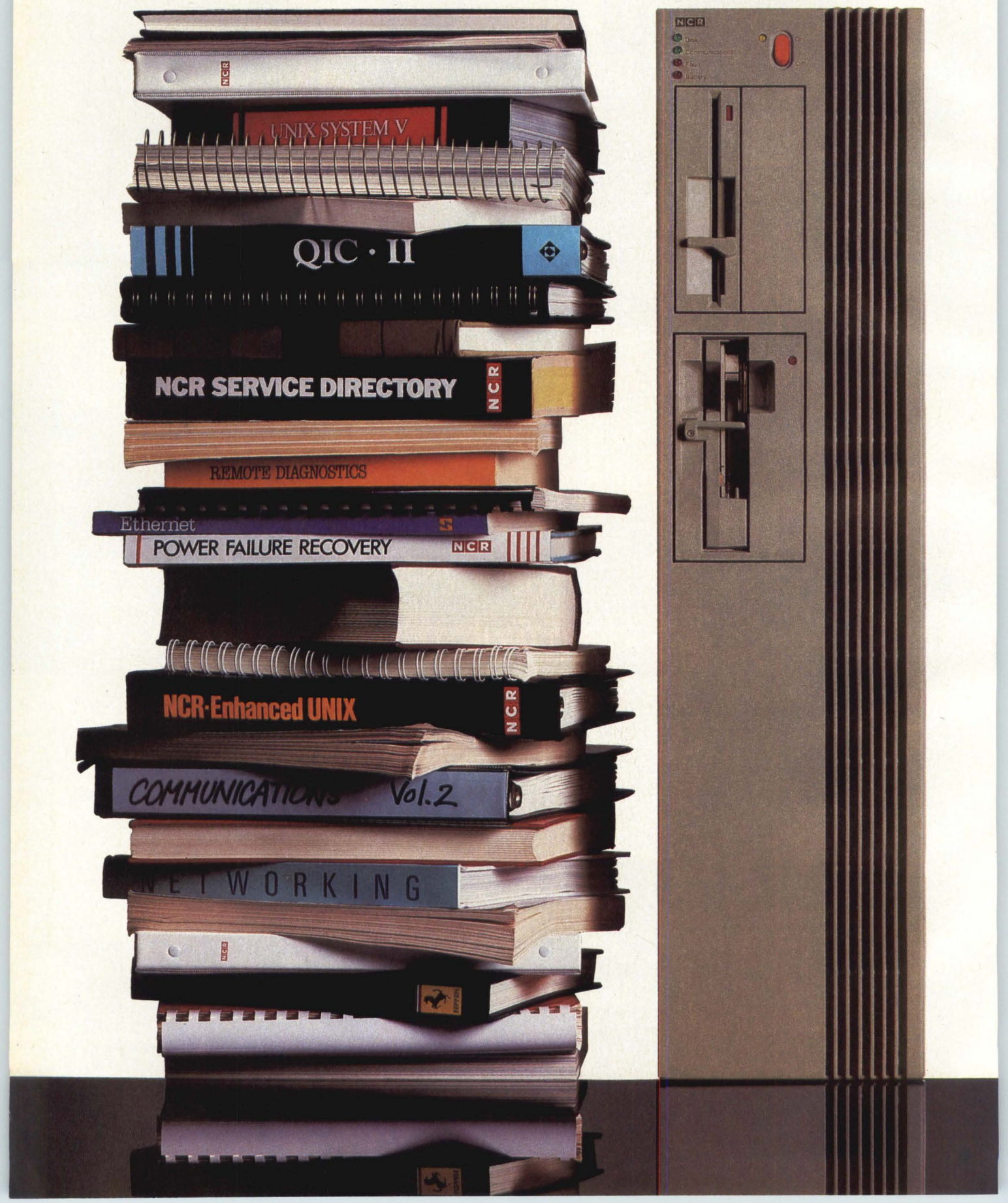
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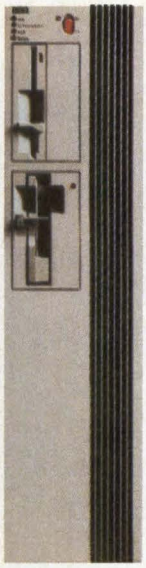

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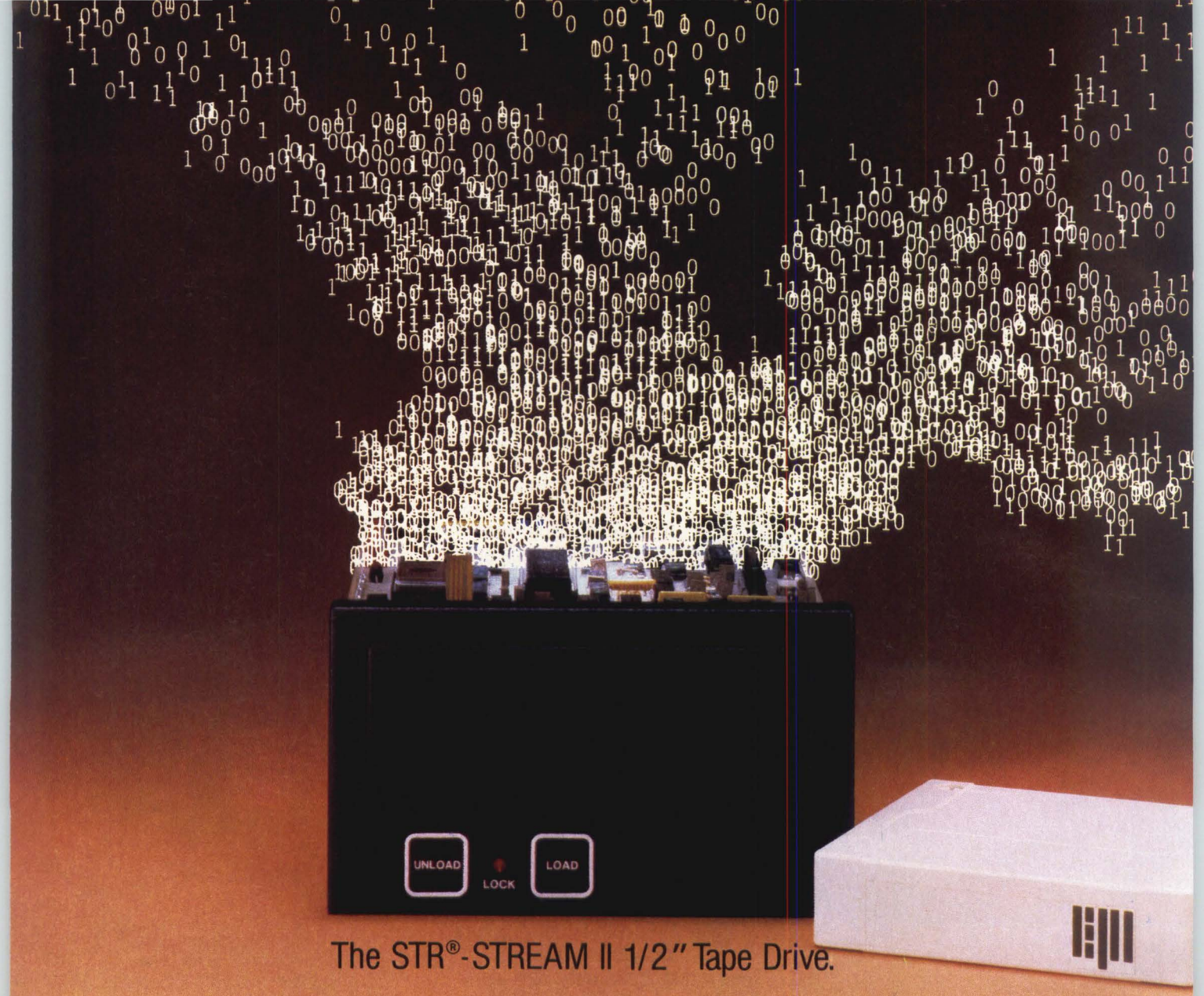

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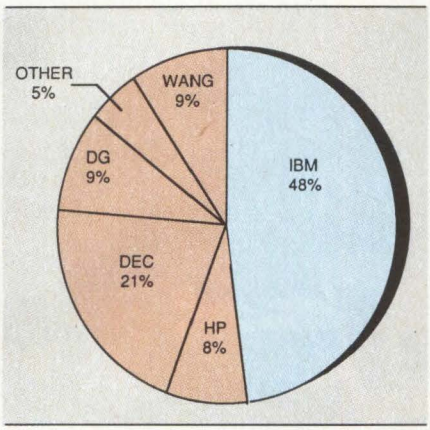
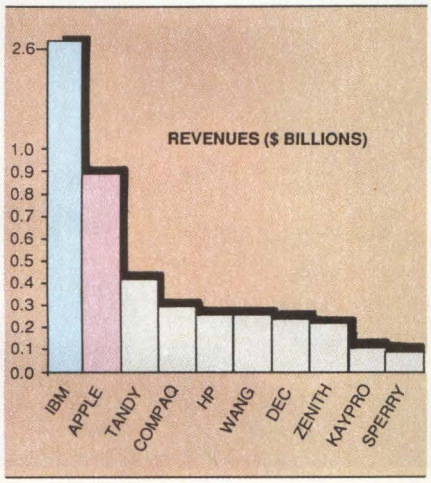


p. 84 . . . . . IBM controls market



p. 123 . . Office market still booming

p. 153 . . . . . See you in Chi-town

PERSPECTIVE: 'POWER PYRAMID' AND IBM CONTROL MARKET 85

Many companies are relying increasingly on venture capitalists, public relations companies and the trade press, which together comprise the "power pyramid." This triad in turn rests precariously on a base of often-questionable market research. However, the largest single market influence is still IBM.

LOCAL AREA NETWORKS: DEMAND, NEW PLAYERS BOOST LAN MARKET 97

Local area networking is one of the hottest topics in the computer industry and promises to remain so through the rest of the year. But it looks as though a shakeout is imminent as the telecommunications giants begin to make bold moves into the LAN market.

PERSONAL COMPUTER SOFTWARE: MICRO SOFTWARE PROMOTES EASE OF USE 111

If you've sat through demos of the new personal computer software offerings, you'll agree that the main goal is rich functionality with ease of use.

PERSONAL COMPUTERS: IBM, APPLE RULE OFFICE MARKET 123

One research firm expects the market for office personal computers to grow from $6.6 billion in 1984 to $30 billion by the end of the decade. Two companies are issuing the orders, while a phalanx of others form the rank and file.

TAPE DRIVES: IBM ENTRY SPURS HIGH-END TAPE DRIVE MARKET 137

Tape drives rarely enjoy the technological wizardry afforded the disk drive industry, but an entry from IBM this year marks a new level of sophistication for tape technology, which will undoubtedly spur the market for ½-inch tape cartridge drives. Meanwhile, the ¼-inch tape drive market is streaming along.

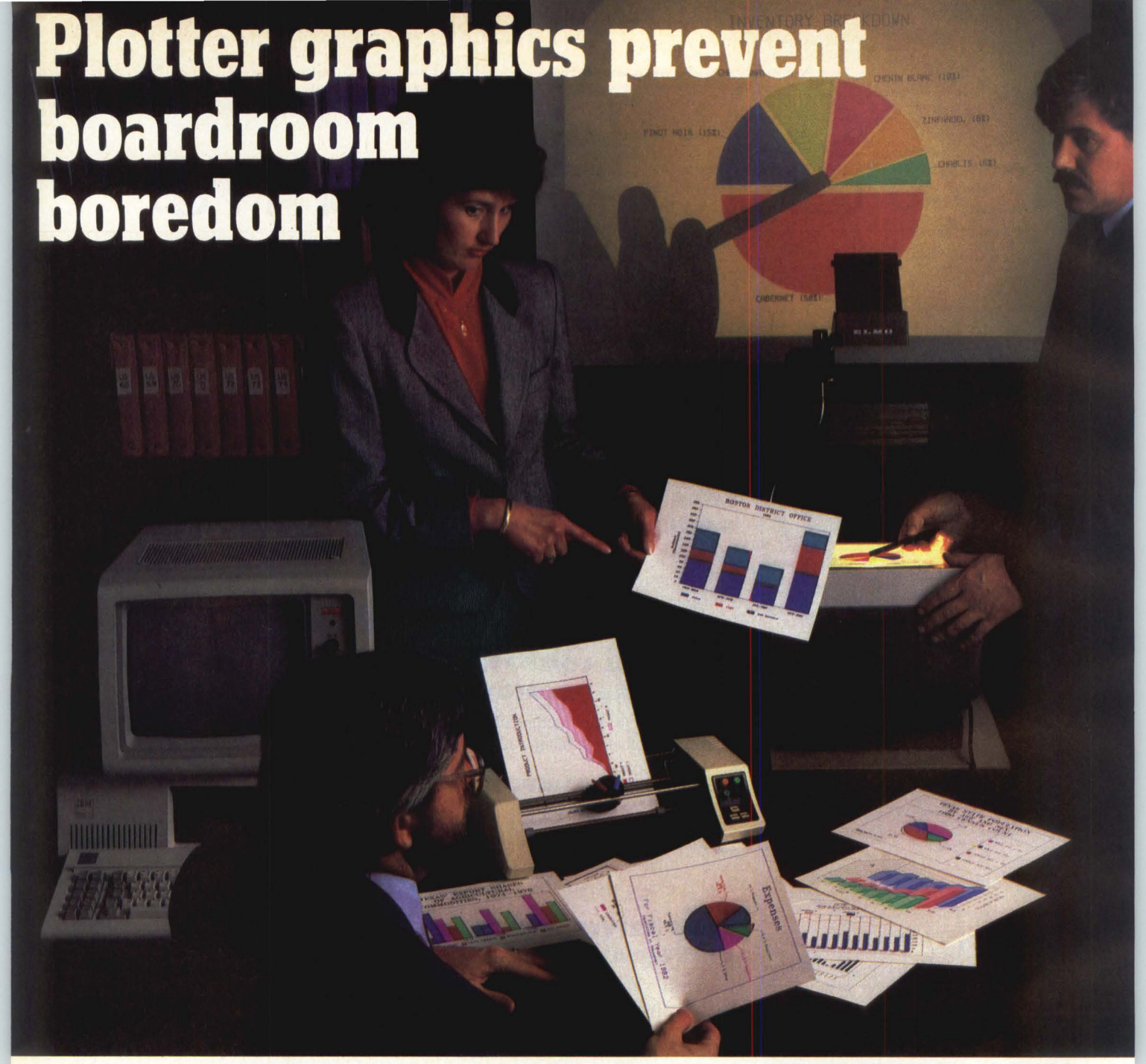
VALUE-ADDED RESELLER MARKET: VAR CHANNEL SKIRTS RETAIL LOGJAM 147

Reacting to the crowded retail marketplace, many manufacturers are seeking alternative distribution channels. One fast-growing route is the value-added reseller, who often sells into niche, or vertical, markets.

NCC PREVIEW: NCC PANELS STRESS INTERNATIONAL OUTLOOK 153

This year's National Computer Conference — July 15 to July 18 at Chicago's McCormick Place — will feature over 700 exhibitors and 80 technical sessions. Focus topics include the international market, AI and networks.

Plotter graphics prevent boardroom boredom



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CIRCLE NO. 42 ON INQUIRY CARD

'POWER PYRAMID,' IBM CONTROL MARKET

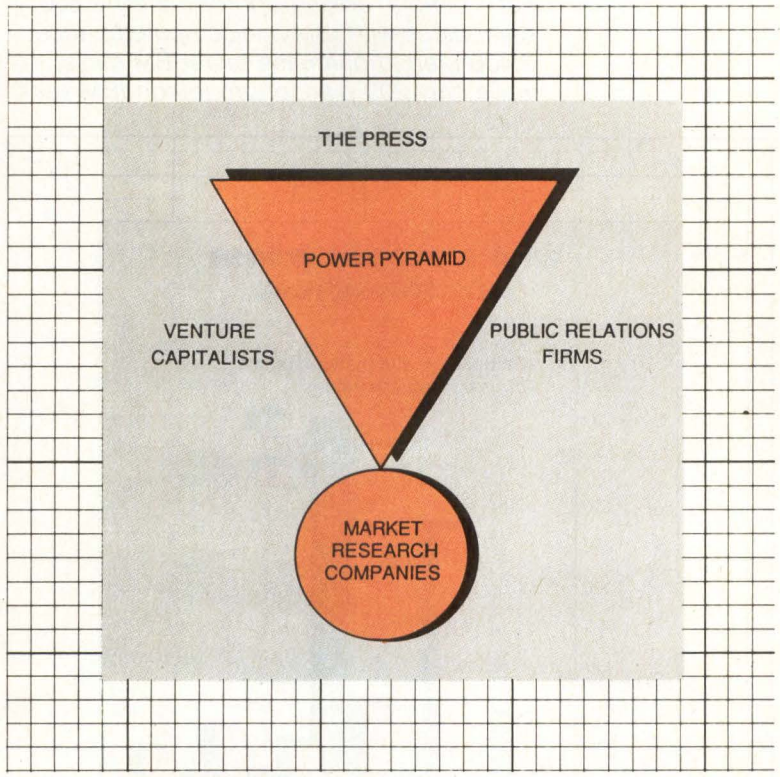
Venture capitalists, public relations companies and the trade press exert strong influence on most segments of the industry, but the largest single influence remains IBM

Gene R. Talsky
Contributing Editor

By the end of the decade, medium and small businesses will surpass big corporations as the largest markets for small business systems and office automation products. However, these markets remain the most difficult and costly for computer hardware, software and service vendors to reach. IBM Corp., freed in court from the threat of governmental regulation, is committing unprecedented resources to capture the major share of this market. Other companies addressing these markets find themselves increasingly dependent upon venture capitalists, public relations companies and the computer trade press for success in both direct and indirect marketing. These three groups now comprise a "power pyramid" that exercises sufficient influence to determine the success or failure of all but the largest vendors.

Venture capitalists take charge

Venture capitalists are no longer passive sources of financing for start-ups and young companies. Most of the venture capitalists participating in a recent seminar admitted to using their financial position to replace the founding management in 30 percent to 50 percent of their portfolio companies. In a growing number of cases, venture capitalists are actually assuming the responsibility for managing their investments themselves. Additionally, investors are increasingly attempting to influence new entrants to



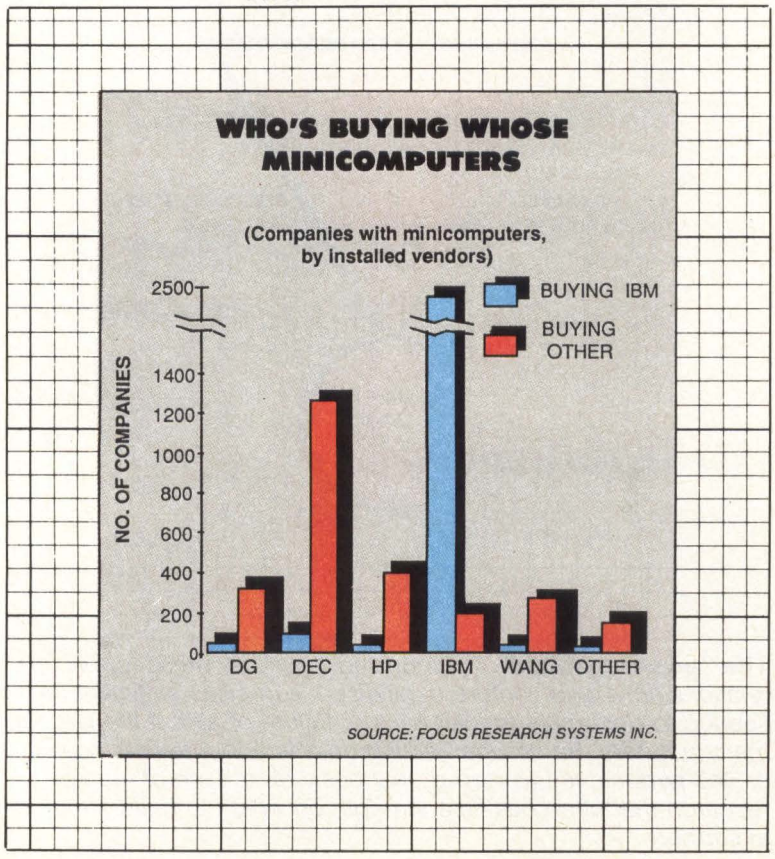
The "power pyramid"—*comprising the trade press, public relations firms and venture capitalists—exercises sufficient influence to determine the success or failure of all but the largest manufacturers. Rather than sitting on a firm foundation, however, the pyramid is inverted precariously on a base of market research that often has little strength on which to build structural support.*

merge their talents or products with one of the investor's existing clients, in order to bolster management or address a market weaknesses.

Furthermore, by withholding previously committed additional financing—typically justified by a company's failure to attain projected revenues and earnings—venture capitalists are gaining financial and operational control of companies at an unprecedented rate. Unfortunately, venture capitalists are not necessarily the best managers of high-technology companies, and rarely do they have the marketing expertise required in such highly competitive arenas. The number of venture capitalists who are seasoned managers with successful track records is extremely limited.

Venture capitalists' need to protect their investments and minimize losses is understandable. However, in most instances, assuming active management roles in high-technology industries in which they have insufficient expertise is not proving beneficial to them or to the principals of their portfolio companies.

Reported buying plans *of companies with installed minicomputers indicate that loyalty is high among owners of IBM equipment. For example, among approximately 2,600 companies with IBM minicomputers, about 2,400 plan to purchase more IBM minis, while only 200 plan to turn to non-IBM vendors.*



PR power grows

Selling high-technology products in a highly competitive environment has elevated marketing from a support function to a science. Market penetration and market share are the primary goals of all vendors. Their need to identify and address their markets requires more than full-page, four-color ads in the appropriate business journals. Sophisticated marketing plans are implemented well before a company is ready to sell a particular product, in order to generate growing interest and excitement as the introduction date draws near.

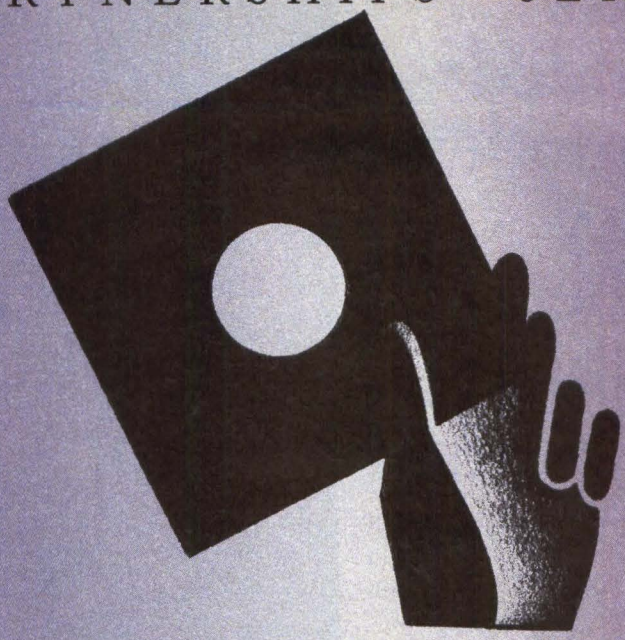
Marketing programs address three primary targets: the financial community—including venture capitalists, investment bankers and other institutions—to attract the money for development and marketing; resellers—including distributors, dealers, integrators and OEMs—to develop the multiple distribution channels needed to reach large, medium and small businesses; and the business press, whose influence on markets continues to grow. The buyer is often the secondary target of these marketing campaigns.

A handful of high-technology public relations companies, such as Franson and Associates Inc., Miller Communications, Regis McKenna Inc. and Simon/Public Relations Inc. are proving themselves masters of the art of high-technology marketing. They start promoting companies and products long before product availability; carefully orchestrate product introduction; and nurture the financial community, the press and resellers as the product nears delivery. Their great risk is the possible failure of their clients to deliver products. Ovation Technologies Inc. stands out as one of the more recent examples of failed marketing expectations. The Canton, Mass., company was launched with great expectations in 1983 and was in financial ruins in little more than a year. It never produced the business software it had promised.

But not least, the trade press

The trade press remains the single most influential force on the market. However, editorial policy is increasingly being influenced by shrinking advertising revenues as vendors' budgets are cut back and competition among publications increases. The trade press sometimes favors po-

GREAT PARTNERSHIPS · SERIES I NO. 1



Most people are satisfied doing one thing well. Not Dick Bard. He runs a successful construction company *and* a successful software design firm.

Fortunately, he has a very hard-working partner: KnowledgeMan.™

"It's a terrific all-purpose tool for designing easy-to-use programs," says Bard, who uses KnowledgeMan to write software for everything from home building to hospitals. "You can design beautiful, user friendly screens; programs that are very simple to follow. And they're a pleasure to write.

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"I considered Lotus™ and Framework.™ KnowledgeMan is more logical—far more powerful, too. And it thinks the way I do."

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A variety of KnowledgeMan options, including K-Text,™ K-Graph™ and K-Paint,™ are available from MDBS.

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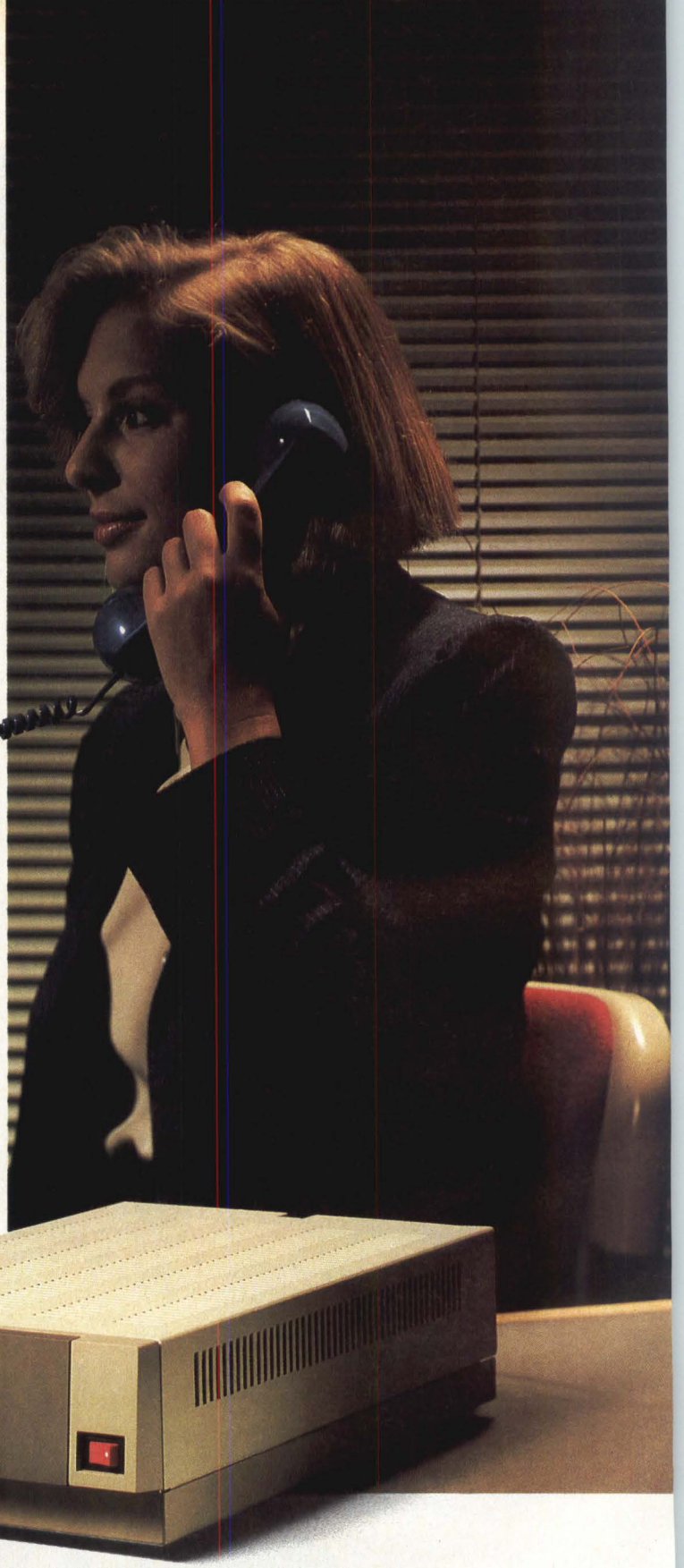
CIRCLE NO. 43 ON INQUIRY CARD

Fujitsu's Trellis-coded 14,400 bps modem. Quality that's got the best OEMs talking.



Increased data reliability through Trellis coding.

OEMs need fast, reliable modems. And Fujitsu has the right answer: the Fujitsu M1926L stand-alone modem.

It's fast. Transmitting at 14,400 bps. It also operates at fallback speeds of 9600, 7200 or 4800 bps.

It's reliable. With Trellis coding for error-free communications. Erroneous noise is canceled in the receiver because the Trellis-coded modulation in the transmitter adds redundancy to the signal. Possible bit errors are corrected over the line by a Viterbi algorithm scheme in the receiver. And the M1926L is designed for OEMs only. So your concerns always come first with us.

The Fujitsu M1926L has a built-in, 6-channel multiplexer and operates on four-wire, unconditioned leased lines. In addition to the standard LED indicators, it has a Liquid Crystal Display for easy monitoring of modem operations and tests.

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tential and current advertisers.

The trade press also retains a disproportionate influence on the other two pillars of the power pyramid. Rarely is there a business plan submitted to venture capitalists that does not include copies of favorable product reviews, trade-press interviews with a company's principals or other press coverage. That often includes press clippings that are abbreviated, but otherwise unedited, press releases.

In general, the trade press is less influenced by extravagant entertainment by manufacturers than by editorial and personal bias. Some publications lean more toward certain manufacturers, publishing more about their products and related news, than toward others. Other publications review more favorably products that are easy to learn and to use than products that offer broader capabilities and are, therefore, more difficult to learn and to use.

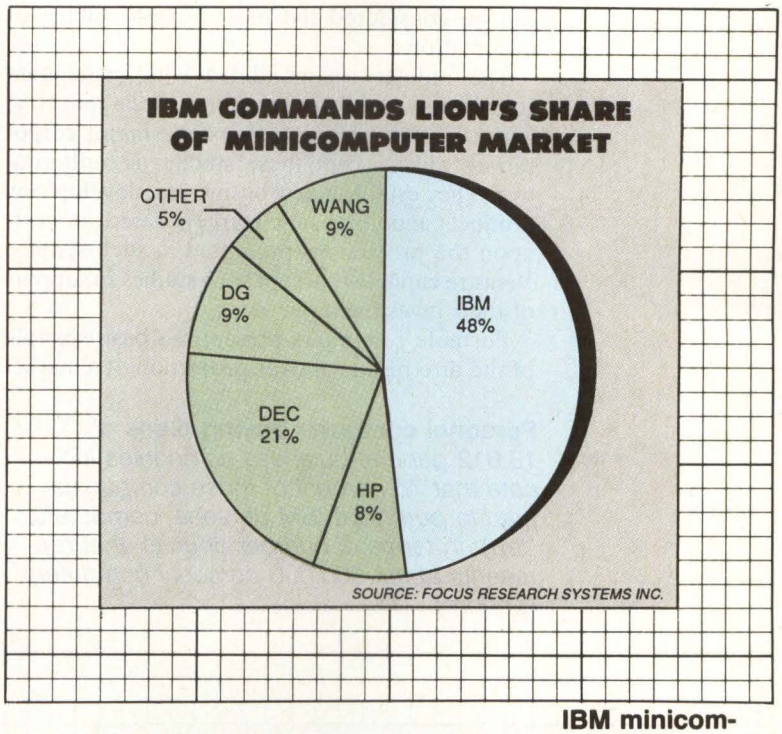
Topical coverage of trade shows and financial results often reflects editorial bias. One headline might read "50,000 attend ConExpo," while another says of the same event "ConExpo Attendance Down." One publication might report "XYZ Earnings Down," while another, on the same day, proclaims "XYZ earns $50 per share." These examples, in themselves, do not evidence bias. However, tracking individual publications on a continuing basis makes it easy to follow any ebb and flow of favoritism through article placement and headline wording.

In an ongoing campaign, much of the trade press has lead users to believe that prices of computer hardware and software should continue to be driven down. Editorials and reports have created strong expectations of lower and lower prices, causing many buyers to delay their purchases. Such expectations are often unrealistic, and contribute to the competitive chaos that is forcing so many manufacturers and resellers out of business. Without sufficient profit opportunity, there is no motivation for manufacturers to develop innovative products, or for resellers to offer sufficient support to assure users of success with their computer systems. It is the end users who suffer the consequences when manufacturers and resellers go bankrupt.

In order to retain credibility, the trade press needs to assume greater responsibility for news reports and editorials.

Pyramid rests on shaky research

Rather than sitting on a firm foundation, the power pyramid is actually inverted, with its point balancing precariously on a base of market research that often has little credibility. The proliferation of market research companies, along with their reports on computer and office-automation markets, has created a competitive environment that at least matches that of the trade press. The competitive environment often leads to attention-getting reports that are based on shabby research methods. The power pyramid often relies on this specious information.



IBM minicomputers—*which include the Series/1 and System/34, System/36 and System/38 lines—account for 48 percent of the total installed base of minicomputers among 37,508 general-business companies.*

A handful of well-established research companies, such as Dataquest Inc. and The Gartner Group, have been joined by as many as 100 newer companies, many of which produce studies and projections based upon highly questionable samplings and methodologies. Many of these newer companies, however, well understand the importance of self-marketing and commit substantial budgets to public relations and to promoting their products and services.

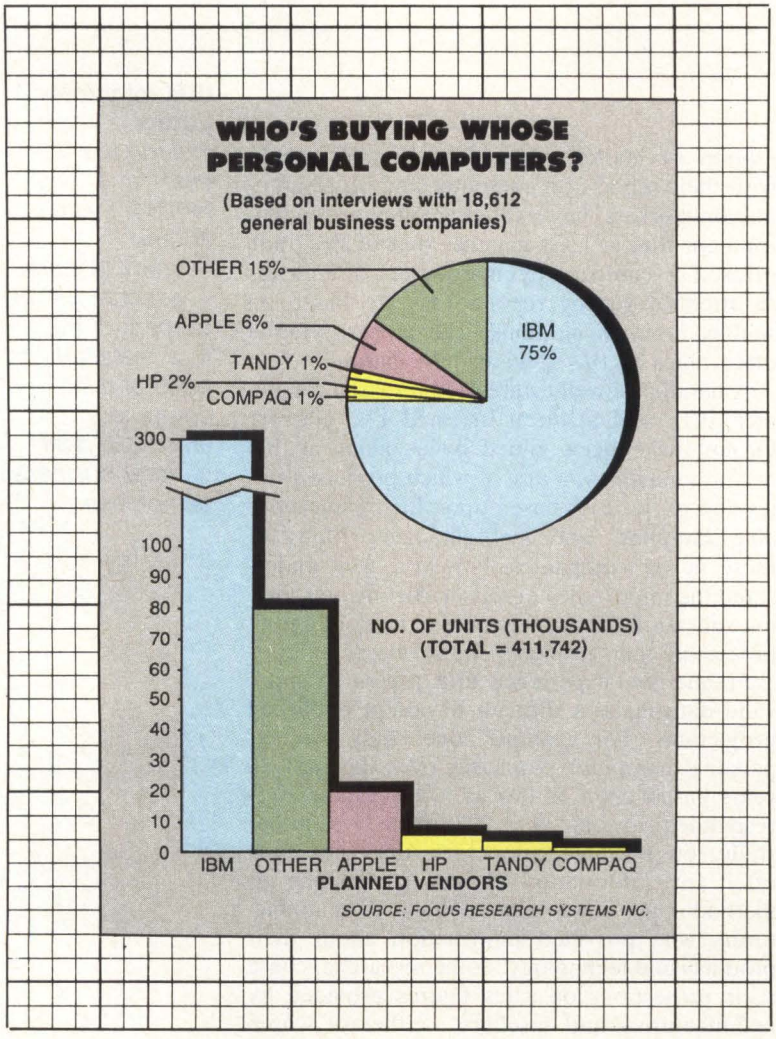
Frequently, experience and access to more valid data make it difficult to accept published projections. For example, one study projects personal computer purchases over the next 10 years based upon as few as 170 questionnaires responded to out of 1,000 mailed. Another study, on portable computers, does not even offer any information about its sampling or methodology, other than profiling 23 manufacturers who provided information about their products and technology. Some researchers base their projections on sales figures provided by manufacturers and resellers, neither of whom

can be considered the most reliable source of information.

The industry is inundated with inadequate studies on virtually every aspect of the industry. Unfortunately, entrepreneurs and major corporations alike accept these studies as authoritative. They establish new businesses, develop new products and enter new markets based, in part, upon the projections presented in such studies. Venture capitalists accept such studies in support of their investment decisions.

Portable computers present the best example of the dire results of over-projection of a market by research reports. More than 150 companies have offered portables; fewer than 40 companies still having some chance of surviving. Hundreds of millions of dollars have been lost in chasing markets that have yet to materialize.

Personal computer buying plans *of 18,612 general-business companies indicate that 75 percent of those companies plan to purchase IBM personal computers (top). In terms of number of units, that represents about 300,000 personal computers (bottom).*



It is important to remember that until an end user actually buys a product, there is no real revenue entering the computer industry. Researchers often ignore this fact and report sales of products that never leave the distribution channels. The fact that a component manufacturer sells to a system manufacturer, who sells to a distributor, who sells to a dealer, who sells to a system house, which may or may not be able to sell to an end user, simply means that many of the reported revenue and profit figures reflect interim economic dust, which, when it settles, ends in bankruptcy for many in the manufacturing/distribution chain.

Few research companies interview or obtain questionnaire responses from enough end buyers to substantiate current and projected usage and purchase reports. One which does, Focus Research Systems Inc., West Hartford, Conn., interviews more than 25,000 companies each month, generating actual usage and planned-purchase information on office-automation and computer hardware, software and services. However, even with a growing database that currently includes more than 200,000 companies interviewed by Focus Research Systems at least once a year, it is careful to qualify the information to prevent false assumptions.

Trade journals also publish market-penetration studies, based upon surveys of their readers. The readers being end users, are influenced in their responses by the products in which they have invested or plan to invest. Additionally, graphs from numerous market studies often appear in business and trade-press publications, without editorial qualification or consideration. Thus the power pyramid balances precariously on questionable market data.

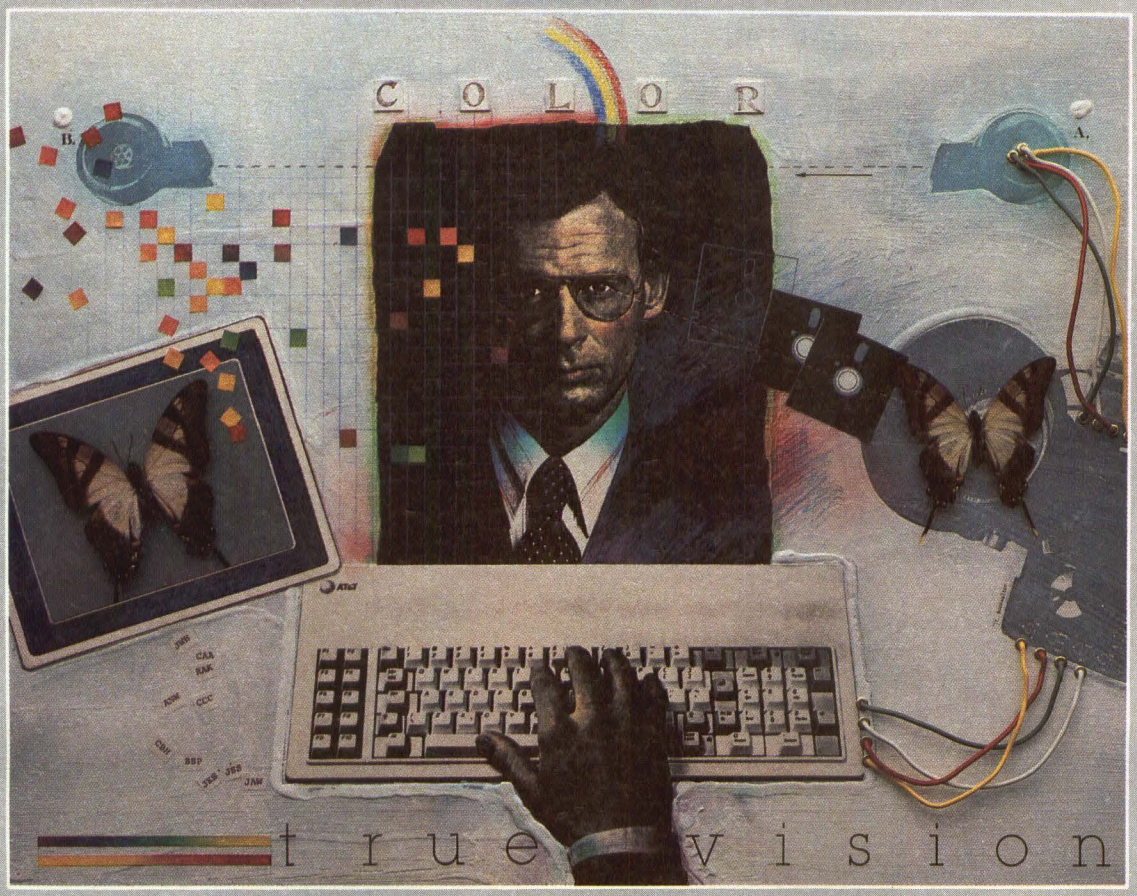
IBM wants it all

The power pyramid influences virtually the entire computer industry with, perhaps, only one exception—IBM.

Even in the mainframe arena, IBM continues to assert aggressive marketing. By targeting a 12 percent growth in their mainframe business in 1985 (as reported in *Business Week* Feb. 18), it may be expecting to capture as much as 90 percent of mainframe sales this year. IBM also shows increasing strength in minicomputer, microcomputer and personal computer markets.

In today's volatile marketplace, buying inten-

Let there be sight



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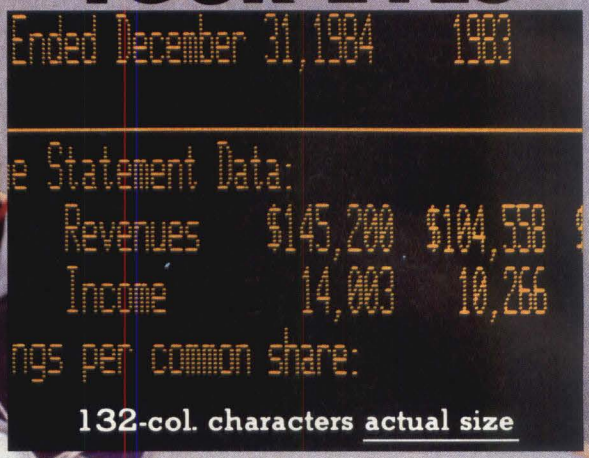

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CIRCLE NO. 46 ON INQUIRY CARD

tions provide more insight than do current market share. It is interesting to note that of companies interviewed this year that have non-IBM minicomputers—and that planned to buy one or more additional minicomputers—more than 90 percent planned to remain with non-IBM vendors, according to Focus Research Systems. Of the companies that currently have IBM minicomputers (more than 47 percent of 37,500 companies with installed minicomputers), 93 percent said they planned to buy IBM minicomputers. IBM's enhancements to their System/36 and /38 lines are preserving customer loyalty.

IBM's inroads are most evident in the personal computer arena. Of more than 18,000 companies interviewed—more than 60 percent of which already have one or more personal computers—76 percent planned to buy IBM PCs, 6 percent planned to buy Apple Computer Inc. personal computers, and 2 percent Hewlett-Packard Co. units.

IBM's growing market strength becomes more evident when one isolates those companies that currently have Apples installed. More than half of the Apple users that plan to buy more personal computers plan to buy IBM PCs. Only 22 percent plan to buy more Apples. Even more ominous for Apple is the finding that 25 percent intend to buy personal computers from other vendors. Because Apple aggressively (and shortsightedly) seeks to stop anyone from manufacturing and marketing Apple clones, most of that substantial market share will probably go to IBM-compatible systems.

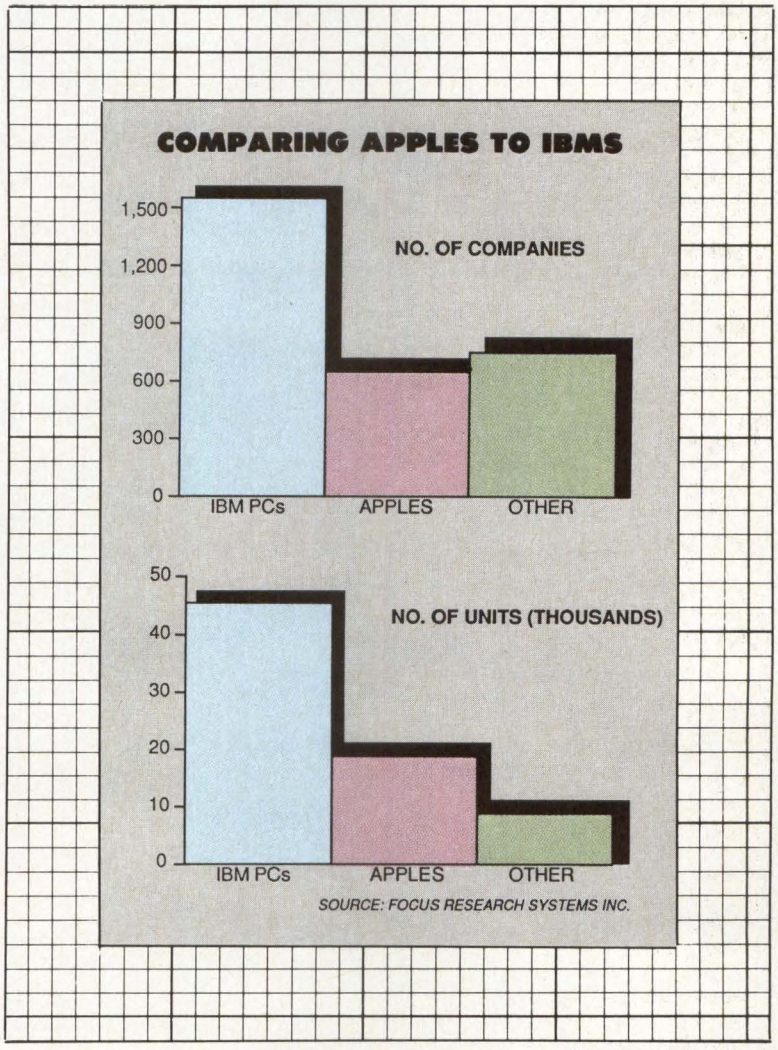
Translating this data into other terms illustrates the point more graphically:

- 18,000 interviewed companies planned to buy more than 411,000 personal computers
- 14,000 of those companies planned to buy 300,000 IBM PCs
- 1,100 of those companies planned to buy 19,000 Apples.

(Figures are rounded for illustration purposes.)

There can be little question that IBM's market position is on its way to becoming virtually unassailable. IBM's recent product and marketing announcements emphasize its aggressive stance in all segments—hardware, software, financing and servicing. And it has the resources and organization to ensure its continuing dominance. The unknown factor is the extent of "noise" (non-IBM vendor sales) they will consider acceptable going into the 1990s. The ultimate cost, if IBM's market dominance is not challenged, will be limited technological innovation and limited market selection. Without viable competitive alternatives, end users will suffer those consequences.

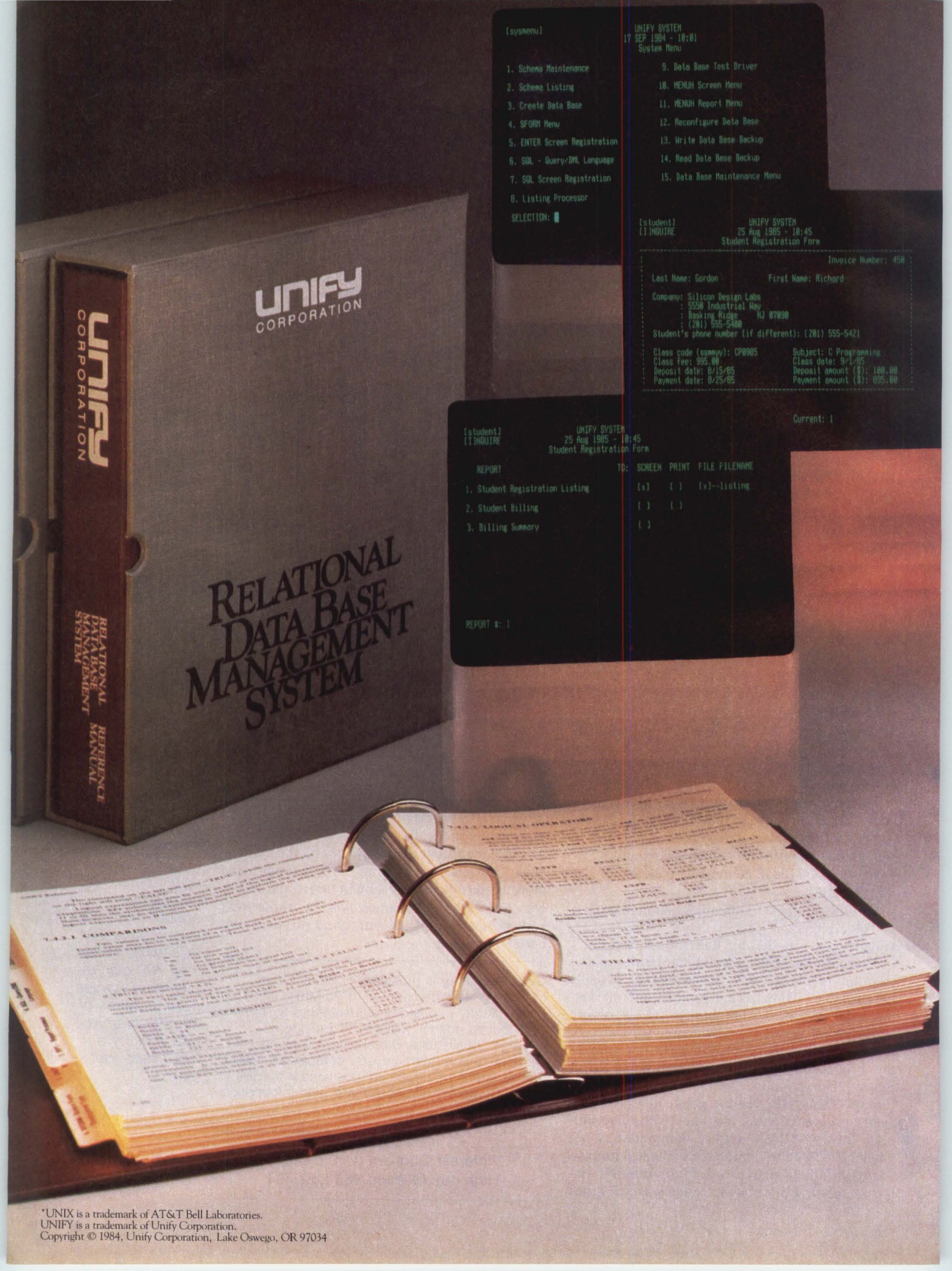
It is evident that the influences on the marketplace portend continuing consolidation and more bankruptcies of manufacturers and resellers. Successful companies will be those that address specific niches with good products and better marketing programs. □



Among interviewed companies *that have Apple personal computers, about 1,550 plan to purchase IBM PCs, while fewer than 700 plan to buy more Apples (top). In terms of number of units, IBM wins by a 2.5-1 ratio (bottom).*

Gene R. Talsky is president of Professional Marketing Management Inc. (PROMARK), Old Lyme, Conn., and is one of *Mini-Micro Systems'* contributing editors. PROMARK provides strategic, business and marketing-planning services to computer industry companies. Talsky has served in management positions with IBM Corp., Computer Sciences Corp. and Informatics General.

Interest Quotient (Circle One)
High 462 Medium 463 Low 464



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DEMAND, NEW PLAYERS BOOST LAN MARKET

The LAN marketplace shakeout begins as the telecommunications giants make their moves

David Lytel

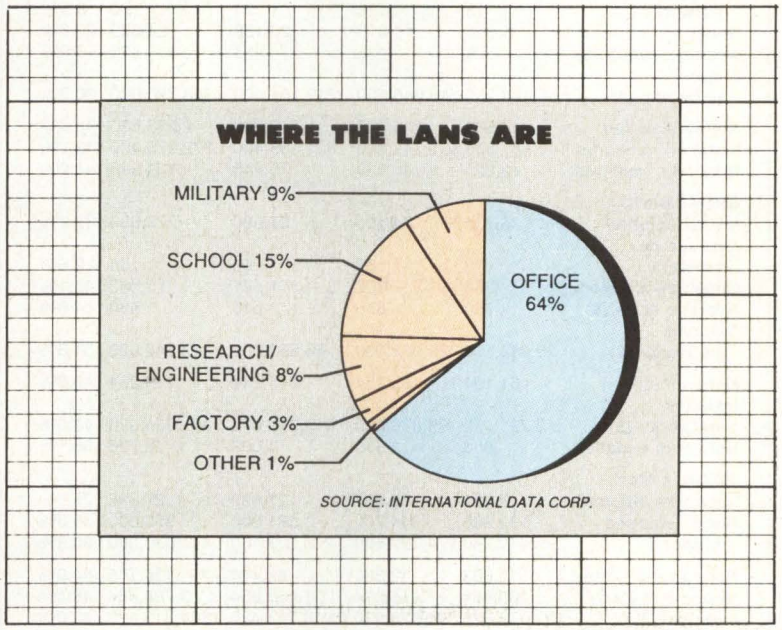
Until recently, the problem with local area networks was finding one that would handle local data-communications needs. Now the problem is selecting one from the competing solutions. Just three years ago, there were few choices; today, there is a bewildering array.

Gone are the "media wars" that characterized the LAN market's early years—not that the relative merits of twisted pair vs. coaxial cable vs. fiber optics have been argued to their limits. But currently the conflict, for the most part, concerns real products rather than design philosophies. The same is true of the debate over standards. The argument goes on, but the viable standards will be sorted out by the marketplace, not by committees.

The premier standard is Ethernet (IEEE 802.3), pioneered by Digital Equipment Corp., Intel Corp. and Xerox Corp., which were joined by early vendors such as Interlan Inc., 3Com Corp. and Ungermann-Bass Inc. The token-passing bus (IEEE 802.4), brought out by Concord Data Systems Inc., is on its way to becoming the factory-LAN standard. Meanwhile, the token-passing ring (IEEE 802.5) was made famous by last year's IBM Corp. non-announcement—that its general-purpose LAN based on this standard would not be ready for as long as two years (see "Emerging standards trigger $3B LAN market," *MMS Communications Digest*, February 15, Page 59).

One of the few things LAN market research experts agree on is that the market is growing at a healthy rate. Dataquest Inc., the San Jose, Calif., research company, predicts that the annual growth rate measured in number of units shipped will be around 65 percent from 1984 to 1988. Growth in dollars, according to Dataquest, will be up 46 percent over the same period, the difference being due to the lower cost of LAN components in the future. In real numbers, that represents an installed base of 587,000 components in 1984—including terminals, printers, personal computers, gateways and workstations—and almost 5.5 million connections by 1988.

The LAN market divides into three segments: proprietary LANs that leverage an installed base



The majority of LANs *are installed in office environments. The segmentation percentages for baseband and broadband networks are approximately equal.*

of office equipment, such as DEC's DECNet, ARC from Datapoint Corp. and Wangnet from Wang Laboratories Inc.; general-purpose LANs, such as those from Interlan, Ungermann-Bass and Sytek Inc.; and LANs geared to the growing number of microcomputers.

The LAN market *is "poised for takeoff," say analysts. They expect the total value of installed LANs to approach $2 billion by 1988.*

LANs BOTH NEAR AND FAR: HOW WORLDWIDE MARKET GROWTH WILL LOOK (1982-1988)

	1982	1984	1986	1988	ACG
BASEBAND					
Nodes shipped	105,570	300,300	483,800	730,000	35.4%
Average per network	18	20	24	30	9.5%
Networks shipped	5,865	15,015	20,158	24,333	23.6%
Average nodes ($)	525	485	453	423	-3.5%
Shipped networks ($)	55,424,250	145,645,500	219,161,400	308,790,000	30.6%
Nodes installed	244,500	775,830	1,643,630	2,973,630	48.3%
Installed networks	140,587,500	401,748,000	801,389,400	1,372,979,400	43.2%
Networks installed	12,225	40,830	78,443	124,998	43.2%
BROADBAND					
Nodes shipped	26,718	44,400	98,000	228,000	37.2%
Average per network	73	85	68	64	-2.8%
Networks shipped	366	522	1,441	3,563	41.1%
Average node ($)	750	655	616	580	-4.0%
Shipped networks ($)	20,038,500	29,082,000	60,368,000	132,240,000	31.6%
Nodes installed	61,194	135,234	315,234	755,234	49.0%
Installed networks ($)	50,791,020	99,880,020	212,318,020	471,334,020	42.6%
Networks installed	658	1,560	4,002	10,776	56.1%
TOTAL LANs					
Networks shipped	6,231	15,537	21,600	27,896	25.1%
Nodes shipped	132,288	344,700	581,800	958,000	35.8%
shipped	75,462,750	174,727,500	279,529,400	441,030,000	30.9%
Networks installed	12,883	42,390	82,444	135,775	44.0%
Nodes installed	305,694	911,064	1,958,864	3,728,864	48.4%
Installed ($)	191,378,520	501,628,020	1,013,707,420	1,844,313,420	43.0%

Notes
1. Number of nodes shipped x average number of nodes per network = number of networks shipped
2. Number of nodes shipped x average cost per node = dollar value of networks shipped
3. Number of nodes shipped plus prior year nodes installed = number current year nodes installed
4. Dollar value of networks shipped plus dollar value of prior year networks installed = current year dollar value of networks installed
5. Nodes are physical connections and do not account for connected devices.
6. ACG: Annual compound growth

Source: International Data Corp.

A great deal of attention has been focused on LANs for personal computers, due to the significant battle between companies specializing in this part of the market. Companies such as 3Com, Corvus Systems Inc., Nestar Systems Inc., Novell Inc. and Orchid Technology Inc. have been the early leaders of this segment. In the last year, however, several significant developments have taken place that may threaten their lead.

PC LANs booming

"The most significant introduction in the LAN marketplace in the last year was IBM's PC Network," says Sherry Geddes, director of communications systems for market research company Strategic Inc., Cupertino, Calif. PC Network is produced by Sytek on an OEM basis with IBM. The PC Network is a broadband network for IBM PCs that moves data over a coaxial cable at 2M bits per second (bps). Although the hardware was due in the second quarter of 1985, some close observers are saying that the software won't be ready until later this year.

Geddes says, "The most significant impact of PC Network is that the software interface is at the session level. The software developer doesn't have to worry about the network aspects of it. Until now, they had to worry about all ISO [International Standards Organization] intermediate levels."

Although the PC Network is a blow to LAN hardware interconnectivity—it isn't consistent with Ethernet—the new IBM product is a boon to the development of LAN software standards. IBM's PC Network virtually assures the lightning-fast acceptance of Microsoft Corp.'s Networks 1.0 as a de facto networking software standard. Networks 1.0 is a layer of the broadly accepted MS-DOS operating system, and Microsoft says that any program written for the new MS-DOS 3.1 will run under IBM's PC-DOS 3.1. PC-DOS 3.1 will support IBM's equivalent to Network 1.0, the PC Network program. Because Networks 1.0 is hardware-independent, third-party software developers now have a standard for which to write, which is certain to overcome one of the key obstacles to LAN growth—lack of application software.

Novell's network software was an early attempt at an industry-wide standard, according to Maureen Fleming of research company International Resource Development (IRD), Norwalk, Conn. As Fleming puts it, "Novell's network software is a better product. But Novell just doesn't have the market clout Microsoft does." Analyst Dave Terry of the Boston consultancy

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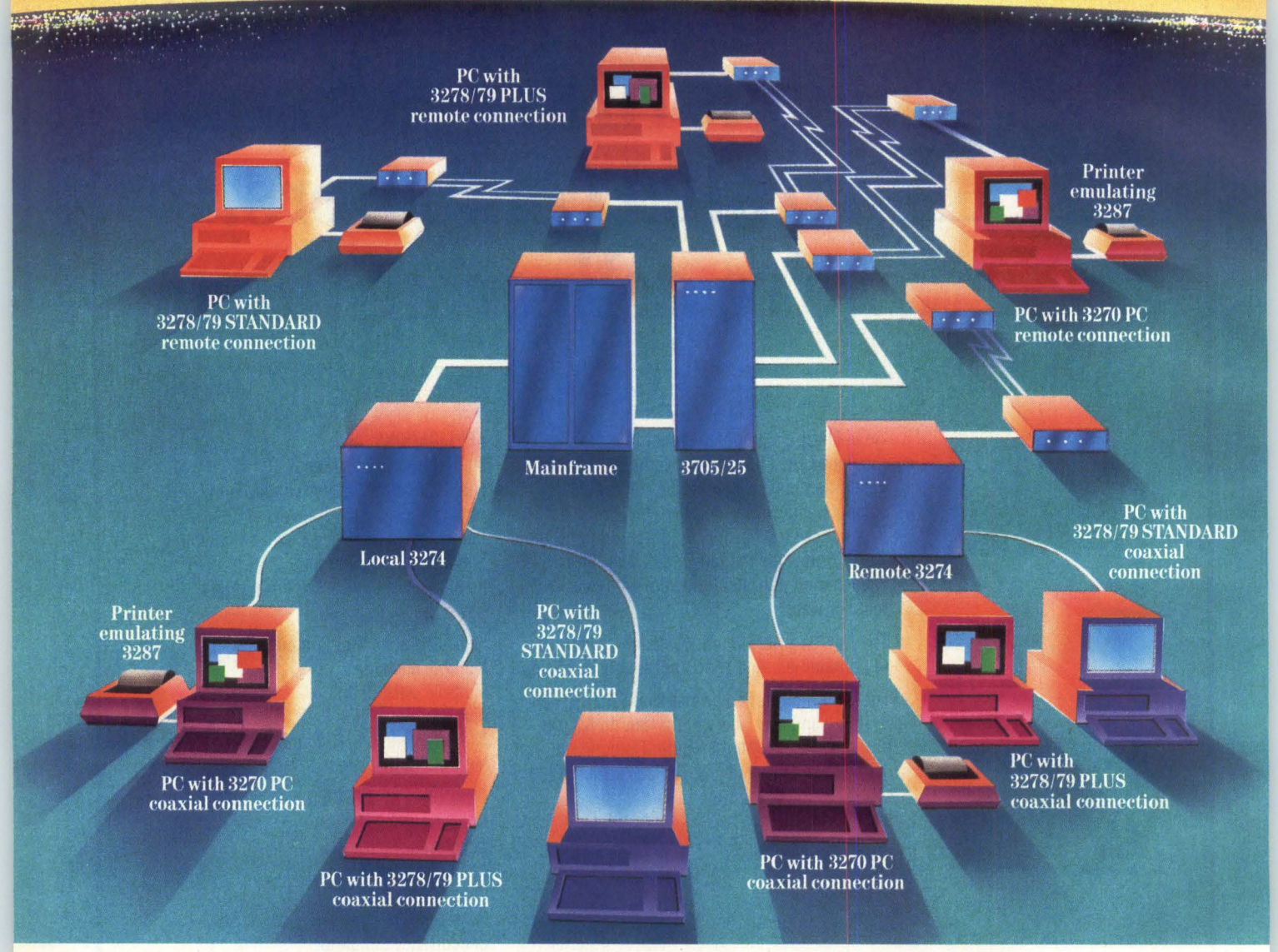

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the Yankee Group agrees: "The PC Network doesn't provide the performance of Netware, but it sets a standard for the LAN world. Other than PC Networks, MS Networks, Novell's Netware and EtherSeries, there won't be any other network software in a year's time."

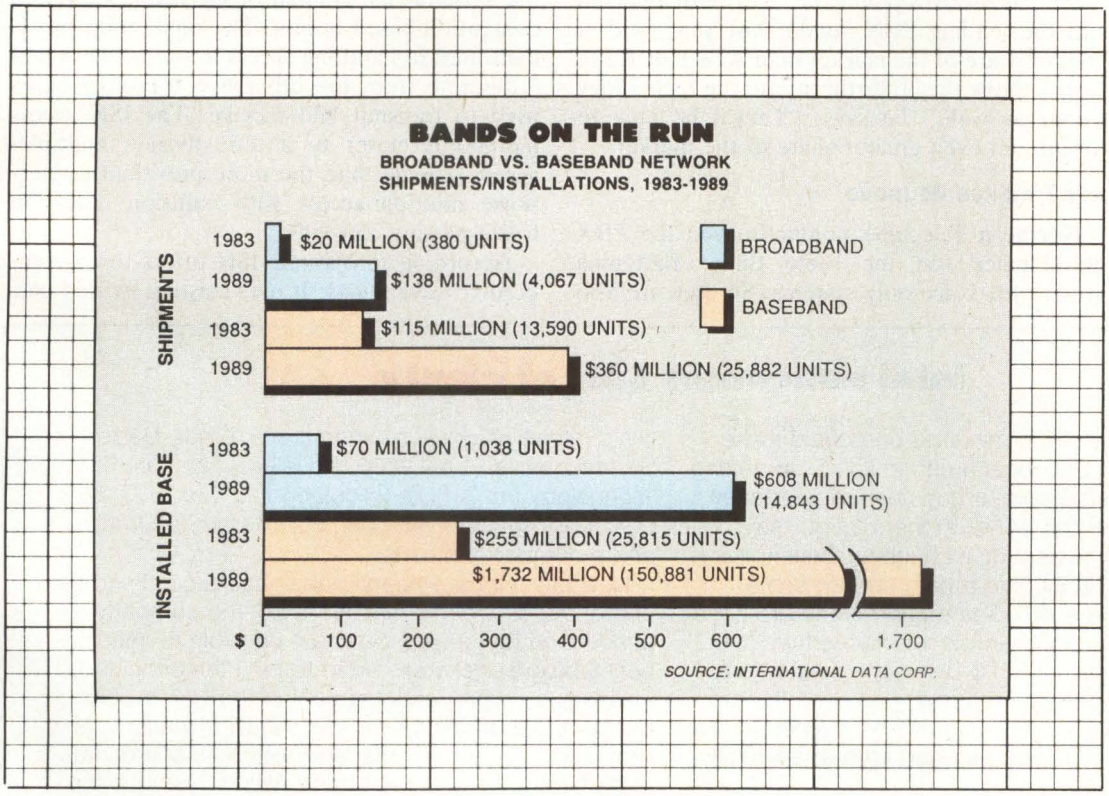
The announcement of IBM's PC Network is significant in that it represents the first of the behemoths of computing and telephony entering the enormously lucrative local data-communications market. The early LAN market leaders might seem to be well-established, but, as Ken Thurber, president of Minneapolis networking group Architecture Technology, says, "I don't think those companies are so well-established in comparison with the large companies. In the future, the large companies will be at an advantage." According to Thurber, the signs of stress on the early entrants will begin to show in early 1986, when IBM's PC Network hits the market.

The actions of such superpowers as IBM, AT&T Co. and Northern Telecom Inc. will be tremendously significant, especially when they join forces with powerful corporate allies. The day of reckoning for the LAN vendors that have been crowding the marketplace might not be too far away.

According to IRD's Fleming, Northern Telecom's announcement of its Meridian Line, a twisted-pair private branch exchange with a closely integrated local network, was the most significant development in the LAN marketplace last year because "it is indicative of what other PBX manufacturers, like AT&T, will do."

Meridian allows data communications at 2.5M bps, which begins to approach the 10M bps of Ethernet or other data-intensive communications channels. Meridian's local network is based on a double-bus networking scheme—a 40M-bps bus for information flow and a 100M-bps controller. A central processor polls all nodes for voice or data packets. Because of a proprietary chip in each terminal, Northern's new voice/data terminals can access the network at speeds to 2.56M bps. The chip is placed in the boards of other devices, such as the IBM PC. The Meridian line includes gateways to Computer and Communication Industry's X.25, IBM's Systems Net-

AT&T has two products currently in the LAN market and one in the wings that is certain to have a major impact.



Shipments of broadband networks *are expected to increase at a 31.6 percent annual growth rate between 1983 and 1989. Shipments of baseband networks over the same time period are expected to increase at 30.6 percent (top of chart). The installed base of broadband networks is expected to increase at 42.6 percent, while baseband installations are expected to grow at 43.2 percent (bottom of chart).*

'The early market leaders like Ungermann-Bass and Sytek will make excellent acquisition candidates.'

work Architecture and other protocols. Northern does not have interfaces to Ethernet or proprietary networks but says it is working on them. "Until this introduction," says Fleming, "twisted pair was too slow. But this is a way to transmit at high speed without doing any wall-bashing."

George Merrow of Advanced Resources Development, El Dorado, Calif., echoes Fleming's analysis. "Meridian is a market-setting product," he says. "It's a LAN with voice capabilities, but they're secondary to data. It's primarily for small groups of users [five to 35 data and 100 voice users simultaneously]. It's an exciting product that brings together more voice-and-data features than ever before."

Meridian isn't alone in the market, however. Intecom Inc. for example, has been a pioneer in developing high-speed internal packet switching. Its Integrated Business Exchange (IBX) LANmark combines the functions of a PBX with Ethernet and can provide data communications as fast as 10M bps over standard twisted-pair telephone wire.

Still, as Merrow points out, Northern Telecom was the leading PBX vendor last year, with a greater share of the market than AT&T or Rolm Corp. "Now they [Northern] are the technology leader as well," he says. "They'll be able to capture an even greater share of the market."

AT&T makes its move

Northern Telecom's competitors in the PBX marketplace see the same thing: flattening growth for voice-only systems. So they are also on the move. AT&T currently has two products for the LAN market, and one in the wings that is certain to have a major impact.

AT&T has a personal computer network for its 3B line of microcomputers, which are built by 3Com. But much more important is AT&T's introduction eight months ago of a general-purpose, wide area network called the Information Systems Network (ISN). ISN can move data at 8.64M bps and is very similar to the announced, but not yet introduced, IBM WAN designed around the token-ring architecture. ISN is a value-added version of AT&T's Datakit virtual circuit switch which it sells to local phone companies.

Neal Vasant, product marketing manager of large business systems for AT&T Information Systems, New York, calls ISN a "total solution—a packet-switching network which is part of a premises-wide data network for 50 users and up." It is a centrally controlled, star-based system using twisted-pair wiring.

ISN uses three very short bus-type local networks inside a central controller. They allow for the veritable assignment of high bandwidth and contention-based access. The contention bus is dedicated to handling access to the network and is discrete from the other two transport buses used to transmit and receive. The ISN access method is closer to a time-division multiple-access scheme than the more prevalent carrier-sense multiple-access with collision detection token-passing methods.

According to Vasant, ISN offers three competitive advantages. It uses existing twisted-pair

Intel announces LAN of plenty

In the past, one of the mistakes one could make with the selection of a local area network was getting stranded—not being able to buy needed interfaces. "When you look at the LANs on the market," says Stuart Wecker, president of Technology Concepts, Sudbury, Mass., "they give a path and do some switching. Some are broadband, and some are baseband. They start to differ in the interfaces they offer, but, if one guy offers a 3270 terminal emulator today, the next guy will offer it tomorrow." He sees the growing number of interfaces to various host types (X.25, Systems Network Architecture and others) as "really significant."

For example, Novell Inc., Orem, Utah, is solidly in the business of connecting departmental LANs into company-wide systems. Its NetWare connects Corvus Systems Inc.'s Omninet, Davong Systems Inc.'s Multilink, Gateway Communication Inc.'s G-Net, Nestar Systems Inc.'s PLAN 2000, Novell's S-Net, Orchid Technology Inc.'s PCnet, Proteon Inc.'s proNET, Standard Microsystems' ARCnet, 3Com Corp.'s Etherlink and a number of others.

Now Intel Corp., Phoenix, Ariz., has proclaimed the end of the stranded LAN. In March, the company announced that it would make it possible to interconnect whatever networks need to be interconnected. This was a ringing endorsement of the LAN's place in the computer marketplace. Says David House, vice president and general manager of Intel's Microcomputer Group, "The impact that LANs will have in the future is only now beginning to be understood. One thing is clear to us: Soon, LAN devices will have the same strategic importance to Intel that microprocessors do today."

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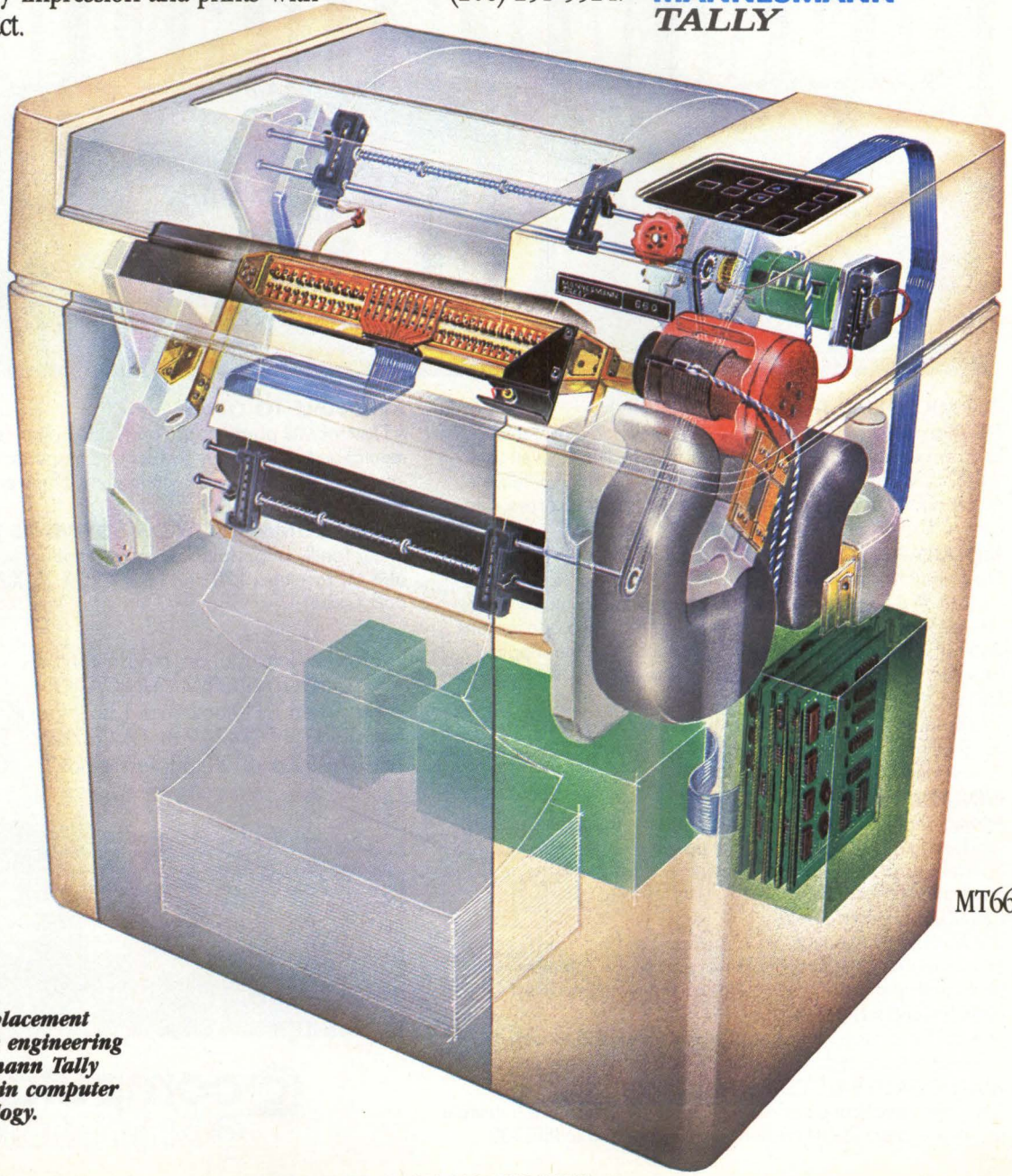

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wiring but "allows selected upgrading to fiber optics anywhere in the system." Vasant also says his product "can start with a low number of users and network to thousands of users without worrying about gateways."

ISN has two other significant market advantages. It could be the local node on AT&T's widely anticipated but yet-to-be-announced public packet-switching network. Or, it could be used in the construction of a private packet-switched network. And ISN is available now, unlike IBM's token-ring, general-purpose LAN.

But AT&T also has a product based upon the emerging Starlan standard. Terry of the Yankee Group believes that AT&T will announce this product in the second quarter of this year, and he predicts that by the end of 1985 about a half a dozen companies will be offering Starlan-based products (802.3 is also considered another alternative to Ethernet) (see "Cheapernet makes local area networking more affordable," MMS, January, Page 74).

Starlan is a slow, less expensive LAN for small areas. Intel introduced its 82588 chip for Starlan last December. Starlan runs at 2M bps—much slower than Ethernet's 10M bps, but the cost per connection for Ethernet is almost $1,000, while for Starlan, it is $250.

This is not good news for Corvus. With an installed base of more than 50,000 nodes worldwide, Corvus considers its Omninet to be the de facto low-speed LAN standard. Omninet is a 1M-bps network using an RS422 twisted-pair-cable bus that allows up to 64 nodes on a 1,219-meter segment without repeaters. After 17 quarters of increased earnings, Corvus fell into the red last fiscal year, losing $10.6 million on $50.5 million in revenues. Although the loss was generally due to slow sales of its hard disks and other storage devices, the thought of competing with AT&T and another dozen or more players in this segment of the market cannot be encouraging for Corvus.

"My guess is that AT&T is making hay right now, although I can't prove that," says Architecture Technology's Thurber. "I do not think AT&T will lose the market edge, even when IBM starts competing. I don't think AT&T has sold many ISNs, but IBM hasn't sold anything comparable."

Awaiting Big Blue's action

IBM's tentacles are so pervasive in the LAN marketplace that virtually every company has some relationship with the company, either as an ally or competitor. In addition to its interim LAN for PCs, IBM has announced its own cabling system, a basic way of wiring a building designed to help solve cabling confusion. According to Architecture Technology's Thurber, "what they've done by announcing their cabling system is to create a market. The first phase is the wire. Then, they'll bring out the token-ring interfaces, then the communications gear. They're taking an incremental approach—solving problems on a migration path."

IBM has shrewdly built alliances with some of the leading players in the LAN and PBX marketplaces. Not only have they acquired Rolm Corp., one of the leading telephony companies, but they also have signed Sytek to produce the boards and transceivers for the PC Network.

This is a shift in Sytek's focus. Until now, it has not concentrated on microcomputer connections. But Sytek's relationship with IBM has been a magnificent boost to the smaller company's business. The communications protocol used by the IBM PC Network is Sytek's property, and Sytek licenses that protocol at its discretion. Analysts already are comparing Sytek's new position to the IBM/Microsoft relationship, which overnight changed Microsoft from a small unknown to a $100 million industry leader, due to the contract to provide the operating system for the IBM PC.

According to industry reports, IBM also has chosen another LAN industry leader for its forthcoming token-ring networks. Although Ungermann-Bass officials do not comment, the company is widely acknowledged to be developing communications software and hardware for IBM's token ring. Ungermann-Bass is also said to be working on peripherals for the IBM token-ring network to get the jump on competitors in the IBM token-ring interface market.

Shakeout or explosion?

These OEM agreements are probably a good indication of the future for early LAN market leaders as the corporate superpowers move into data communications. Analyst Kim Myhre of International Data Corp. (IDC), Framingham, Mass., points to the OEM contracts of the market leaders—3Com's sale of its products through Xerox and Corvus' OEM agreement with NCR Corp.—as indicative of how the early leaders will find a role in the changing market environment.

Analyst Roger Sherman of Creative Strategies Research International, a San Jose, Calif., researcher, believes "the early market leaders like Ungermann-Bass and Sytek will make excellent candidates for acquisition." Eventually, Sherman believes, "survival in the shakeout of the

Perhaps it's more useful to think of LANs not so much as their own market but as value-added devices.

IBM's tentacles are so pervasive in the LAN marketplace that virtually every company has some relationship with it.

market will go to the large vendors because they can offer a total solution. Once the technology becomes mature and standards are resolved, then it becomes a price-competitive market. Clearly, the large vendors are in a position to survive that kind of market."

But it is possible that the sustained growth of the LAN market will allow most of the current players to survive with some identifiable niche in the market. At least one observer expects to see the number of LAN vendors continue to grow. Jan Lewis of Infocorp, Cupertino, Calif., says, "There will still be a tremendous number of new entrants into the market. There are lots of small niches to fill, like gateways between networks and innovative modems."

Analysts frequently compare the LAN market to the microcomputer market, saying that the smaller players will be squeezed out as the larger players take over. But perhaps it's more useful to think of LANs not so much as their own market but as value-added devices. Apple Computer Inc., Cupertino, Calif., recently introduced its AppleTalk LAN for the Macintosh line to allow sharing of its laser printer. As IDC's Myhre says, "The real product isn't the network; it's the printer. It's a terrific printer. The network is just a device to sell the printers. Corvus, too, isn't out to sell LANs; they want to sell their Winchesters. The issue is selling boxes, not networks. Networks are just vehicles to sell more boxes."

Lewis also points to AppleTalk as a market-setting product. "This is a very good vision of what will happen and what needs to happen," she says. "If Apple plays a missionary role of getting LANs into small businesses, they'll definitely help open up the market." □

David Lytel is an Ithaca, N.Y.-based free-lance journalist who has written widely on data communications and computing.

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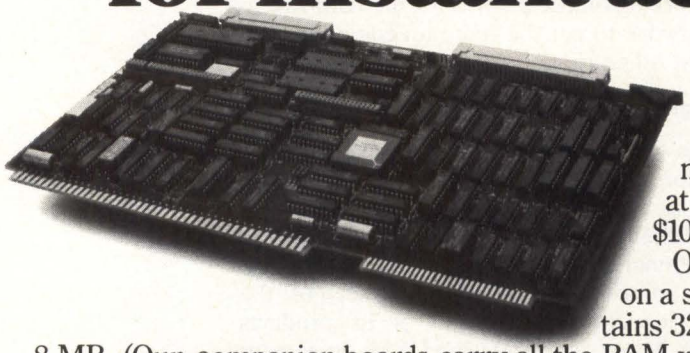

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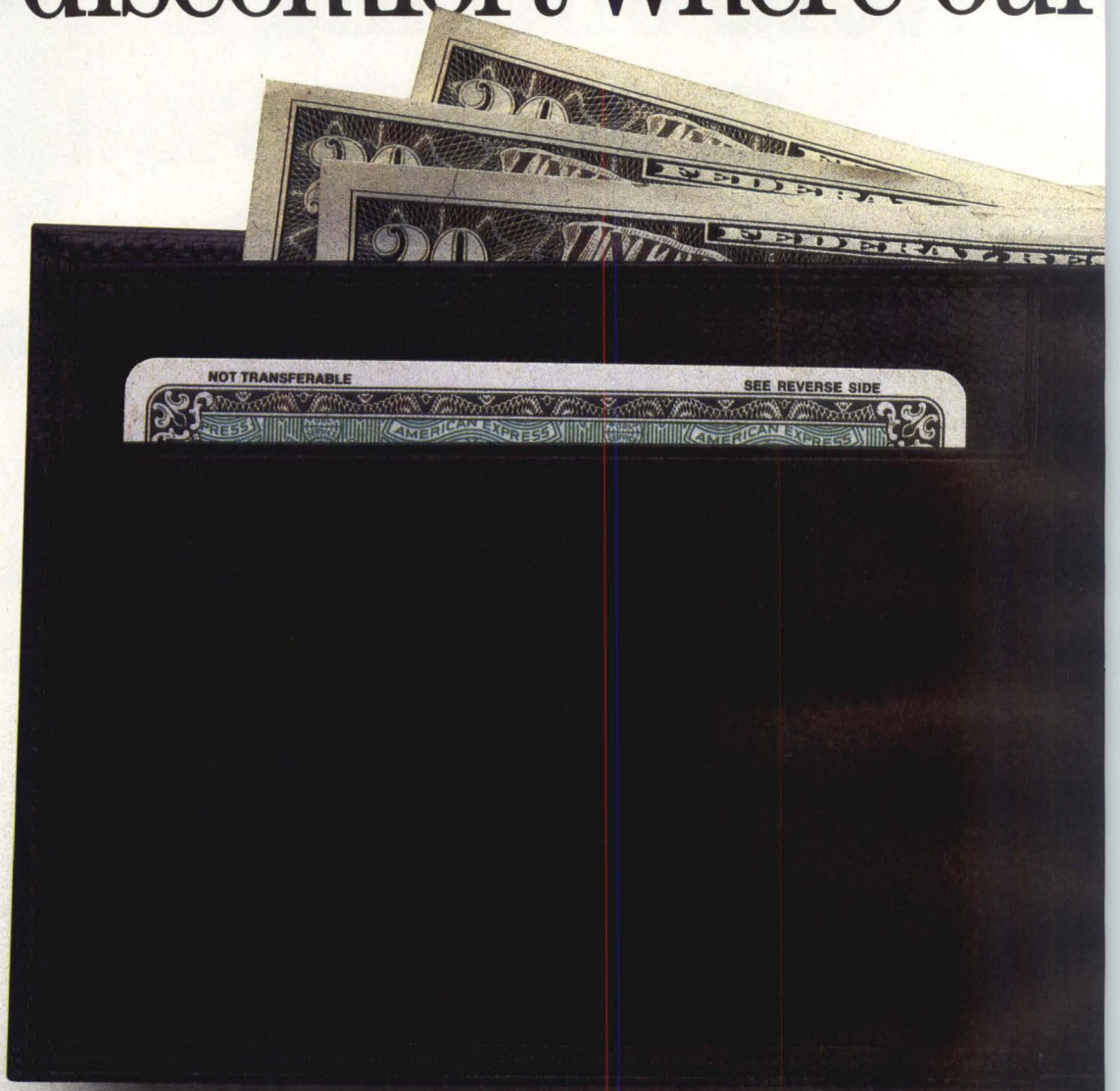

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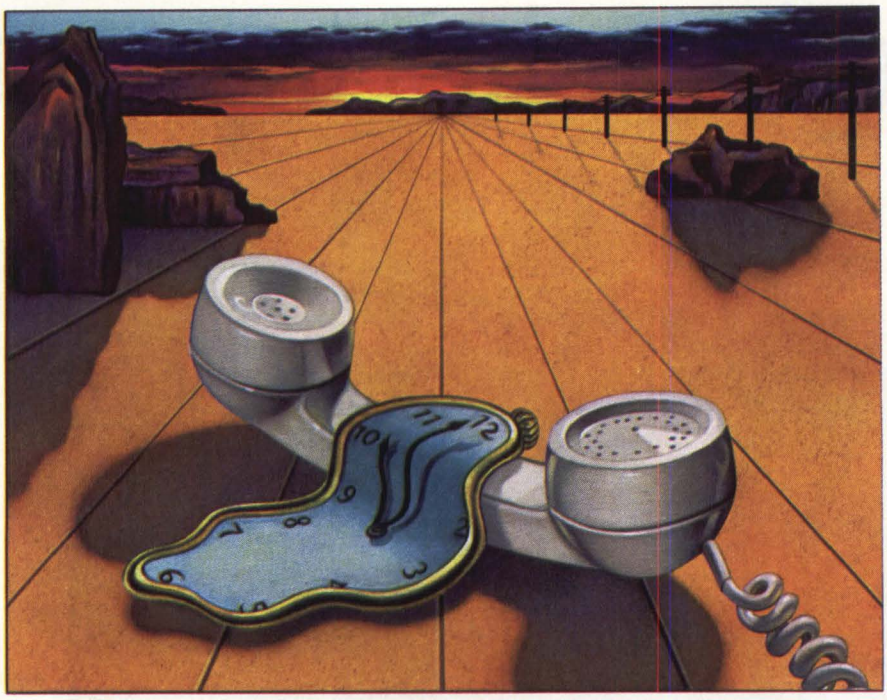

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CIRCLE NO. 56 ON INQUIRY CARD

MICRO SOFTWARE PROMOTES EASE OF USE

Analysts predict a healthy 63 percent annual growth rate for integrated software and a staggering 136 percent annual growth rate for environment managers

Robert H. Blissmer

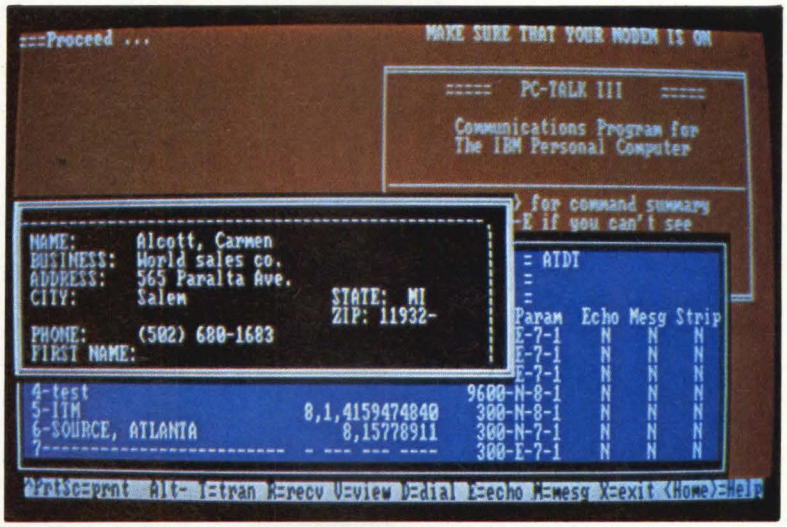
Making personal computers easy to use is shaping up as one of the key marketing strategies for 1985 and beyond.

On the horizontal-market front, non-technical users are developing an interest in incorporating computers into their work, leisure and entertainment. Learning to master complex commands and wading through dense technical manuals, however, does not fit into these users' plans.

In the vertical markets, building customized application solutions to meet end-user needs is often not enough. Application software that is rich in functionality is getting so complex that success in the marketplace often lies in making that software easy to use.

What makes personal computers easy to use? The industry is addressing the question with a wide variety of software such as integrated packages, environment managers, user interfaces, programmer tool kits and operating system extensions. They offer choices ranging from pop-up menus in place of command-oriented interfaces to high-performance, graphics-based custom interfaces. According to Kim Evans, software analyst at Dataquest Inc., a San Jose, Calif., market research company, high-resolution graphics and high performance will be the two most important factors in determining the acceptance of new generations of application software.

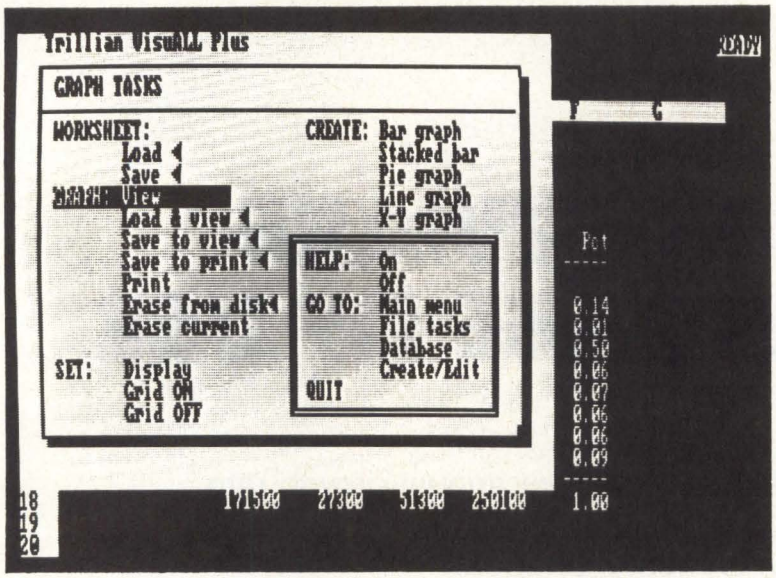
Vast new markets will open up for systems that have rich functionality to solve complex problems and are the easiest to learn and use. Value-added resellers that incorporate ease of use into their products will thus gain a competitive edge over those that simply sell product and documentation.



Concurrent PC-DOS *displays each program in a window and allows a user to run up to four PC-DOS or CP/M application programs concurrently.*

Integrated means multiple functions

Integrated application software combines multiple functions, such as word processing, spreadsheet capabilities, database management, business graphics creation and communications, under a unified command structure so that all



VisuALL *displays a pop-up menu window that overlaps the application display. The user executes tasks by pointing to task names with cursor-control keys or a mouse.*

functions are performed in a similar manner. Integration can be accomplished by a single multifunction program, such as Lotus Development Corp.'s Symphony or Ashton-Tate's Framework, or by a family of programs that share similar user interfaces, such as Software Publishing Corp.'s PFS:Series. In addition, integrated software shares data between functions and generally supports cut-and-paste operations, such as locating an address from a database, "cutting" it out and "pasting" it into a letter in word processing.

According to Ronnie Ward, executive vice president of Future Computing Inc., a Dallas market research company, "1984 was a difficult year for the multifunction program, as witnessed by the number of products that didn't make it." Ward gives the nod to family series-type integrated products, because the VAR has more options in customizing the software. VARs should note that a 1984 survey of software sales conducted by Future Computing shows that for every unit of Symphony sold through the retail channel, two units of a Software Publishing PFS product were sold. Dataquest estimates show the $121 million market in integrated software in 1984 growing at an annual compound rate of 63.2 percent to $1.4 billion in 1989.

Lotus' Symphony integrates word processing, spreadsheet capabilities, database management, business graphics creation and communications. It also features a command programming language for creating customized applications. Symphony uses the spreadsheet metaphor to store all data, including text. Symphony is a logical upgrade to Lotus' 1-2-3 software because it contains all the features of 1-2-3 plus a word processor modeled after a popular Wang Laboratories Inc. word-processing program.

Late last year, Lotus began offering seminars for independent software developers to introduce them to Symphony's technical details. Symphony's open-ended structure allows independent software developers to develop vertical market and turnkey applications based on Symphony.

Lotus also will enter into collaborative agreements with other corporations. The result of one such agreement, a joint venture with Digital Communications Associates Inc., is a Symphony add-in that connects Symphony to the IBM Corp. 3270 display system and IBM System/34, /36 and /38 minicomputers for high-speed data transfer between the systems.

Ashton-Tate's Framework integrates word processing, spreadsheet capabilities, business graphics and database functions. Its unique feature, as its name suggests, is its use of the frame metaphor for storing information and organizing frames into an outline. A frame is different from a window in two respects. First, frames can be nested. A frame can contain as many as 32 other frames, and each nested frame can have 32 more frames. Second, frames can be linked and organized by an outline that joins frames to form a document.

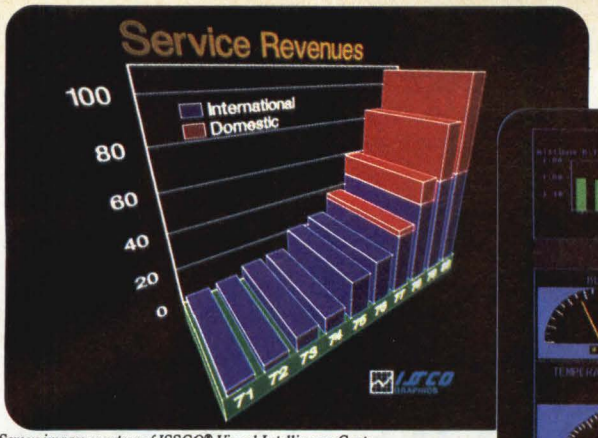
'Fred' writes the software

Framework is written in a programming language called "Fred," which programmers can use to write additional software or to customize Framework for specific vertical-market applications. "Ashton-Tate has a reputation for actively working on joint-marketing ventures," says Karen Orton, OEM contract manager for Ashton-Tate of Culver City, Calif., "and is encouraging VARs and authorized resellers and marketers to build custom solutions."

Dataquest estimated 1984 sales in the integrated-software marketplace of 90,000 units for Symphony vs. 70,000 units for Framework. However, Future Computing figures that Symphony outsells Framework 4-to-1 in the retail channel.

Environment managers are programs that coordinate or supervise independent programs and that are specially designed to support the operating environment. The result is *integrating* software, which allows two or more programs to run under the same environment, as opposed to *integrated* software, which combines functions under the same user interface.

Environment managers can serve VARs in two ways: (1) as an integrating "umbrella," allowing



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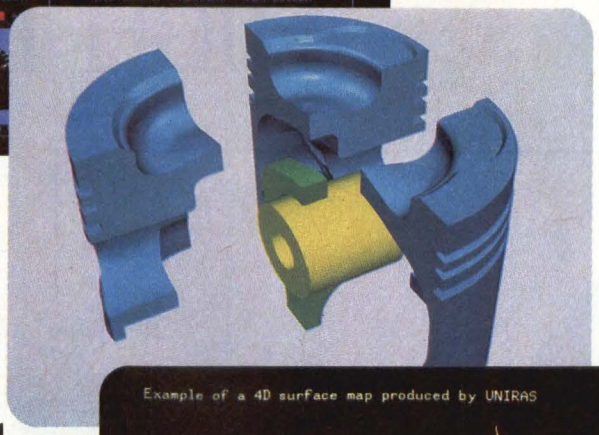

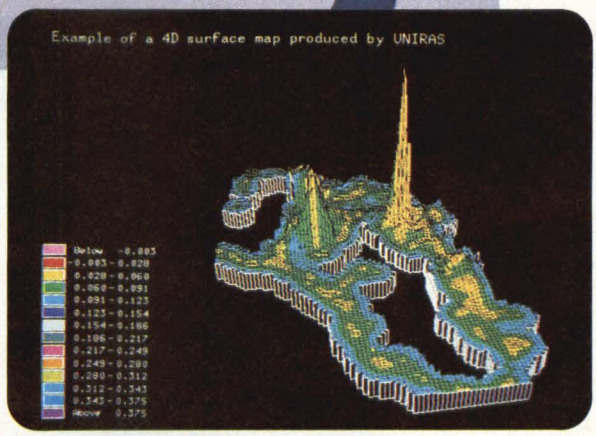

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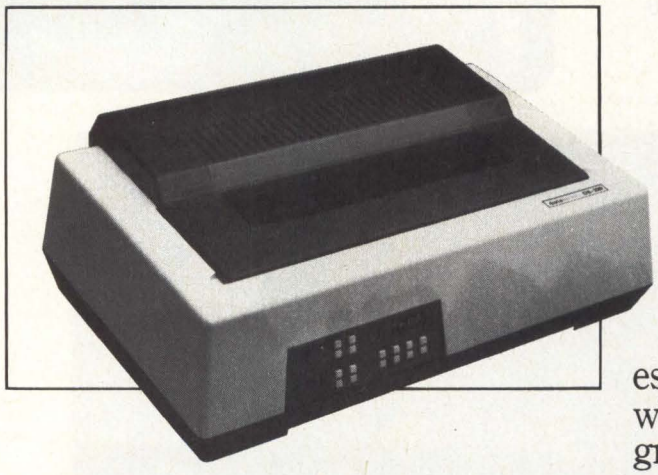

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several applications to be combined, and (2) in what Dataquest's Evans calls "democratization of the user interface," which means the ability of an environment manager to shield the user from the operating system and the hardware, as opposed to its integrating capabilities. Market estimates from Dataquest show environment managers growing at a 136 percent compound annual rate, from $7 million in 1984 to $513.3 million in 1989.

TopView, from IBM's Entry Systems Division, is a single-user, multitasking extension to IBM's PC-DOS that allows the user to run several application programs at the same time and switch from one task to another or to view data from different applications in windows on a display.

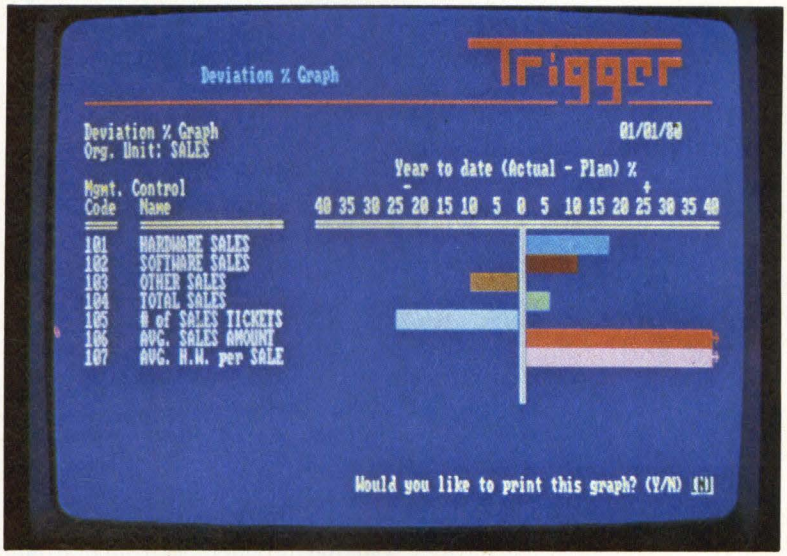
Although existing programs can run under TopView, they cannot take advantage of TopView's features. In addition, IBM does not license TopView to other hardware vendors, so many industry watchers sense the beginning of an IBM proprietary operating system.

The TopView Programmer's Toolkit is a set of utilities for developing TopView applications. The tool kit includes specifications for accessing TopView's functions from application programs, support for pointing devices and specifications for creating windows. IBM also publishes a TopView Application Guide, listing more than 200 compatible, non-IBM applications.

On the plus side, TopView has the IBM name and a large installed base of PCs. Future Computing projects that 75,000 TopView packages will be sold in 1985, 200,000 in 1986 and 378,000 in 1987. On the minus side, TopView does not yet support a graphics interface and reportedly slows the system's overall performance.

Microsoft Windows, from Microsoft Corp., is a graphics-oriented environment manager that supports applications using windows, graphics and pointing devices. It is an extension to MS-DOS that provides multitasking through a feature that Microsoft calls "non-pre-emptive scheduling." This feature prevents arbitrary interrupts from occurring while a program is executing and requires the application to give up control of the CPU through the use of a "yield" call to Windows.

Windows includes graphics device interfaces to provide application developers with the means to support a rich graphics environment on a variety of devices. Existing programs that use standard MS-DOS, basic input/output system or TopView extension calls can run under Windows. The Developer's Toolkit, containing the Programmer's Guide and Reference Manual, shows developers how to adapt Windows to different computers as well as how to rewrite applications.



Trigger's *graphics mode displays exception and monitoring reports in a concise, easy-to-read form.*

In response to criticism that Windows is behind schedule, Rick Dill, product marketing group manager for Microsoft Corp. of Bellevue, Wash., says, "The January release of Windows was shipped to software developers on time, and the release has full application functionality with the final release, which will be shipped in June."

The Graphics Environment Manager (GEM) family of programs, from Digital Research Inc., is a graphics-based environment manager that transforms the text-based interface of single-tasking MS-DOS 2.0 and 3.0 environments into a Macintosh-like graphics interface. Technically, GEM is an operating system extension implemented as an application programming interface with windowing, data-interchange facilities, complete graphics-device support and user-interface primitives.

The GEM Desktop application program is a graphics interface that shields the user from DOS commands, a feature that Dataquest ranks very high in terms of user acceptance. GEM Desktop presents the user with a graphical representation of a desktop, complete with disks, a trash can, file folders and documents in user-controlled windows. A Programmer's Toolkit—a complete software development environment—allows programmers to develop turnkey applications.

Concurrent PC-DOS, also from Digital Research, is a multitasking operating system that allows a user to run as many as four PC-DOS or CP/M application programs at the same time. Concurrent PC-DOS uses fixed-time slicing to

Future Computing projects that 75,000 TopView packages will be sold in 1985, 200,000 in 1986 and 378,000 in 1987.

divide processor cycles among as many as four tasks that can reside simultaneously in memory. The user can view execution of the tasks through dynamic windows that can be scrolled, sized or placed anywhere on the screen.

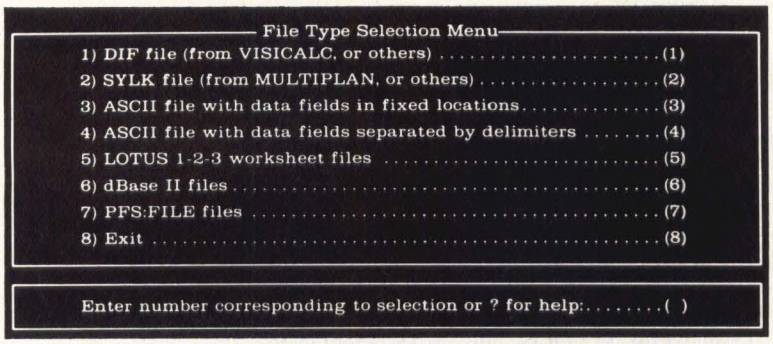
Also included as a part of the system is a print spooler that can drive a printer and a plotter or two printers simultaneously, and a feature that allows two users to share the system.

User interfaces are important

User interfaces are independently written programs that place a shell or environment between the user and the application program. The large number of sales of the Macintosh computer from Apple Computer Inc. seems to indicate that users do want a graphical interface, including windows, pop-up or pull-down menus and pointing devices. On the broader horizontal front, graphical interfaces are simpler than the command-oriented interfaces provided by most application programs.

VisuALL, from Trillian Computer Corp., is a "menu-builder" user interface that incorporates a window environment with pop-up menus with or without the use of a mouse. The interface is wrapped around DOS and other programs, acting as a go-between between the software and the user. Software tasks are executed by pointing to their names in a pop-up window. While the menus are in use, they overlap the application that is being displayed. After a task is chosen, the menu disappears, and the original screen is restored.

Trillian markets three variations of the product. VisuALL Plus is a run-time version that includes interfaces to 1-2-3 and to MicroPro International Corp.'s WordStar and MS-DOS. The VisuALL Design Kit allows software developers to create window/pop-up menu interfaces for any software programs. The Demo Generator is a high-level programming language that enables programmers to write "shows" that can run concurrently with other applications. For example, a show can act as a tutorial and run in parallel with the application software that is being demonstrated.



Clout *features FileGateway, a program that allows the user to access files created by programs other than Microrim's R:base database-management program.*

Clout, from Microrim, is a natural-language query program designed to work with files from many popular application software packages. Clout allows the user to analyze data from Microrim's R:base, dBASE II, PFS:File, 1-2-3, document interchange format files from Visicorp's VisiCalc and Symphony, and SYLK files from Microsoft's Multiplan.

A user can adapt Clout to an application by adding as many as 500 phrases, formulas or synonyms to customize Clout's 300-word vocabulary. To access files created by programs other than R:base, a feature called FileGateway copies and translates files into a format that Clout understands. Clout is a query-only interface, and it is most useful for ad hoc queries.

Decision modeling proves popular

"Artificial intelligence," "knowledge bases" and "expert systems" are terms that are creeping into the lexicon of personal computer software. These are not formal AI programs. They use the conventional number crunching of spreadsheets and Boolean relational operations of databases but "hide" them behind an expert system-type user interface.

"Decision modeling" refers to the ability of the software to build decision-making models that incorporate such knowledge as plans, goals, decision-making criteria and values, with the ability to act upon that knowledge, such as "triggering" a response or choosing a course of action. Developers of decision-modeling software are promoting it as a new general-purpose category similar in scope to spreadsheets or database programs. According to Future Computing's Ward, "The value-added channel may be the best channel for these types of products, although their sales are still too small to show up in retail channel surveys."

Lightyear, from Lightyear Inc., Santa Clara, Calif., is a decision-modeling package designed to meet the needs of executives who want to analyze their decision-making processes. The program's three-tiered decision model functions somewhat as follows. The user first lists the categories, such as a list of employees up for review. Second, criteria for each category are, such as salary level, job qualifications and so on, are entered. Third, the user is asked to weigh the

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SQ338F	Fixed	38.20MByte	30.00MByte

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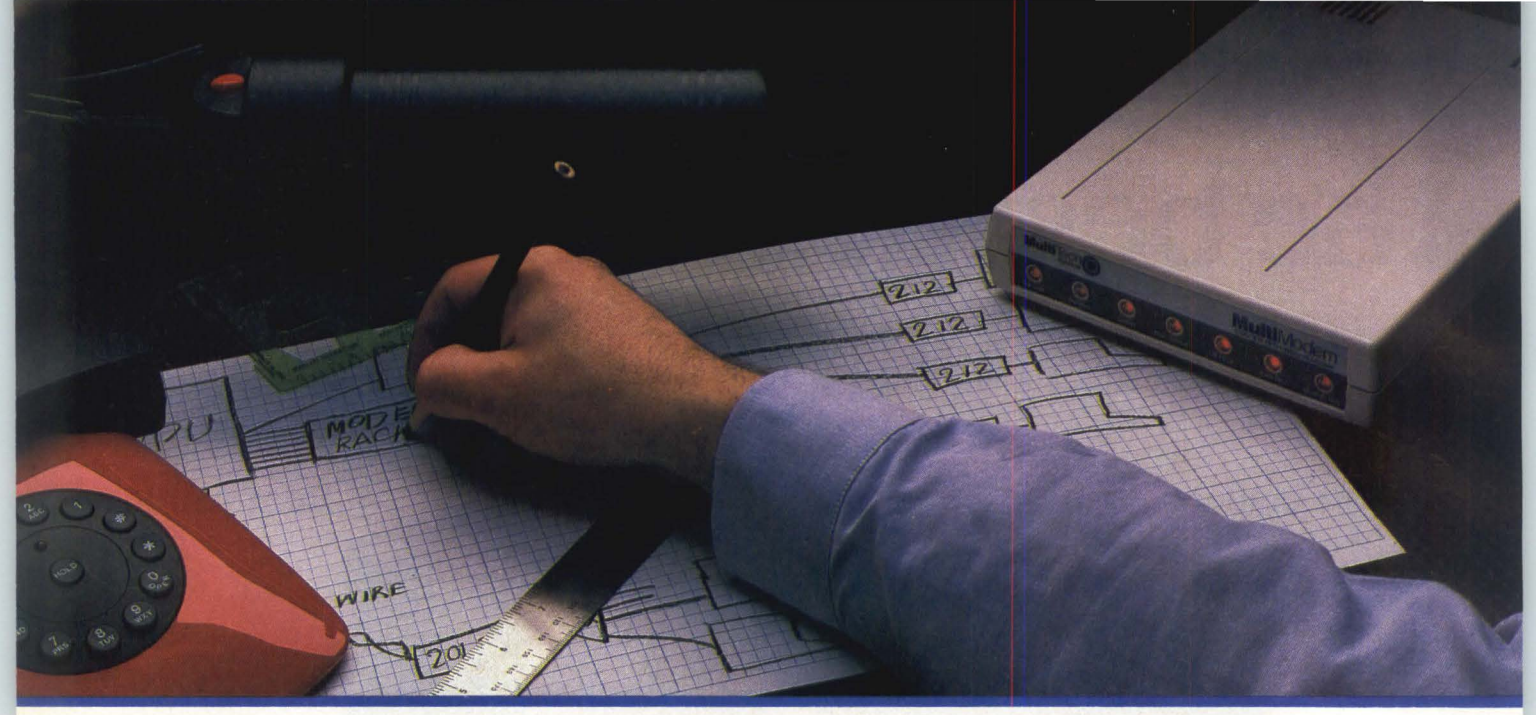

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alternatives, e.g., diversity of experience compared to length of employment. The program assigns numerical values to the criteria and weighted alternatives, and, after all the criteria and weighted alternatives have been entered, the program uses arithmetic in number-crunching fashion to produce a recommended course of action.

"Lightyear has just begun to address the needs of value adders in vertical markets," says Barry Smith, vice president of marketing for Lightyear. "We're working with a commodities trading expert and Dow Jones Inc. to develop an application for commodity traders and commodity buyers." Smith also says that VARs that are already marketing 1-2-3 and dBASE templates have shown an interest in building Lightyear models as an additional product in their offerings.

Trigger, from Thoughtware Inc., Coconut Grove, Fla., is a management-by-exception reporting and monitoring system that helps the user develop a plan, monitor the results, identify situations in which managerial action is needed and analyze the effectiveness of prior management actions.

Thoughtware recently began implementing a value-added marketing program for Trigger. According to Jack Levine, president of Thoughtware, "Trigger is an ideal vehicle for people who have specific industry knowledge and is therefore a logical product for the value-added market. It can easily be tailored to a specific industry and become an easy-to-use vertical application." A real estate expert, for example, could create a Trigger template that would turn Trigger into a real estate-management and -reporting system.

The market for personal computer software continues to grow at astronomical rates. With such a wide variety of personal computer software companies gearing their products and marketing approaches toward VARs, and with last year's tightening of the retail channel, 1985 may turn out to be the year of the value-added channel for the personal computer industry. □

Interest Quotient (Circle One)
High 468 Medium 469 Low 470

Robert H. Blissmer is a Brookline, Mass.-based consultant, writer and software designer.

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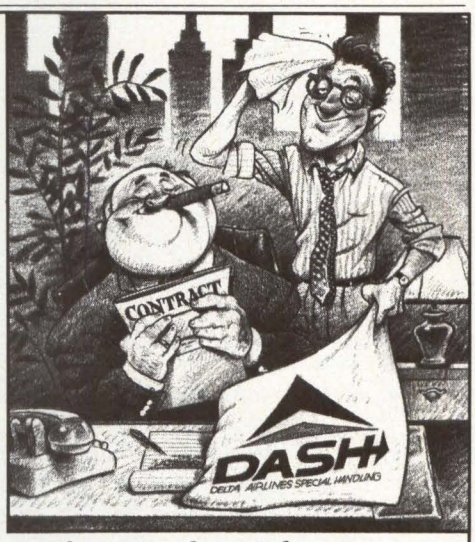

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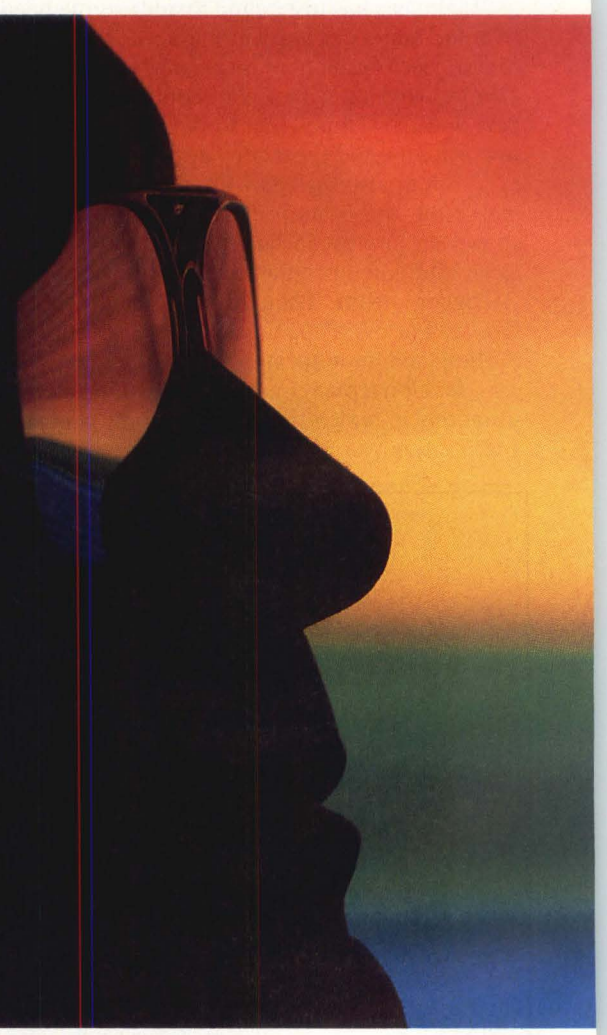

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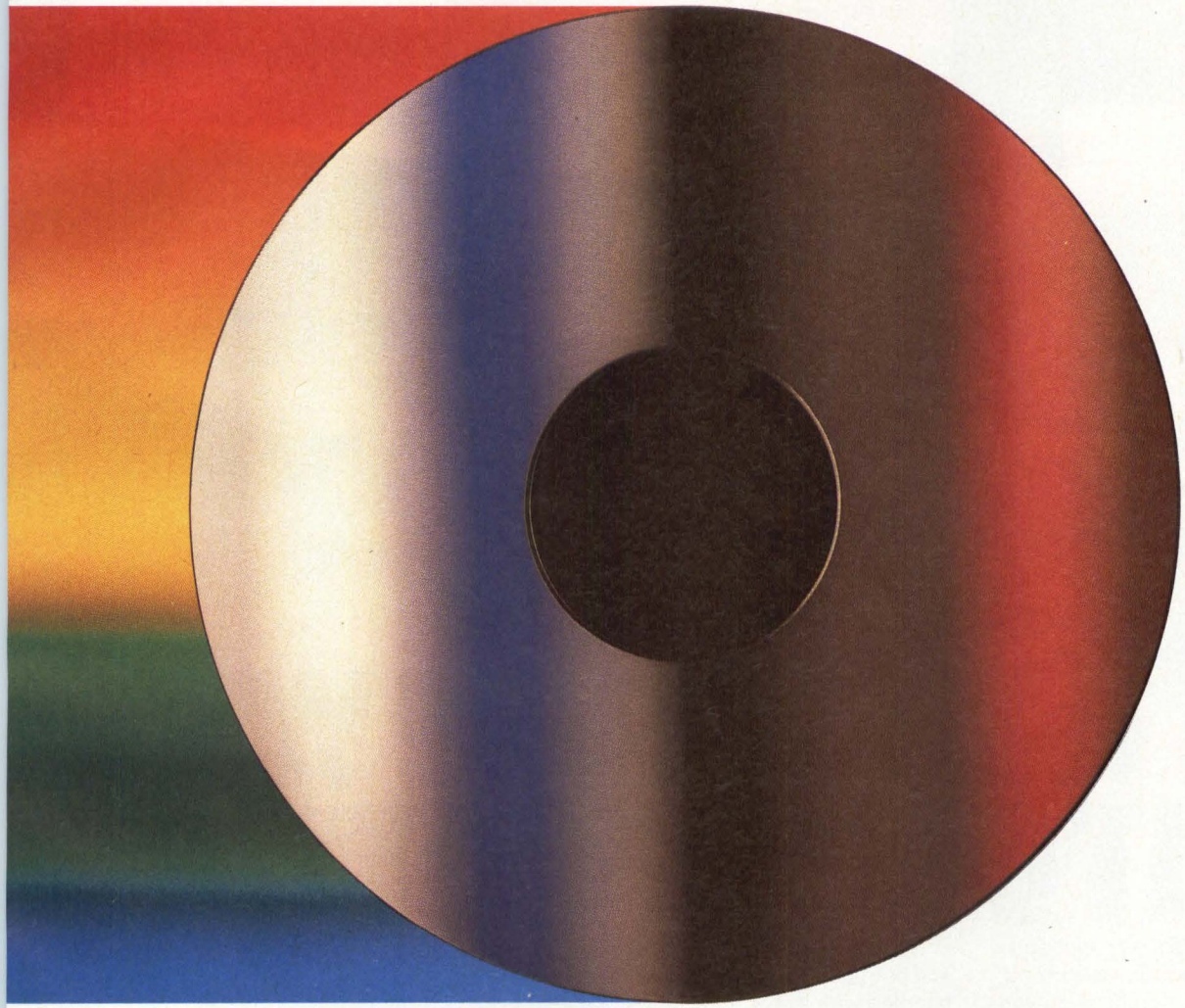

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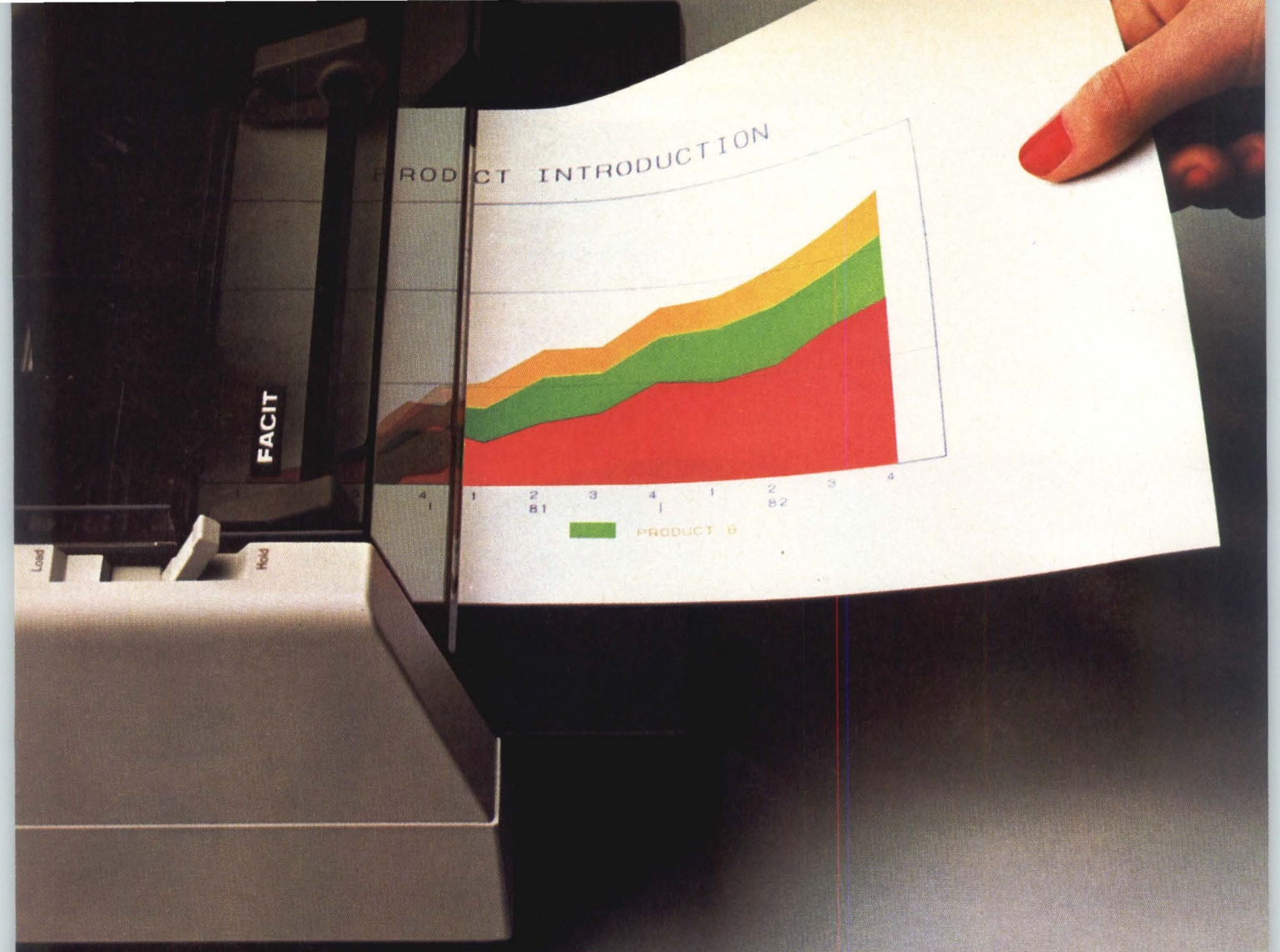

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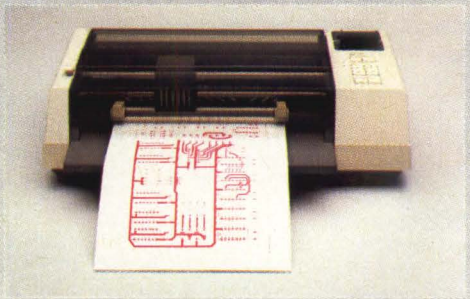

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IBM, APPLE RULE OFFICE MARKET

Burgeoning to $10 billion in 1984, the office personal computer market boom shows no signs of abating, despite minor shakeouts

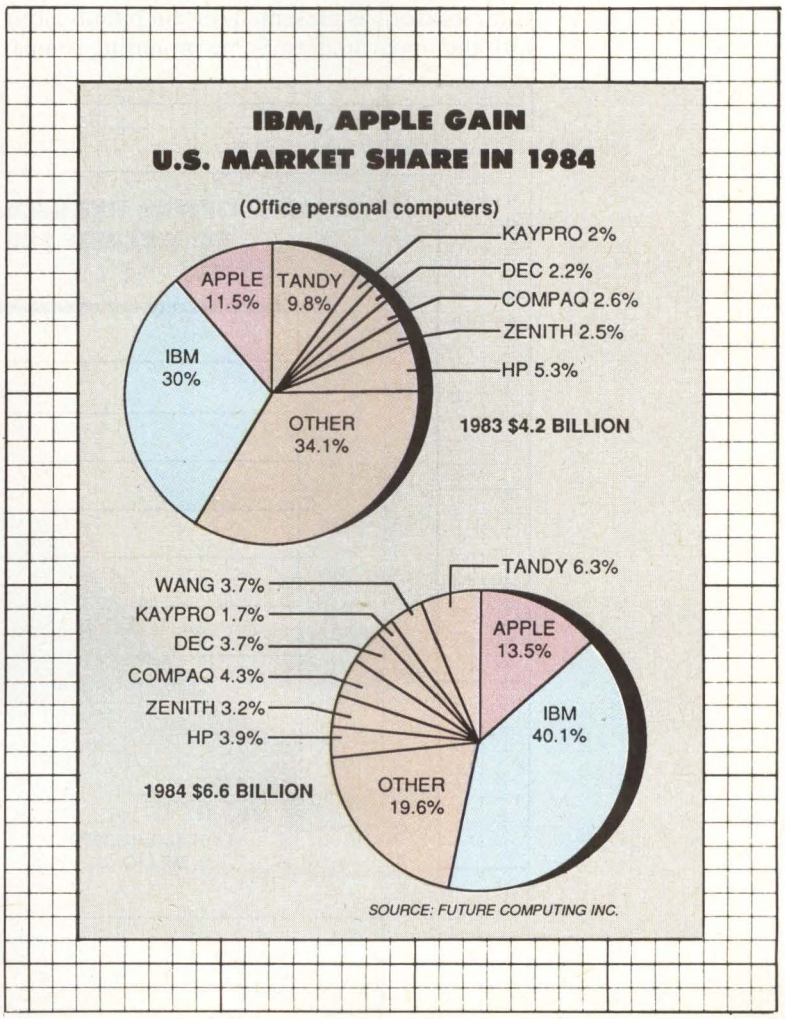
William F. Ablondi and **Laura Lundquist**
Future Computing Inc.

From modest beginnings in the mid-1970s, the U.S. market for both office and home personal computer hardware and software grew to more than $16 billion in 1984. The market is expected to grow at an average annual rate of 26 percent per year between now and 1989, reaching more than $53 billion in 1989.

The phenomenal growth of the personal computer market has generated opportunities for start-up companies as well as for established manufacturers of larger computer systems and of other electronic or telecommunications equipment. Opportunities include software publishing and the manufacture of peripheral devices, computer furniture and accessories and supplies, in addition to making and selling the personal computers. Service-related businesses such as maintenance and training have sprung up, and an entirely new print publishing industry focusing on personal computers has evolved.

In 1984, the U.S. office market segment alone was valued at $10 billion, representing approximately 2.7 million personal computers—that's nearly a million more units than in 1983. By the end of the decade, annual unit shipments will climb to about 10 million, generating revenues of over $30 billion at the end-user level.

Floppy disk-based office personal computers accounted for 57 percent of the market in 1984, but their share will decrease to 44 percent by 1989. The market for Winchester disk personal computers, including local area network servers,



In the late 1980s and early 1990s, the number of new entrants will dwindle, and a shakeout of competitors is likely.

shared processor systems and standalone personal computers, is growing at an annual rate of 28 percent and will increase from 40 percent of the market in 1984 to approximately 44 percent in 1989. Battery-powered personal computers will make up the remainder, accounting for about 11 percent of the office personal computer market value in 1989.

The ratio of Winchester disk personal computer shipments to floppy disk personal computer shipments in 1983 was 1-to-5. That ratio is steadily declining and will likely shrink from 1-to-4 in 1984 to 1-to-2.3 in 1989.

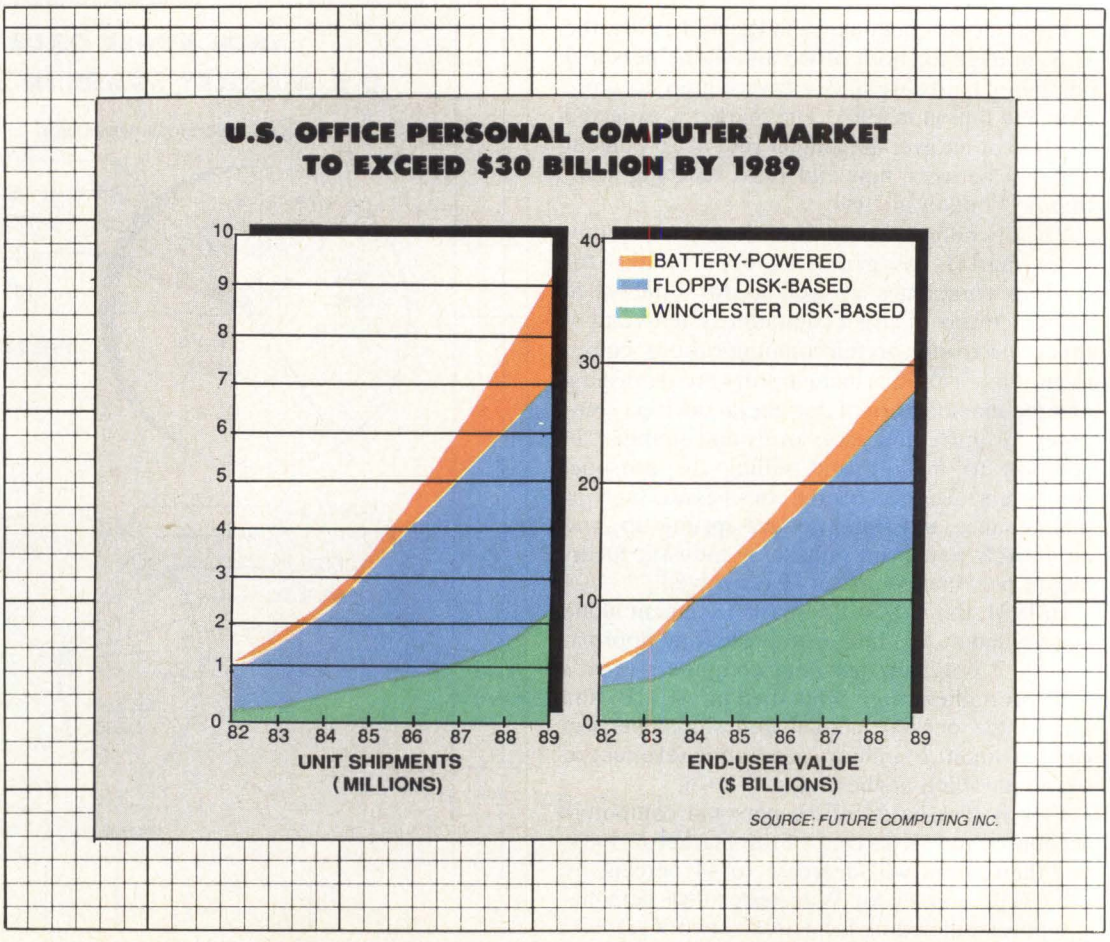
Battery-powered unit shipments in 1989 will be more than 12 times the 1984 total of 170,000. The percentage of battery-powered shipments that are briefcase-sized units will peak in 1986 at 54 percent, decreasing to 52 percent in the following years, as improving technology increases the functionality of book-sized computers.

The rapid growth of the office personal computer market has presented certain pitfalls along with the opportunities. Some promising companies have been forced to file bankruptcy, liquidate their assets or simply withdraw from the personal computer industry.

In 1983, Osborne Computer Corp., which introduced the first transportable computer, became the first well-known player within the industry to file for Chapter 11 bankruptcy. A reorganized Osborne has recently announced plans to stage a cautious comeback with the introduction of a personal computer called Vixen and with a possible stock offering.

Similarly, two of the top 10 U.S. computer manufacturers of 1983—Franklin Computer Corp. and Victor Technologies Inc.— declared Chapter 11 in 1984. Smaller companies to leave the industry in 1984 include Comterm Inc.'s Bytec division, Gavilan Computer Corp. and Otrona Corp.

In a young and rapidly expanding industry, there is a tendency to generalize from such failures and to blame the market environment rather than factors peculiar to the failed companies. Of the recent failures, three companies—Bytec, Gavilan and Otrona—were small, mod-



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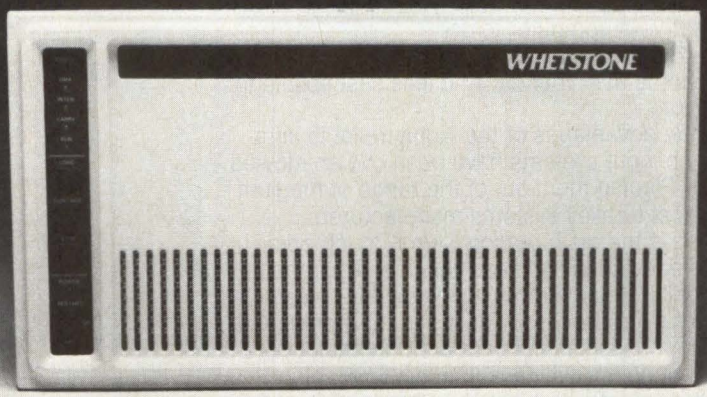

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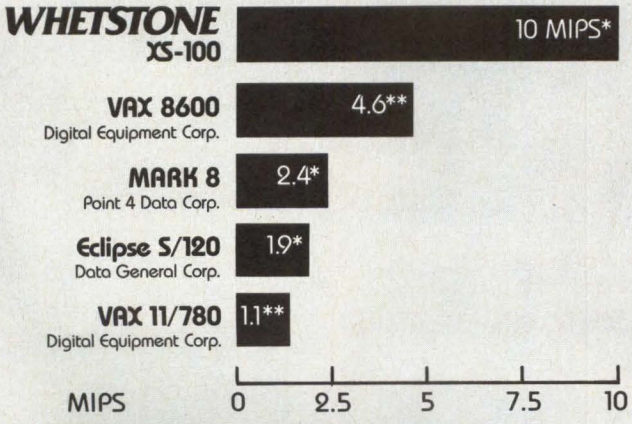

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**DEC Professional Magazine, December, 1984.

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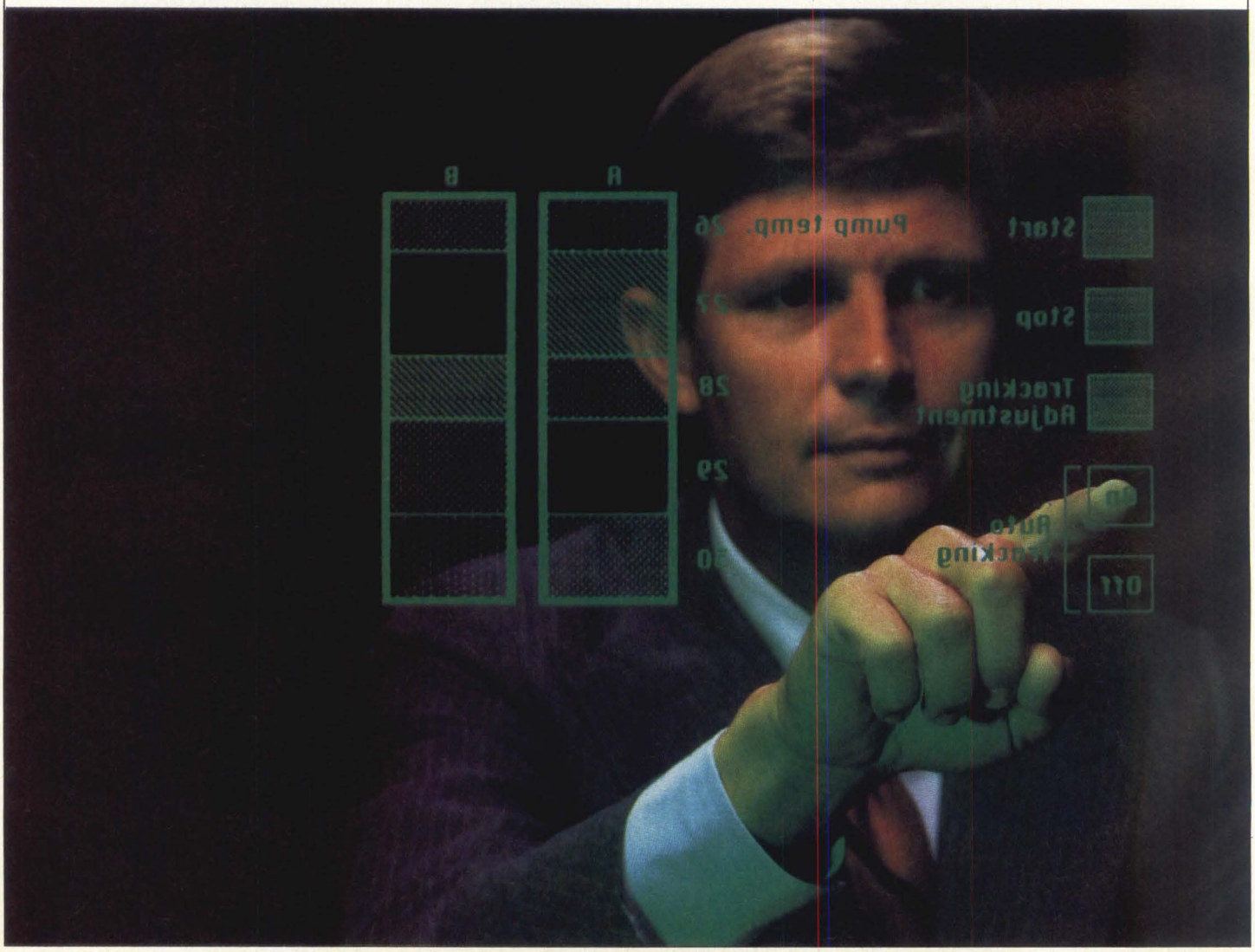


CIRCLE NO. 64 ON INQUIRY CARD

estly capitalized companies that were almost exclusively dependent on one product. The combination of these factors made them vulnerable to normal shifts in the market. A fourth company, Franklin, was severely damaged by the costly settlement of a lawsuit with Apple Computer Inc. over the design of Franklin's ROM BIOS.

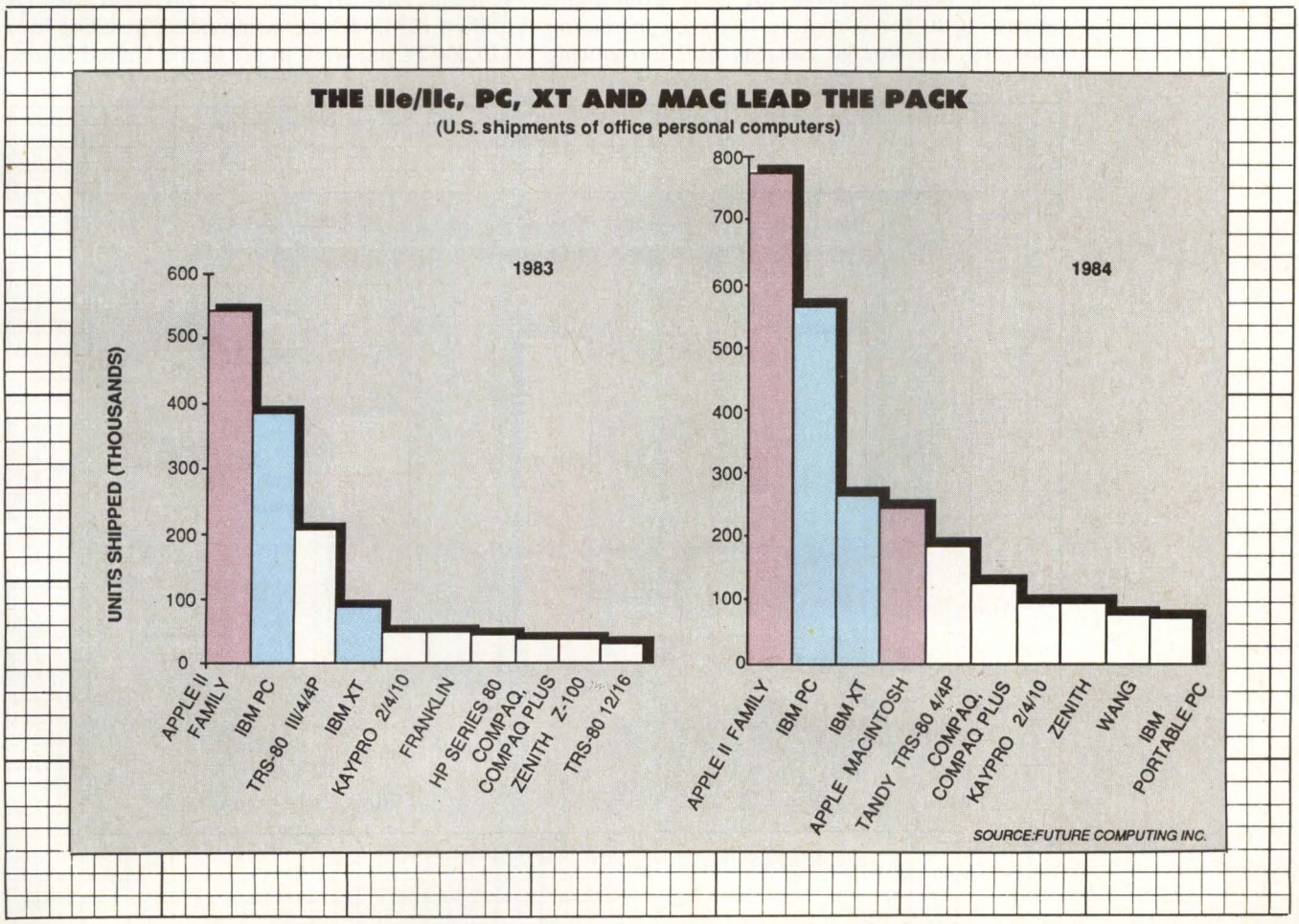
Despite the emphasis given by the press to these failures, Future Computing does not believe that these occurrences are characteristic of an industry-wide shakeout in the industry.

The next three years should be a period of competitive turbulence in the personal computer industry, during which a number of companies enter the marketplace, as weaker competitors fail. Some of these new entrants—such as AT&T, ITT and Sperry Corp.—have much greater financial, technical and marketing resources than those companies that have recently dropped out.

In the late 1980s and early 1990s, the number of new entrants will dwindle, and a shakeout of competitors is likely. Although annual unit sales will continue to increase, the growth curve will flatten as sales to first-time buyers decline in the late 1980s and annual unit sales become more dependent upon replacement sales. Future Computing estimates that the average user will keep a system four to five years before replacing it. As replacement sales become more important, manufacturers will shift to commodity marketing tactics to defend, and to resell to, their installed bases. Although there will be less room for marketing errors in the late 1980s and early 1990s, there will continue to be a number of successful participants at all industry levels.

Apple II leads

In 1983, the most popular office personal computer was clearly Apple Computer's Apple IIe, which sold more than 570,000 units that year. More than 50 percent of the IIes were purchased for use in offices. Next in unit sales was IBM Corp.'s PC, of which just under 400,000 units were sold in the United States in 1983. Following the IBM PC was the TRS-80



In 1984, the Apple II family of products again topped the list of leaders.

III/4/4P family of Tandy Corp.'s Radio Shack division, of which just over 200,000 units were sold.

Both IBM and Tandy had another product in the top 10 in 1983. IBM sold over 90,000 XTs, and Tandy sold nearly 37,000 TRS-80 models 12 and 16. Clearly, Apple, IBM and Tandy were that year's big three of the office personal computer industry.

In 1984, the Apple II family of products again topped the list of leaders. Although the Apple II family is now targeted primarily for home use, a substantial number of Apple IIes/IIcs are being used in office applications.

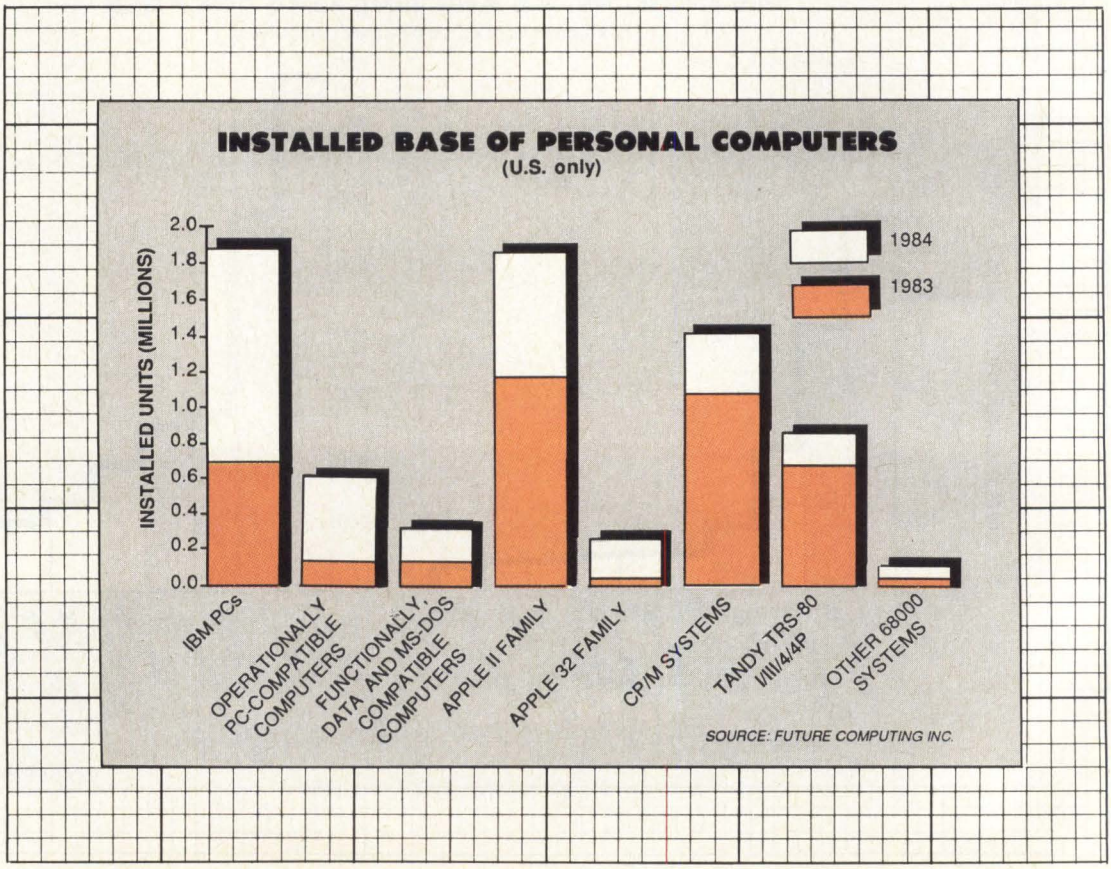
The IBM PC was the next-best-selling office personal computer in 1984. Shipments of the PC totaled more than 565,000 units, a 40 percent growth in unit sales over 1983. The IBM PC/XT followed the PC in sales, with more than 275,000 units shipped in the United States in 1984. Sales of the Apple Macintosh totaled more than 230,000 in 1984 and should reach 500,000 by the end of this year. Apple recently began implementing plans to make the Mac even more appealing to the corporate buyer by increasing memory and storage capacity and introducing the AppleTalk network. In addition, software for the Macintosh is growing in availability.

In 1983, Tandy's TRS-80 III/4/4P family was in third position. In 1984, it dropped to fifth place, with sales of over 180,000 units. The Compaq and Compaq Plus transportable from Compaq Computer Corp. sold over 125,000 units in 1984, putting the company in sixth place.

The total number of office personal computers in use in the United States grew from fewer than four million at the end of 1983 to over 6 million by the end of 1984.

The Apple II family had the largest installed office base at the end of 1984, with over 1.9 million units in the United States and more than 2.3 million units in use worldwide. Based on recent surveys, Future Computing estimates that about 50 percent of the Apple IIs/IIes are being used in offices.

With such a large percentage of the Apple II family in homes and educational institutions, the IBM PC family actually had the largest installed base of all personal computers in offices at year-end 1984. By the end of 1984, more than 1.9 million IBM personal computers (including over 270,000 PCjrs) were in use in the United States,



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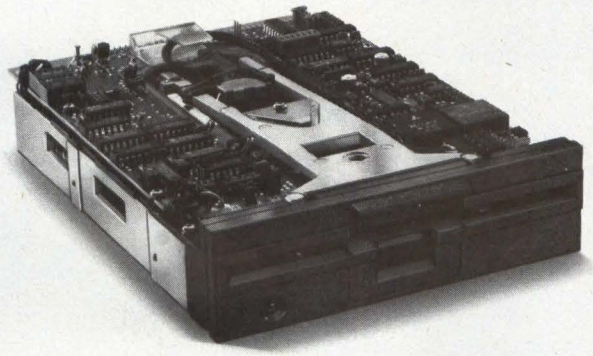

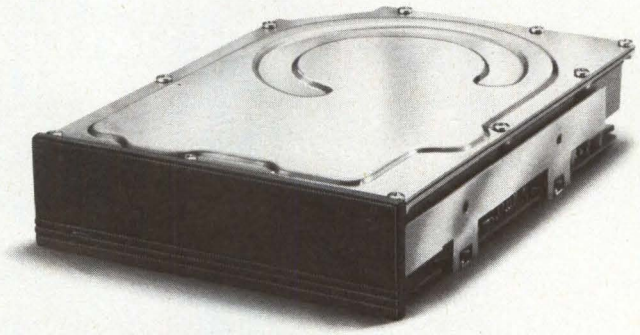

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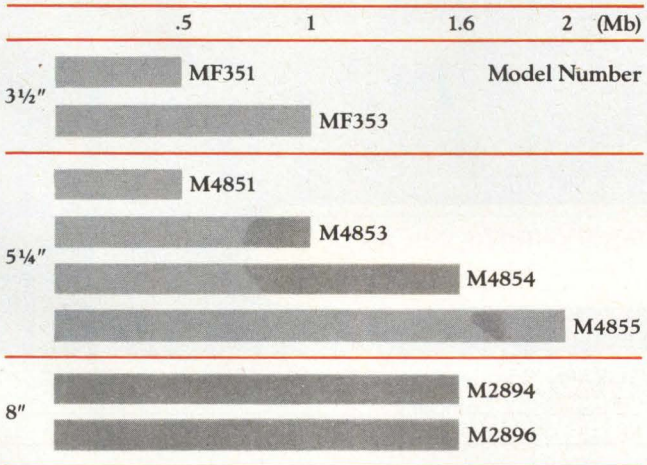

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which is well over twice the 700,000 that were in use at the end of 1983.

The installed base of IBM PC-compatible computers also experienced significant growth in 1984. Growth of operationally PC-compatible computers far outstripped growth of functionally, data- and MS-DOS-compatible computers. (Operationally compatible computers, such as Compaq Computer's systems, are fully compatible with the IBM PC. Functionally compatible computers require some modification of software programs before they can run on the PC.)

Future Computing estimates that by the end of 1984, there were nearly 650,000 operationally compatible computers in use in the United States. Functionally and data-compatible computers, on the other hand, had an installed base of approximately 365,000 units. The preponderance of operationally compatible computers over functionally, data- and MS-DOS-compatible computers is expected to increase substantially as the marketing of a "PC-compatible" computer that is less than operationally compatible becomes less and less successful.

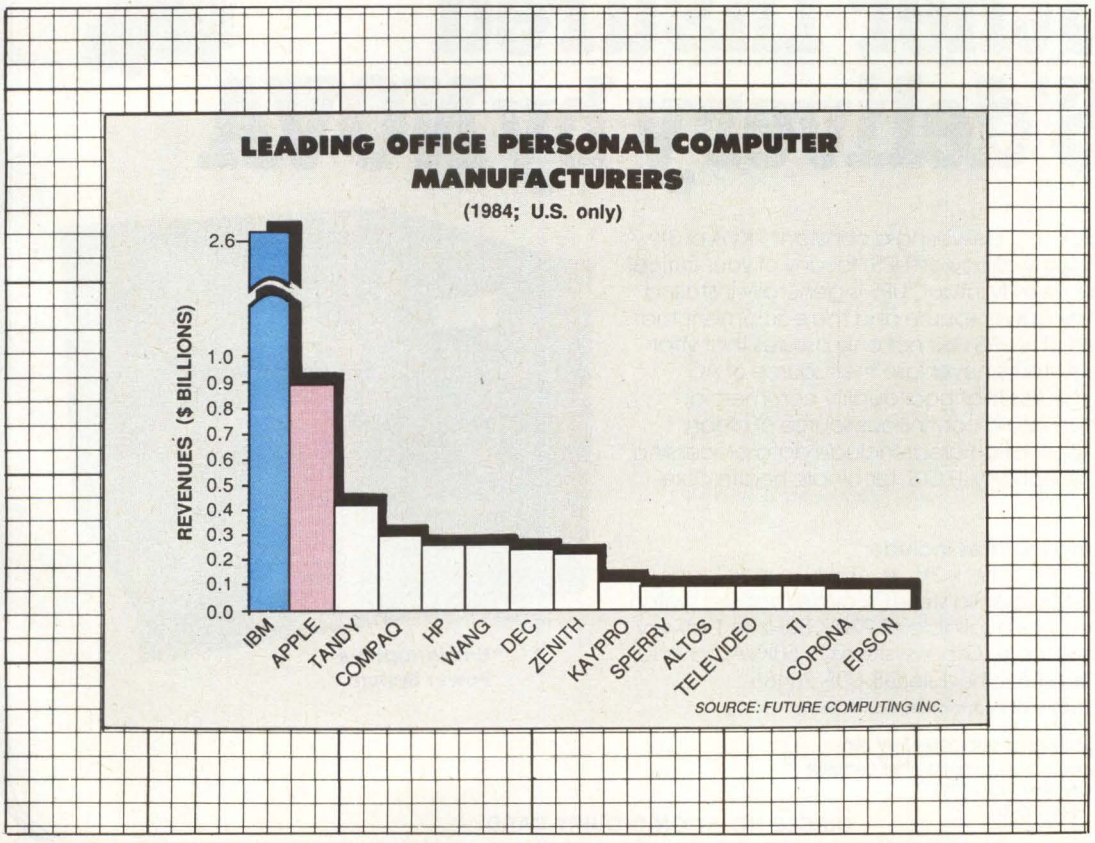
CP/M-based systems had the second largest installed base at year-end 1983, with nearly 1.1 million units in place. Only about 350,000 CP/M systems were shipped in 1984, which caused the category to slip into third place behind the IBM PC family. Although the sale of CP/M-based systems has slowed, due primarily to their having been outstripped by faster systems, CP/M-based systems are still an important target for software development because of the large installed base.

Commodore Business Machines Inc. introduced a line of products at the January 1985 Consumer Electronics Show. The new high-end product of the line is the Commodore 128 personal computer, which has two microprocessors —the 8502 (6502-compatible) and the Z80A. This system can run either Commodore 64 or CP/M programs. If this product is successful, it could improve opportunities for software targeted for CP/M machines.

In 1983, the Apple 32-bit family consisted of only the Apple Lisa. In January 1984, the family received a boost with the introduction of the Macintosh. Approximately 230,000 Macintoshes were sold in 1984 in the United States, bringing the installed base of the Apple 32 family to about 260,000.

IBM was clearly the leading sales leader in 1984, with domestic personal computer revenues of approximately $2.7 billion, excluding the

IBM was the clear leader with U.S. personal computer revenues of approximately $2.7 billion in 1984, excluding the PCjr.



PCjr. The PCjr contributed nearly $200 million more in revenues. Next in line was Apple, with 1984 revenues from the office marketplace of approximately $900 million. When software and total Apple II family sales are included, Apple's total U.S. revenues reached more than $1.5 billion for calendar year 1984.

Tandy's Radio Shack ranked third with more than $420 million in office personal computer revenues. Office personal computer revenues represented about 50 percent of Tandy's total personal computer-related revenues in calendar year 1984, with the remainder being software, peripherals and home computers.

Compaq was No. 4 in sales of office personal computers in the United States in 1984. Sales of the Compaq and Compaq Plus transportables contributed more than 85 percent of revenue, with the Deskpro accounting for the remainder. Hewlett-Packard Co. followed Compaq with U.S. sales of approximately $260 million in personal computer revenues for the year. International sales of HP products accounted for about 50 percent of the company's personal computer revenues.

The next three companies in order of sales—Wang Laboratories Inc., Digital Equipment Corp. and Zenith Data Systems—all had personal computer revenues exceeding $200 million in 1984. Kaypro Corp., Sperry Corp., Altos Computer Systems, TeleVideo Systems Inc. and Texas Instruments Inc. followed. Corona Data Systems Inc. and Epson America Inc. did not quite reach the $90 million level during 1984, nor did AT&T, which posted sales of $70 million to $75 million for its PC 6300. □

William F. Ablondi is vice president and **Laura Lundquist** is an analyst, Markets Group, with Future Computing Inc., Dallas.

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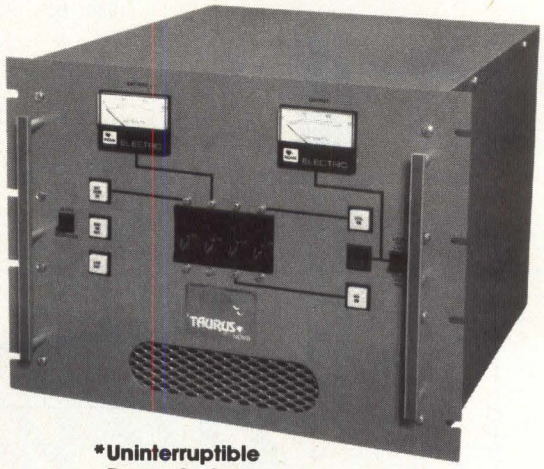

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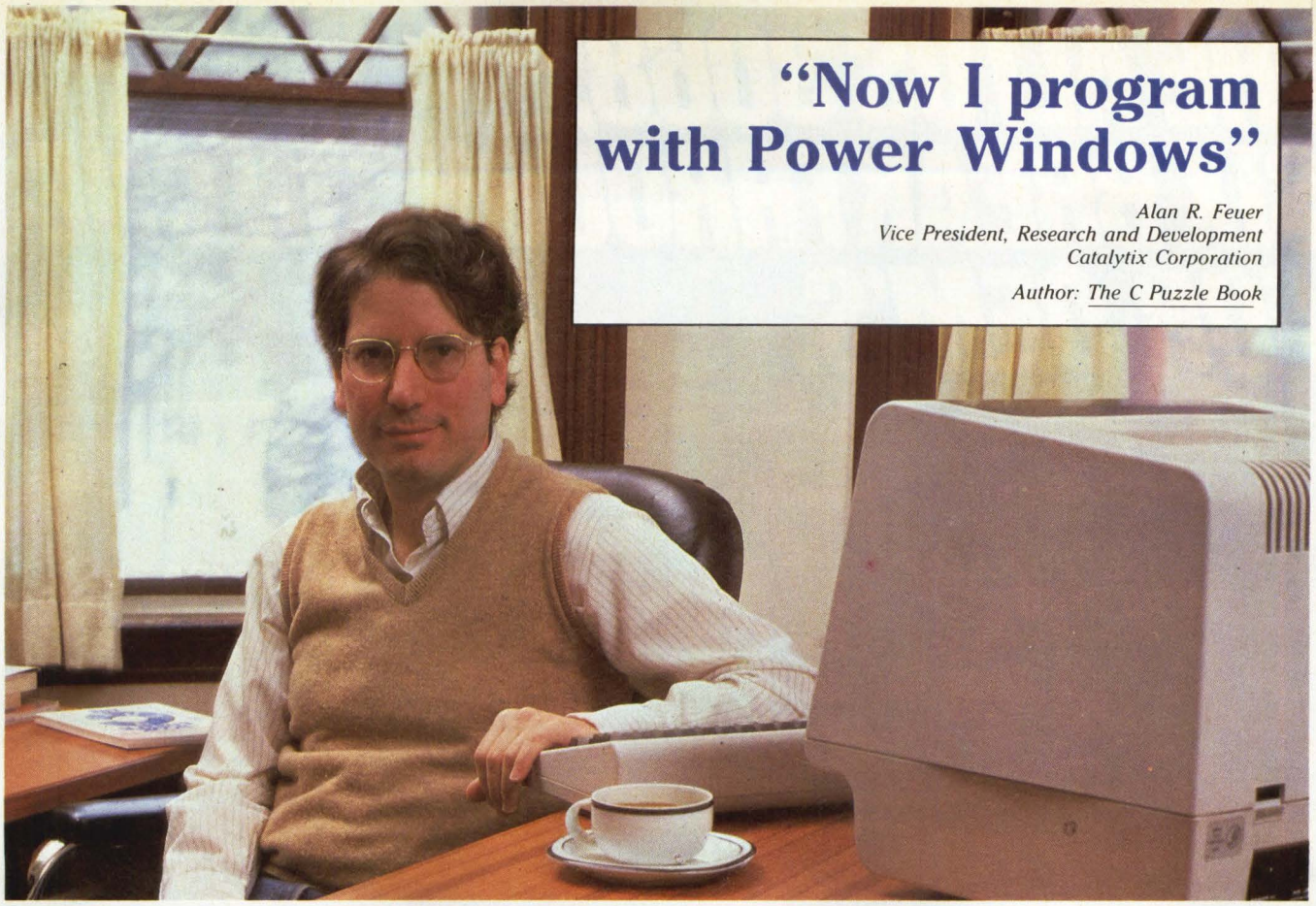

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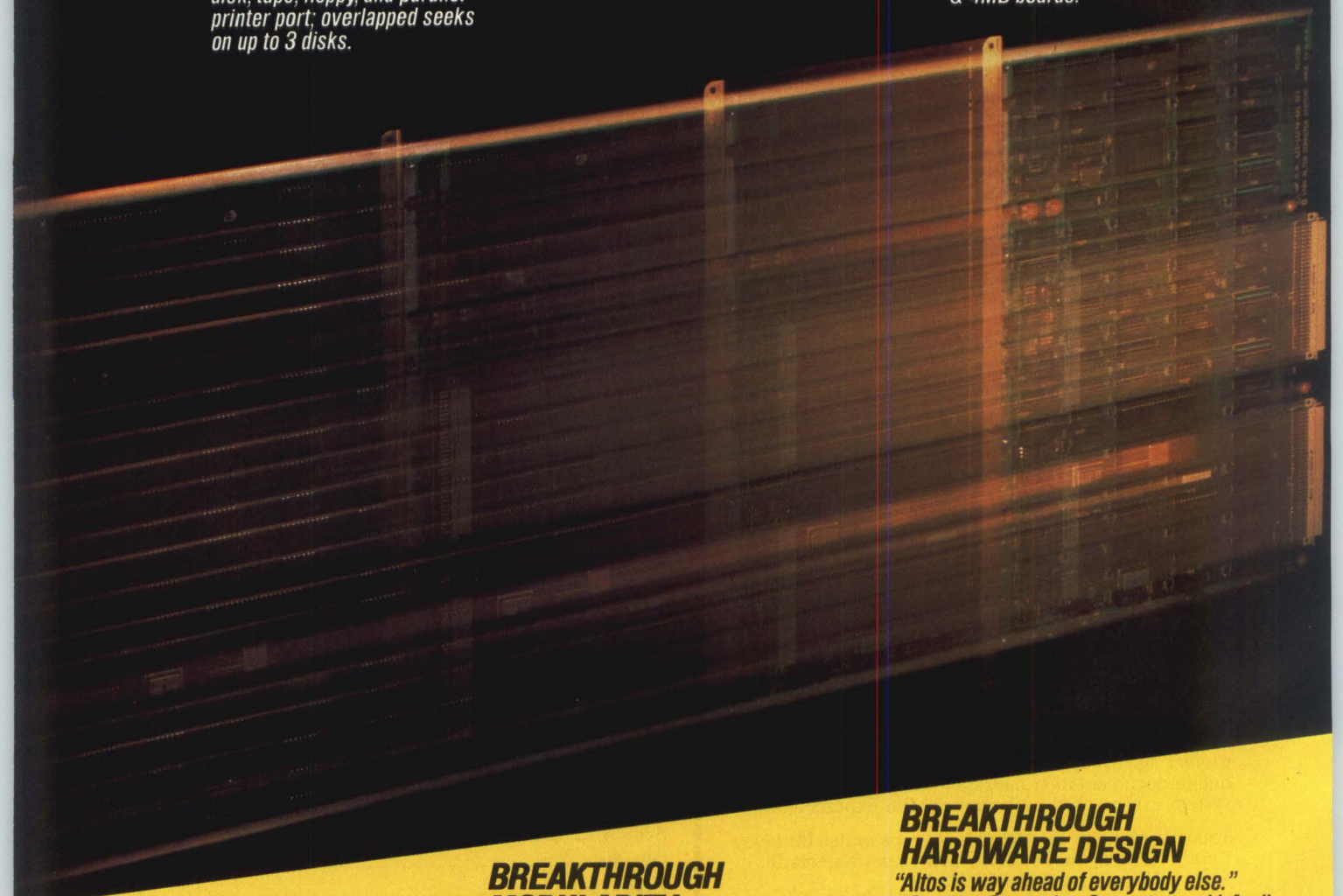

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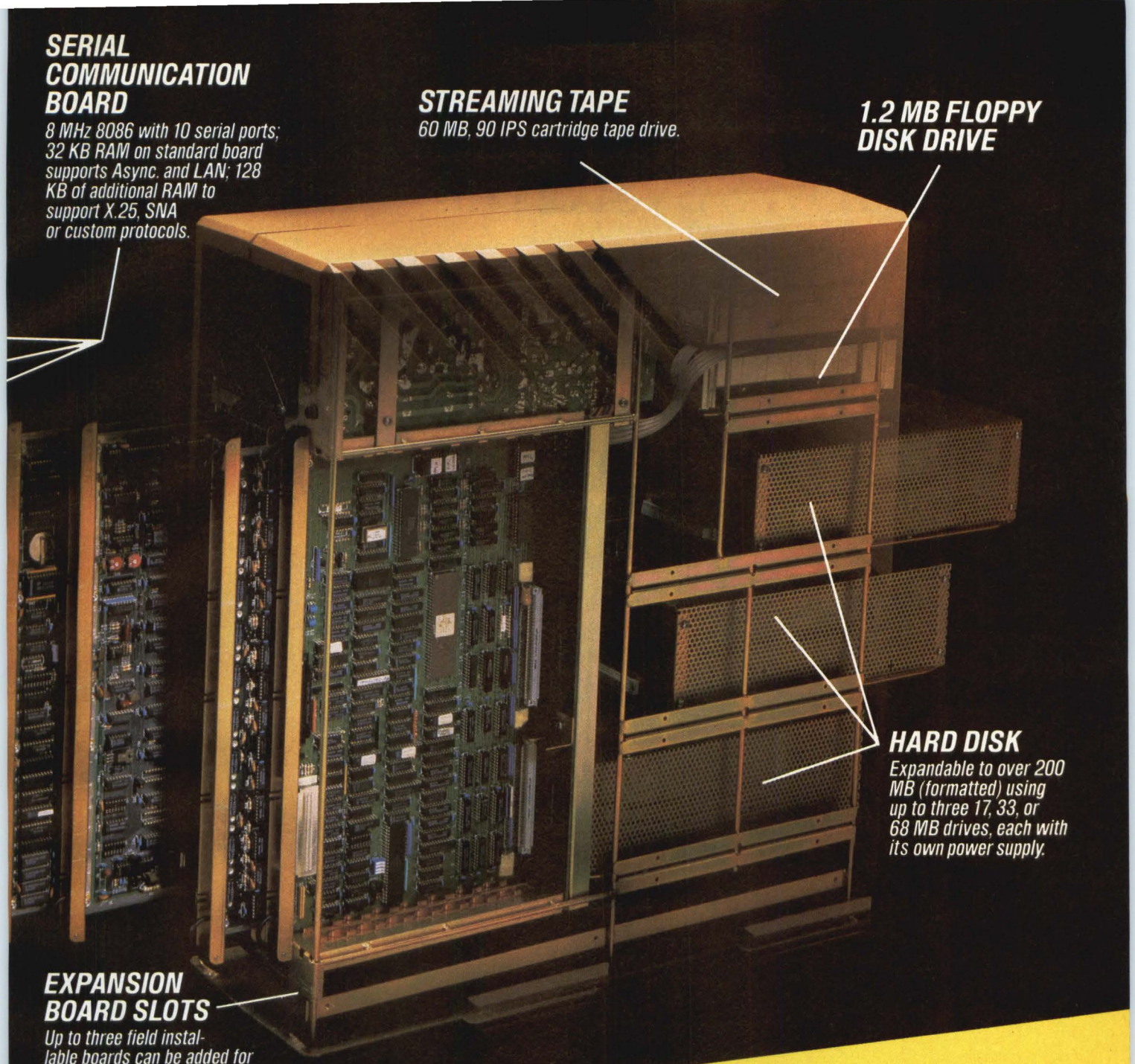

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IBM SPURS HIGH-END TAPE DRIVE MARKET

The tape drive market is shifting from large reel-to-reel units toward compact, high-performance cartridge-based drives. IBM may bring order to the ½-inch tape-cartridge chaos

Raymond C. Freeman Jr.
Freeman Associates Inc.

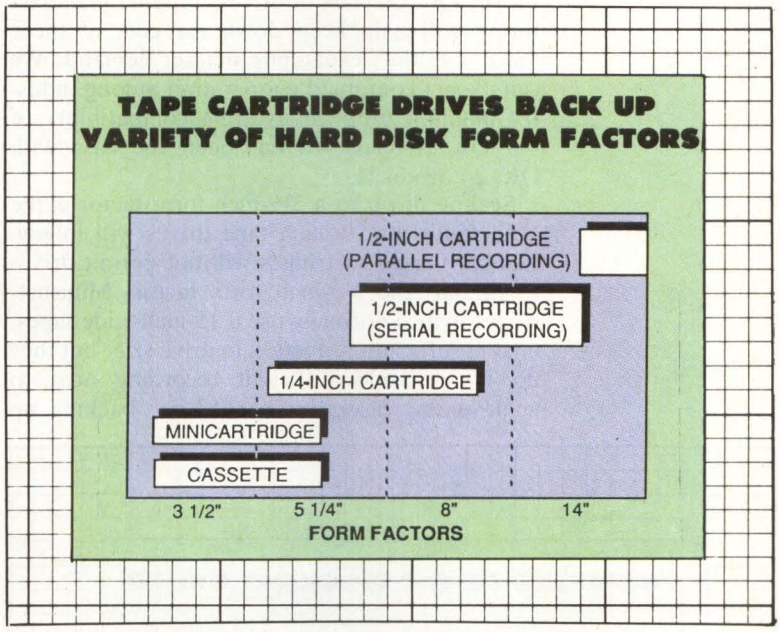
The market for removable tape storage—used primarily for Winchester backup—is undergoing a transition from conventional reels to tape cartridges. Quarter-inch tape-cartridge drives now command the low end of the market. IBM Corp. is aiming at the high end with its long-awaited 3480 ½-inch tape-cartridge subsystem. OEM manufacturers are battling for the middle ground, using IBM's cartridge in smaller, lower cost machines.

The ¼-inch tape-cartridge industry has been the early leader in building market demand for tape-cartridge drives. These manufacturers have been working together for nearly three years to define product standards. The Working Group for Quarter-Inch Cartridge Drive Compatibility (QIC) has spearheaded this effort. Formed in June 1982, QIC now has 15 member companies representing drive, media and controller manufacturers in the United States and Europe.

QIC's initial accomplishment was to specify a product class with capacities of 20M or 45M bytes. This class, popularly known as "QIC-24," after the recording format used, has risen to the 60M-byte capacity level through the use of the DC600 type of cartridge and its greater tape length. Paired with its companion interfaces, the intelligent QIC-02 and the basic-level QIC-36, QIC-24 machines are now widely supported by controller manufacturers.

As a result of the QIC efforts, standardized drives and controllers are available from various sources. Standardization has reduced the market risks involved in opting for ¼-inch drives, simplified integration and helped bring down prices. In both form factor and capacity, ¼-inch drives are well-suited for backing up and offloading 5¼-inch and low-end 8-inch fixed disk drives. For these reasons, the market has embraced ¼-inch tape drives as a mainstream product class.

With the 60M-byte QIC-24 class now better established, manufacturers are turning their at-



The ¼-inch tape-cartridge industry has been the early leader in building market demand for tape-cartridge drives.

tention to future product requirements. QIC has laid the groundwork for moves in two directions. Higher capacity drives are sure to follow the QIC-24 class. A QIC-50 recording format, now developing as a standard, defines a 120M-byte product class, using an enhanced cartridge dubbed the DC600XTD. This next drive class will enable ¼-inch products, as they increase in capacity, to serve as backup for higher-capacity 5¼-inch Winchesters, and will also permit ¼-inch tape drives to continue serving low-end 8-inch Winchesters. Increased cartridge capacity will assure that a large percentage of data dumps can be done on one media unit.

The QIC-50 class will provide a sensible growth path for users who have established libraries of QIC-24 cartridges. They will still be able to read those cartridges on the new QIC-50 machines when they become available, since backward-read compatibility has been specified by the Working Group.

QIC is also at work to define a standard head for the QIC-50 class of drives. Volume manufacturing will help keep down the cost of these machines, thus expanding market demand. We can expect continued cooperation among industry manufacturers in assuring compatibility of the QIC-50 class, as has been the case with QIC-24 products.

Scaling down to a 3½-inch form factor is the other path that ¼-inch tape drives will follow. Standard-sized cartridges will not permit drives to fit into the 3½-inch form factor. Minicartridges, which normally use 0.15-inch-wide tapes, enable sufficient reduction in drive size, but they do not provide sufficient recording area to achieve the capacities needed for backing up tomorrow's disk drives. 3M of St. Paul, Minn., has attacked this limitation by upgrading the minicartridges to a new DC2000 configuration. The DC2000 uses ¼-inch tape. The DC2000 also uses a longer tape load and incorporates the mechanical improvements developed by 3M for the DC600XTD full-sized cartridge.

A new class of ¼-inch tape drive based on the DC2000 minicartridge should start moving into the market in 1986. This will provide appropriate capacity and form factor to match up with 20M-byte and larger 3½-inch Winchesters as companies start shipping them in volume. The DC2000 class of drive may also serve some half-height, 5¼-inch Winchesters. This new class will not only permit more compact systems but will also reduce the amount of space required to store cartridges.

Competition for the DC2000 class of minicartridge drives will come from the data-cassette drive industry. Several manufacturers of high-performance cassettes and drives, taking their cue from the QIC Group, banded together as the Working Group for Data Cassette Drive Compatibility (D/CAS). They have proposed standards for recording format, drive interface and media for 10M-, 20M- and 45M-byte products. Their drives are compatible with QIC-02/QIC-24 controllers, thus simplifying integration.

3M improves media

3M has responded to increased market demand for ¼-inch tape-cartridge drives by committing itself to their future improvement. 3M is developing higher performance coatings with fewer defects, improving tape tracking and reducing instantaneous speed variation. These cartridge improvements will support the advances being planned for future cartridge drives.

Availability of cartridges is also improving. 3M, which invented the ¼-inch tape cartridge, still dominates the market and enjoys technological leadership. Data Electronics Inc. (DEI), the other current supplier of ¼-inch tape cartridges, is now past its market-entry phase and is expanding its production capabilities. DEI offers innovative variations on standard cartridges and will offer a broad line of both full-sized cartridges and minicartridges. Cartrex Corp. has received venture funding and is developing a manufacturing facility for production of a modified ¼-inch tape cartridge said to be compatible with the standard cartridge.

In addition to mainstream standards, several manufacturers also offer innovative variations on ¼-inch drives to meet differing market requirements. Northern Telecom Inc. and Qantex

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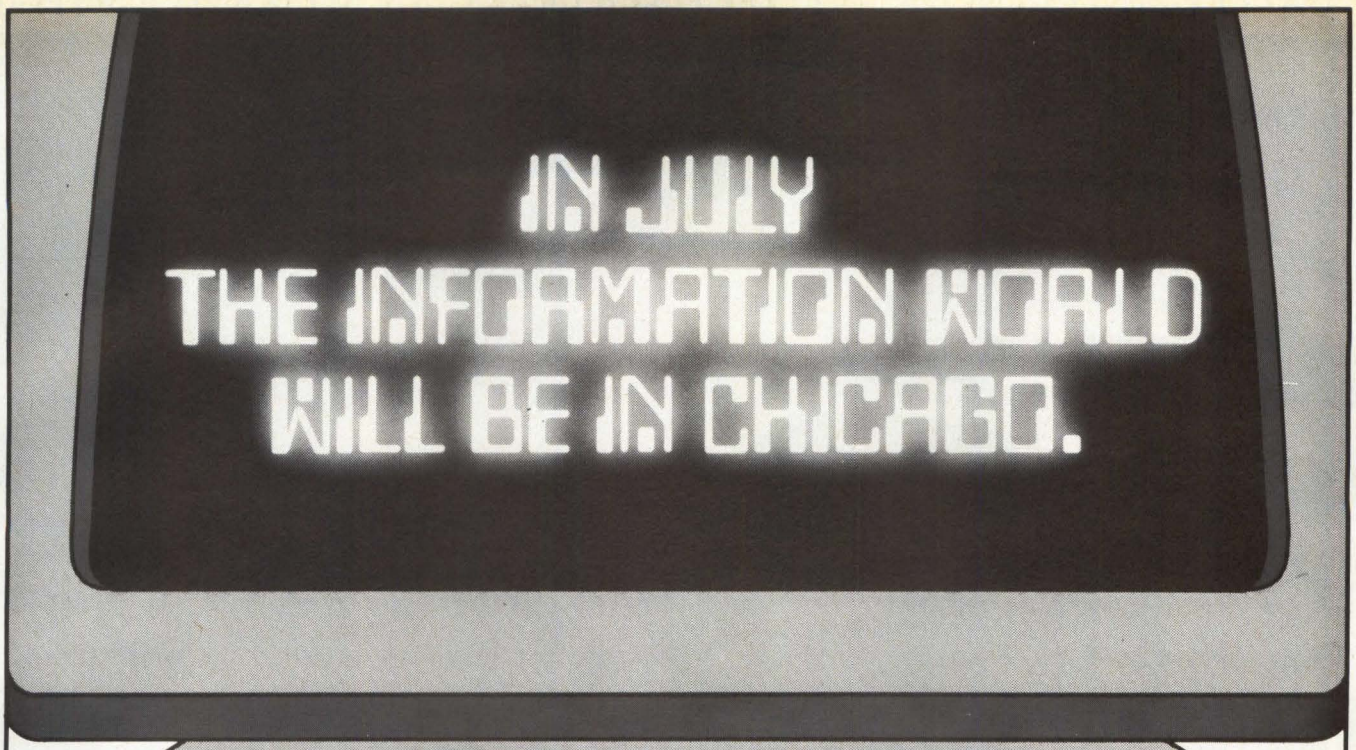

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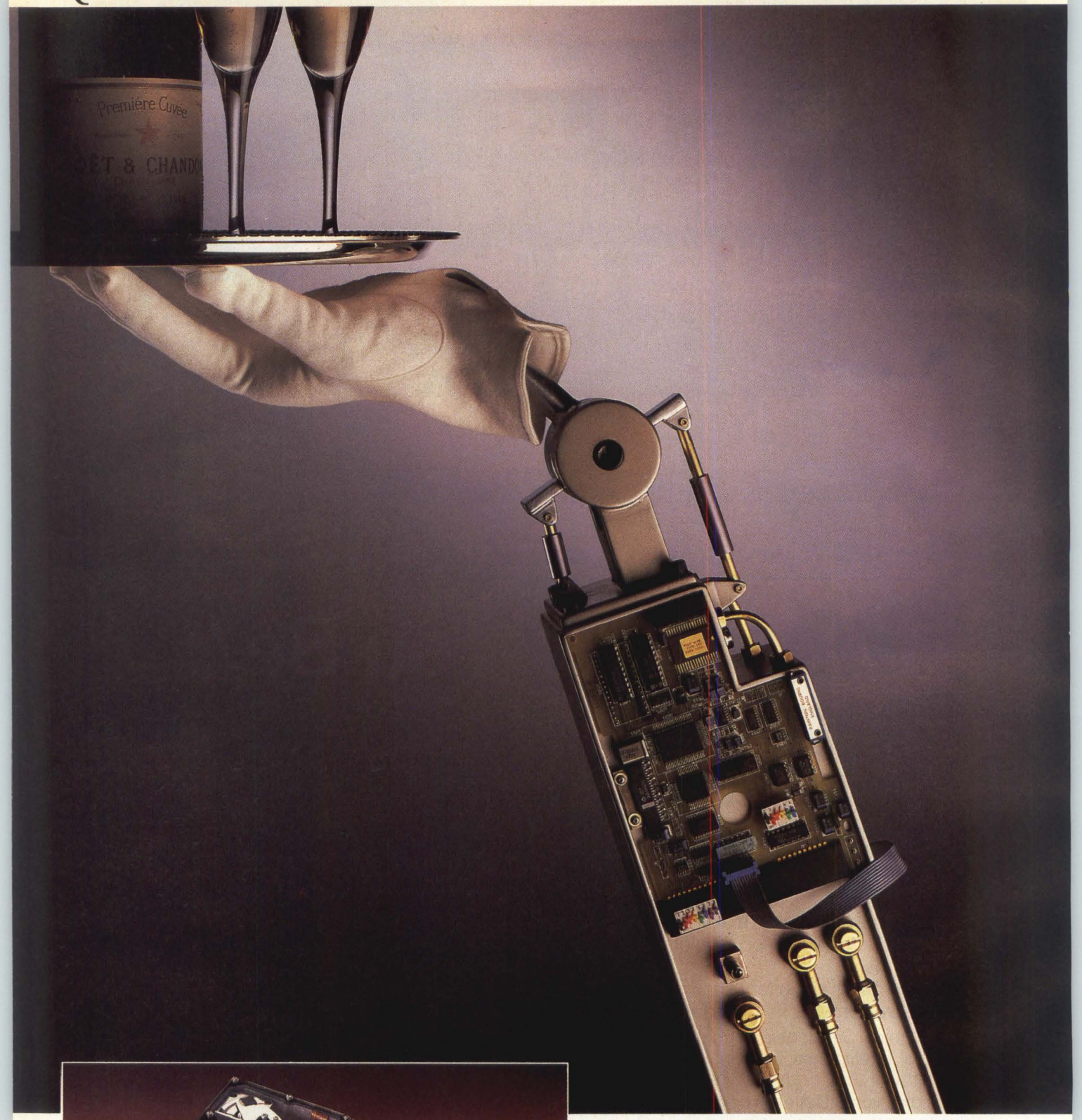

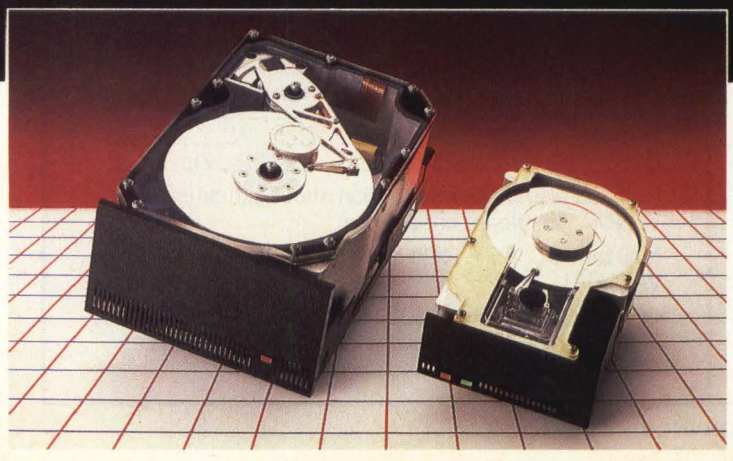

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Corp. were first to tackle the 100M-byte capacity level. Tallgrass Technologies Corp., selling through retail channels, has achieved success with drives using its proprietary PC/T recording format. Other non-standard products are also offered as alternatives, including single-reel cartridge drives from Interdyne Co.

IBM shakes up ½-inch world

In the high-capacity (over 100M-byte) tape drive market, a demand for smaller, lower cost tape drives disrupted the ½-inch reel-to-reel world. The demand was reinforced by long-standing rumors that an announcement of such a drive by IBM was imminent. Several enterprising companies plunged into this "opportunity" with drives that used ½-inch tape and that were designed to fit into 8- and 5¼-inch form factors. Unfortunately, no two drives were compatible or used the same kind of tape cartridges.

The IBM announcement, in March 1984, largely upended these early initiatives. While the IBM 3480 ½-inch tape-cartridge drive itself is aimed at the high-end market, as a companion for IBM 3380 disk drives, the IBM tape cartridge should quickly become adopted as the media standard for smaller, lower cost OEM drives as well.

Early market forays—by Digital Equipment Corp., Electronic Processors Inc., MegaTape Corp., Rosscomp Corp., Tandon Corp. and Tokyo Electric Co. (TEC)—are unlikely to become mainstream contenders. DEC may ship large quantities of its drive on its own systems, creating a sizable but unique interchange environment. The product is unlikely to appeal to the OEM market, however.

EPI's drive has not yet made it into production volumes. The company's link to Memorex Corp. is now of questionable value, since Memorex has bailed out of the OEM market. And Fujitsu America Inc., EPI's new partner, may not be able to push a non-standard product to widespread acceptance.

MegaTape, with its 330M- and 500M-byte capacities and ready availability of products, can carve out niche markets suited to the characteristics of its products, but growth in such markets will be limited. Rosscomp offers an engagingly simple design in either 5¼- or 8-inch form factors, with a variety of popular interfaces. Its offerings will have short-term appeal but will not stave off the inevitable adoption of the IBM tape cartridge as the new ½-inch media standard.

Tandon's ½-inch tape-cartridge project never made it to market. Its 50M-byte capacity level has now been usurped by the QIC-24 class of ¼-inch drives. TEC's device, at 200M bytes, uses an endless loop of tape on a single reel. Because IBM will set the standard for this capacity range, unique approaches such as TEC's are unlikely to gain significant market penetration.

HI/TC TENTATIVE SPECS FOR ½-INCH DRIVES

Capacity (user)	240M bytes
Transfer rate	200bps
Intelligent interface	ADAPTEC, SCSI and/or IPI
Track addressability	yes
Block addressability	yes
Backup file	20 minutes, maximum
Form factor	5¼-inch or 8-inch
Head channels	two
Media	IBM tape cartridge or equivalent

Standards remain the key

Many companies in the OEM industry have decided to cooperate in defining standards for a new class of ½-inch tape-cartridge drives using the IBM tape cartridge or equivalent. Most major manufacturers of ½-inch tape are expected to offer cartridges compatible with the IBM product, so the desire for multiple sources will be satisfied.

The Working Group for Half-inch Tape-Cartridge Drive Compatibility (HI/TC) is providing a forum for developing standards for this new OEM product class. Organized last November, the HI/TC group has nearly hammered out an agreement on a recording format, which will probably be based on serpentine recording with two active channels.

Head standards also are being developed by HI/TC to reduce drive cost and improve availability. Definition of one or more device interfaces will follow, so controller developments can move forward.

HI/TC formal members include Archive Corp., Computer Peripherals Inc., Kennedy Co., Perex Ltd., Pertec Peripherals Corp., Storage Technology Corp., Tallgrass Technologies Corp., Telex Computer Products Inc., and Wangtek Inc.

The sword hanging over HI/TC's head is the uncertainty about IBM's and Cipher Data Products Inc.'s intentions in the low-end ½-inch market. An announcement was made last fall of

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The IBM tape cartridge should quickly become adopted as the media standard for smaller, lower cost OEM drives.

a joint development agreement for several products between IBM and Cipher. It is widely thought that Cipher is at work on small, low-cost, serial-recording drives incorporating the IBM tape cartridge. Such machines would be logical as attack vehicles on the OEM market because of the formidable strength of an IBM-Cipher alliance. If IBM were to adopt such drives for its own systems, a low-end standard would probably be declared in the process. Because of customarily tight lips on both sides of the IBM-Cipher agreement, no one knows what to expect or when to expect it. The HI/TC initiative reflects a determination not to simply wait and find out.

In terms of capacity, low-end ½-inch tape-cartridge drives, in whatever form they emerge, will pick up where ¼-inch drives leave off. Buyers will make their choices depending on capacity, performance, form-factor and interchange requirements.

As these products enter the market, each will play its own role. Minicartridges will serve 3½-inch and low-end 5¼-inch requirements, as will data cassette drives. Full-sized ¼-inch tape cartridges will address 5¼- and 8-inch hard disk needs. OEM ½-inch tape-cartridge drives will target high-end 5¼-, 8, 10½- and 14-inch applications. High-end ½-inch tape-cartridge drives, compatible with IBM's 3480 will be used with top-of-the-line 14-inch disk drives. There will be room for all five product classes. Their expected popularity and the new wave of industry cooperation on standards will support the swing to tape cartridges. □

Raymond C. Freeman Jr., a contributing editor for *Mini-Micro Systems*, is president of Freeman Associates Inc., a Santa Barbara, Calif., data-storage management consulting and publishing company. He is a facilitator and spokesman for the QIC, D/CAS and HI/TC working groups.

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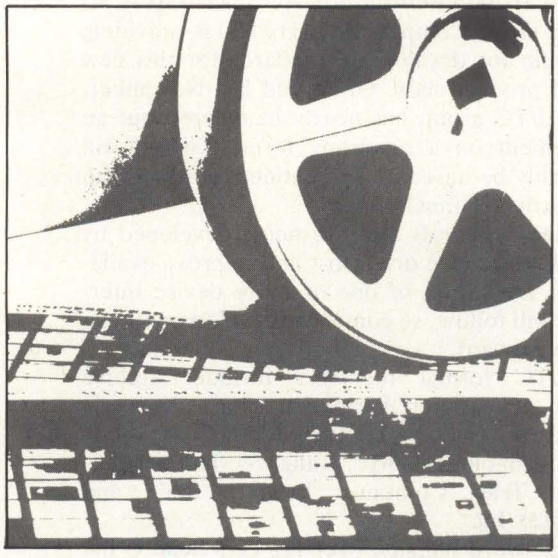

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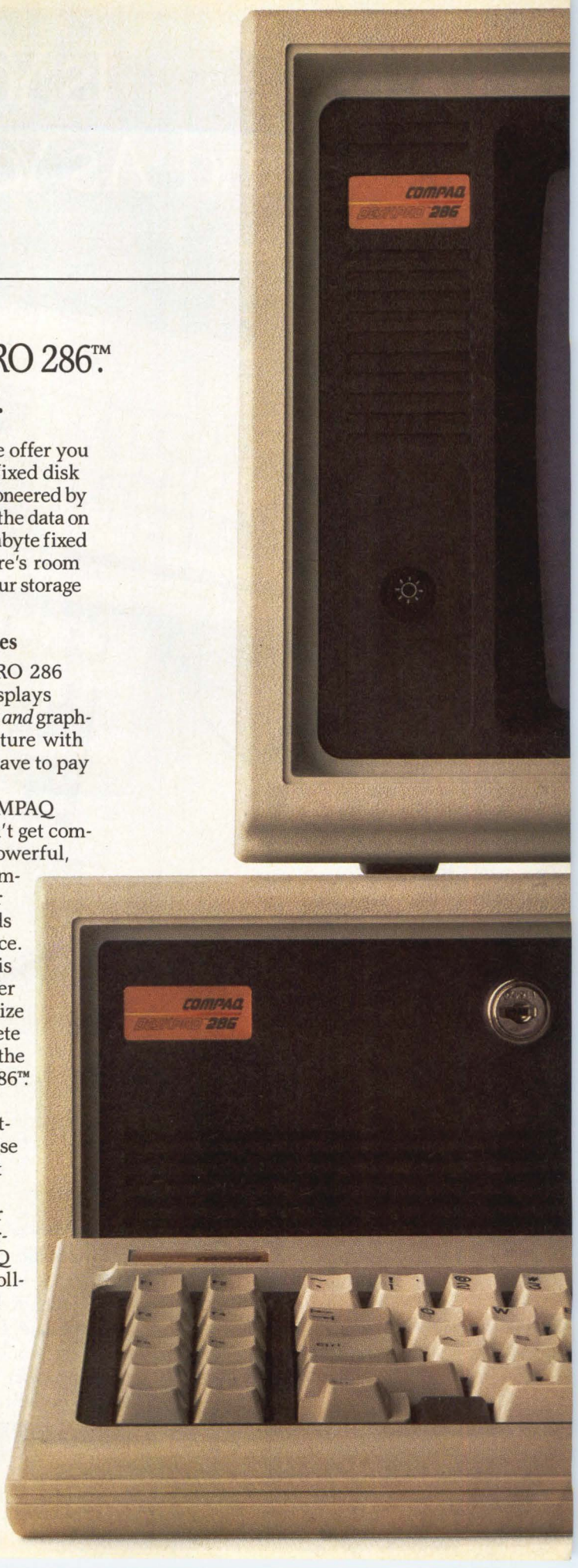

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CIRCLE NO. 74 ON INQUIRY CARD

VAR CHANNEL SKIRTS RETAIL LOGJAM

A niche marketing strategy through VARs provides an alternative to battling for retail shelf space

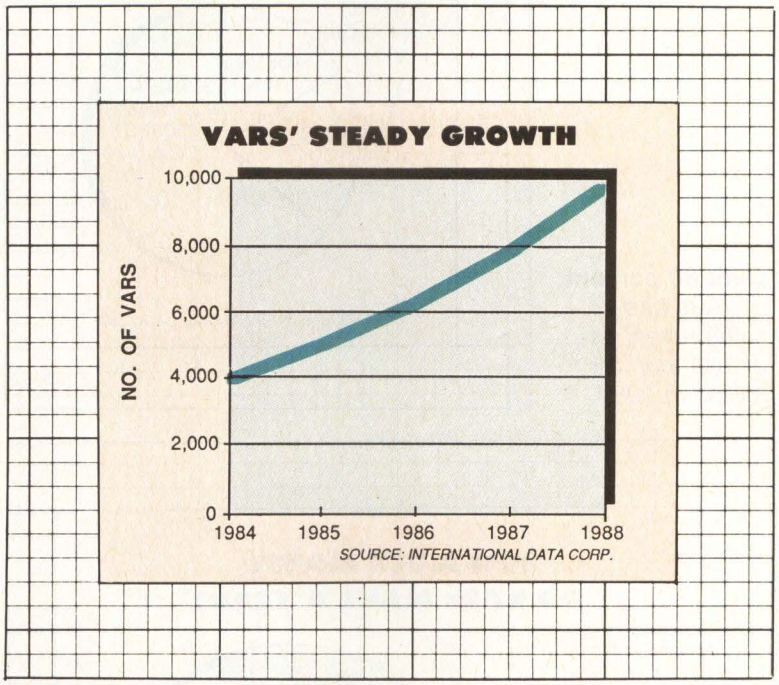
Evan Moltz
International Data Corp.

The microcomputer industry faces a predicament. Simply put, the retail channel cannot support the multitude of microcomputer vendors. Too many manufacturers are vying for shelf space in the major retail chains, such as ComputerLand, Businessland Inc., Entré Computer Center and Sears Business Systems Center, differentiating their products only by price. Nor is the retail channel sophisticated enough to sell multiuser or networked systems. And manufacturers cannot afford to be continually squeezed on margins by keeping up with IBM Corp.'s price cuts.

Developing a niche marketing strategy to satisfy the needs of a specific, targeted market is one possible solution. The value-added reseller is the primary distributor in these niche markets, providing manufacturers access to markets currently untapped by traditional retailers.

Because most VARs are well-established in the vertical markets they address (73 percent have been in business for three or more years), they provide manufacturers a specific industry-area access. VARs are specialists, offering a high level of professionalism, particularly with multiuser and networked products. The VAR channel's value-added focus makes it less susceptible to margin erosion than is the retail channel.

Unfortunately, there is no industry-wide definition of a VAR. Generally, the term refers to a sales organization that is not classified as retail and that in some way adds value. A possible reason for any misuse of the acronym may be that VARs have been perceived as occupying a higher level of distribution than retailers, leading many non-VARs to appropriate the label.



The number of VARs *is expected to rise roughly 25 percent per year through 1988, with system integrators seeing the most growth.*

As a result, "VAR" has become an umbrella term that now includes the traditional categories of computer resellers. In an effort to clarify, market research company International Data Corp. (IDC) defines a VAR as a non-retail organization that buys products from a manufacturer, adds tangible or intangible value and resells the products to the next tier of distribution or to the end user. (Tangible value can be in the form or either hardware or software; intangible value can be service, support, training or expertise in the given market niche.) What's actually added varies, depending on the size and type of the system, the level of integration

provided and the end-user application.

The following categories of resellers fall under IDC's definition of a VAR:

- System integrators buy hardware from one vendor and software from another and customize the hardware and software to form a turnkey system, usually adding a front-end or forms generator, thus providing an integrated, turnkey small-business system.
- OEMs integrate a manufacturer's hardware with their own hardware and software and resell the package with a substantively unique identity.
- System houses develop their own software, buy hardware from a vendor and sell a complete solution.

Not all VARs fit neatly into one category, and VARs often have characteristics of several categories.

VARs comprise 63 percent system houses, 21 percent system integrators and 16 percent OEMs. The number of VARs is increasing at a rate of 25 percent per year. The number of system integrators is growing the fastest and is expected to be 2½ times larger than its current size by 1988.

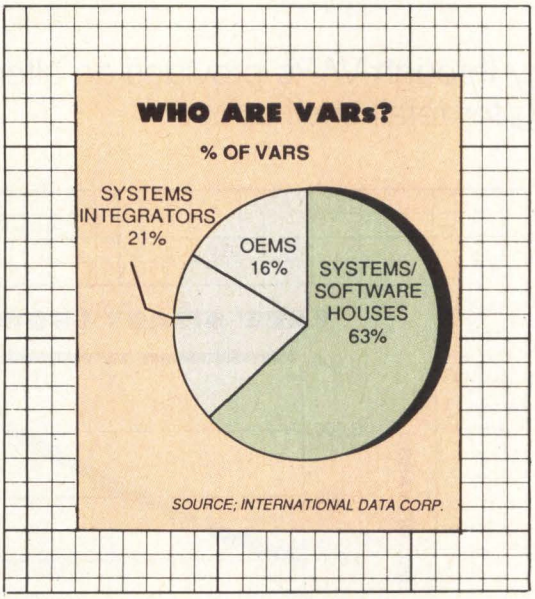
Most VARs locate in areas close to manufacturers in order to share in the local technology base. This enables VARs to establish a closer relationship with primary suppliers. Of the VARs listed in IDC's VAR File, the largest concentration, 795, is in California. When these VARs are combined with those in the next four most VAR-populated states—New York, Massachusetts, Texas and New Jersey—they account for nearly half of all U.S. VARs.

Sixty-one percent of VARs sell to more than one vertical market but usually in the same application area (30 percent of all applications sold by VARs are accounting programs). Manufacturing, medical, banking, government and distribution are the top five vertical markets. These five represent 70 percent of the vertical markets targeted by VARs.

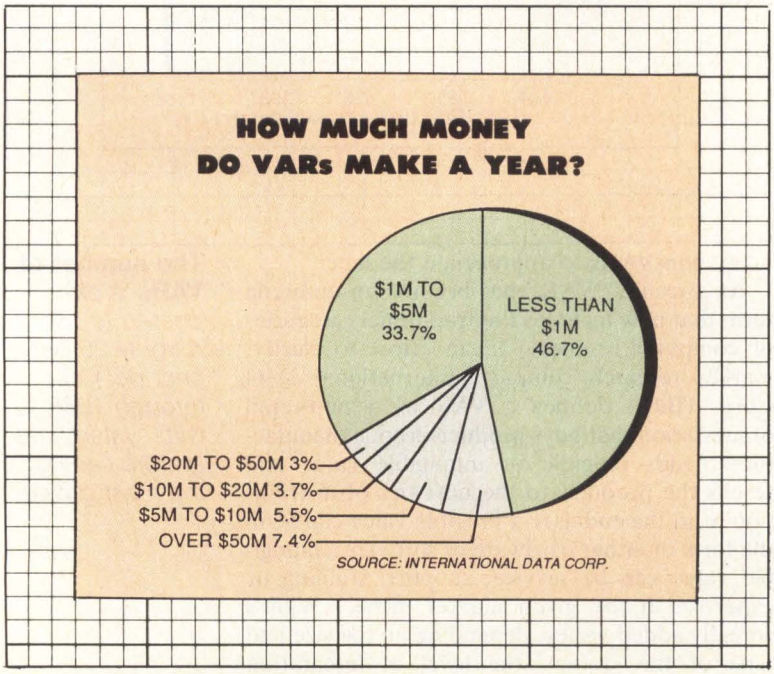
Of nearly 4,000 VARs surveyed, almost half had sales revenues of less than $1 million. Because most VARs have low sales revenues (the average VAR moves 20 to 25 systems per year), it's costly for manufacturers to support them. As a result, 65 percent of the VARs that sell personal or supermicrocomputers to the end user buy their products from distributors.

Unfortunately, the VAR market may not be a panacea for manufacturers' distribution problems. In fact, many manufacturers will find this channel as difficult to penetrate as retail, because VARs are very selective. Vendors wanting to recruit VARs must realize that they can no longer dictate terms to VARs and just sell them hardware. They also must offer VARs the support necessary to sell their systems. □

More than half *of all VARs are system/software houses.*

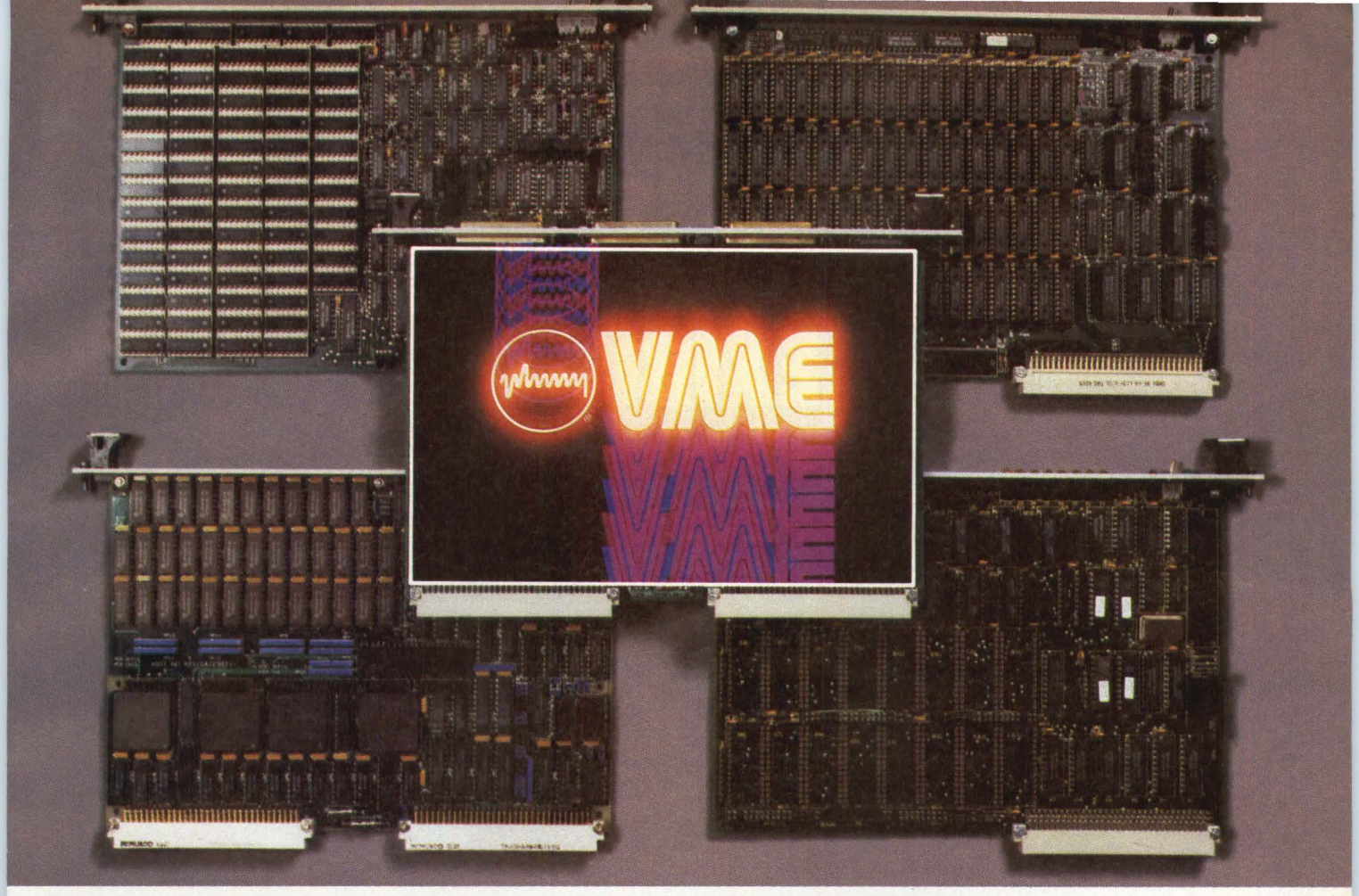


Over 80 percent *of VARs had sales revenues of less than $5 million in 1984.*



Evan Moltz is director of microservices at International Data Corp., Framingham, Mass., a market research and consulting company for the information-processing industry.

Interest Quotient (Circle One)
High 477 Medium 478 Low 479



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3 Mbyte DRAM*	PME 1EA		•	8/16/32	150	300
2 Mbyte DRAM	PME 048D	•		8/16	190	300
1 Mbyte DRAM*	PME 512EP	•		8/16/32	150	270
3/4 Mbyte DRAM	PME 256EA		•	8/16/32	150	300
512 Kbyte DRAM	PME 012D	•		8/16	190	300
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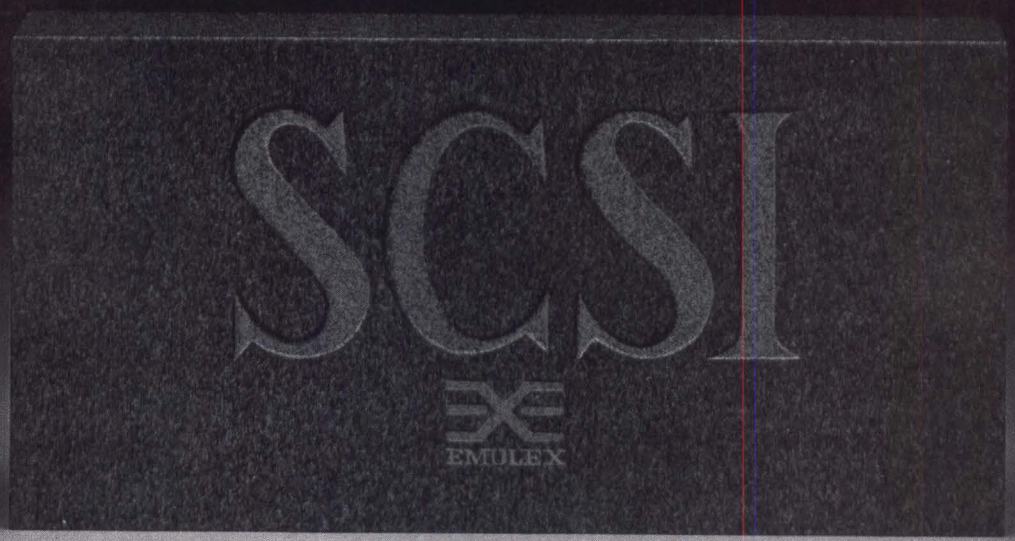

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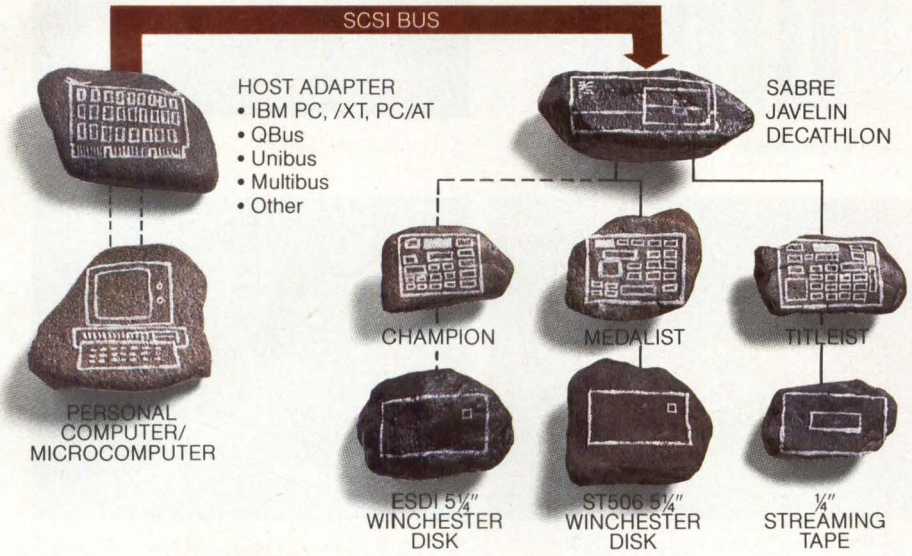

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FEATURE	BENEFIT
Arbitration	Permits concurrent I/O operations between different devices by prioritizing bus usage.
Disconnect/ Reselect	Maximizes bus utilization by providing devices an orderly scheme to release and regain bus control.
Copy	Permits data transfer between devices without host intervention.
Search Data	Used to search one or more logical blocks for less than, greater than or equal to a specified data pattern.
Reserve/ Release	Device can be reserved for exclusive use by a single host in multiple host configuration.
High Level Command Set	Provides host with device independence for a given type of device.

With Emulex's SCSI products as the cornerstone for your mini/micro computer systems, you can continue to build on your investment. Our SCSI-based products offer you convenient building blocks with which to assemble, update, mix or interchange different types of peripheral storage devices to your computer system. Couple that with the industry's widest range of advanced products and you have the single best source for your system building needs. Products with performance, quality and reliability that's unsurpassed.

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SABRE, combines on-line storage and file backup capability in a compact unit housing a 5¼" Winchester disk drive and an 8" removable cartridge disk.

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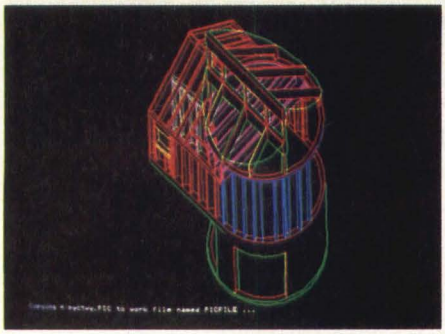
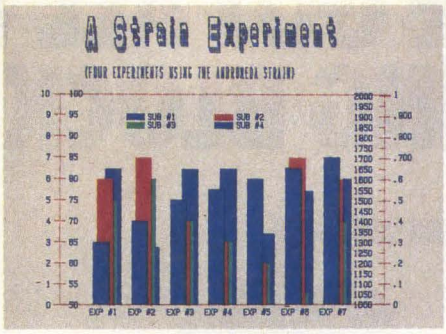
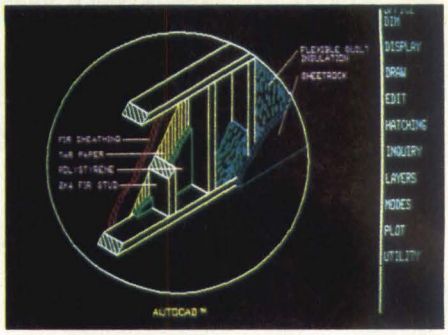


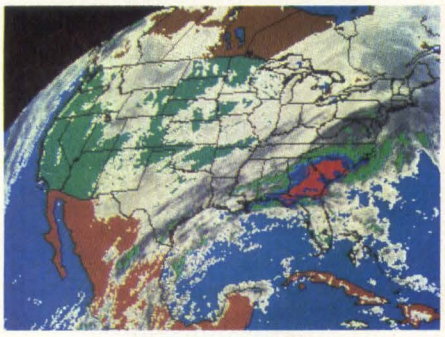
1. High Speed (MicroCAD Software)



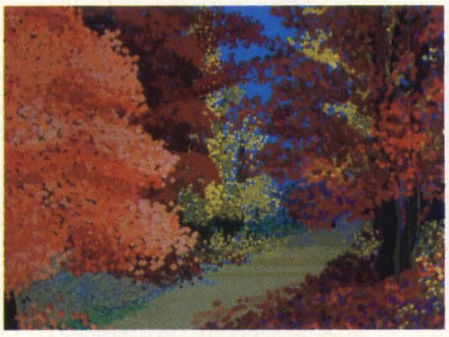
2. Dual Display Modes (Energraphics Software)



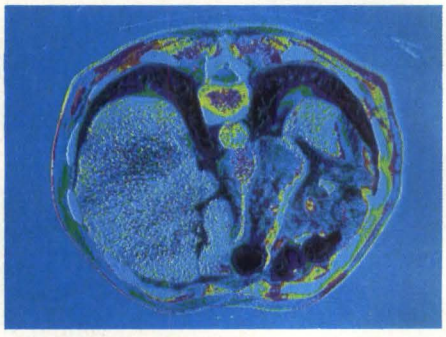
3. Simplified Processing (AutoCAD Software)



4. 9 Bit Planes (Courtesy WSI Inc., Bedford, MA)



5. 16.8M Color Shades (Courtesy Catherine Del Tito, Wave Graphics)



6. High Resolution (Courtesy University of North Carolina at Chapel Hill, Depts of Computer Science and Radiology)

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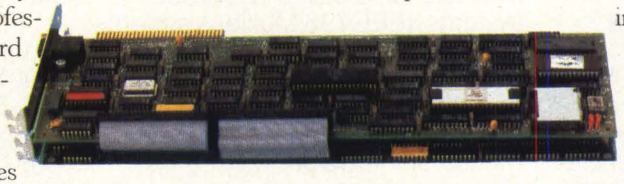

What you will find most surprising, however, is the price. Our VX/PC Board Set was designed with the OEM in mind. So when comparing the performance of Vectrix with the competition, check the price too. You'll like what you see. For more information, contact Vectrix Corporation, 2606 Branchwood Drive, Greensboro, North Carolina 27408. Phone (919) 288-0520. Telex 574417.

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CIRCLE NO. 77 ON INQUIRY CARD

NCC PANELS STRESS INTERNATIONAL OUTLOOK

From The Windy City to the world: The annual NCC conference offers more than 80 technical sessions on AI, networks and architectures

Lynn Haber, Associate Editor

The broadening international scope of computer technology and the impact of denser circuitry, non-traditional architecture, increasingly diverse software and communications will be key topics at this year's National Computer Conference (NCC) scheduled for July 15 to 18 at Chicago's McCormick Place.

Retired U.S. Navy Adm. B.R. Inman, chairman, president and chief executive officer of Microelectronics and Computer Technology Corp., a research development venture in Austin, Texas, will deliver the keynote address, entitled "Managing the Creation and Commercialization of Technology."

"This is increasingly going to be an international marketplace," says Inman. "The industry will need to take new approaches in order to effectively penetrate the markets opening up abroad."

Inman points out that the National Academy of Sciences identifies telecommunications, microelectronics, aerospace, materials, energy and biotechnology as six areas of emerging technology. Inman will discuss the creation of capital to take advantage of these technologies, as well as the speed with which technology moves from the laboratory to the marketplace.

The conference program will include more than 80 technical sessions addressing "Technology's Expanding Horizons," the conference theme. Program topics include "Artificial Intelligence," "Networking," "Personal Computing,"

Chicago's McCormick Place *will host the 1985 National Computer Conference from July 15 to 18.*

As the NCC keynote speaker, *Adm. B. R. Inman will speak on creating and commercializing technology.*

"Information Systems Management," "Software Systems" and "Future Architectures and Supercomputing."

In addition to exhibits by more than 700 manufacturers and the conference program itself, NCC will also feature 27 sessions labeled as Professional Development Seminars. According to Robert Gershon, seminar chairman, the sessions will offer in-depth discussions on critical areas of high-technology.

Topics include: "Fault-Tolerant Systems" by Omri Serlin of the ITOM International Co., "DP and CAD/CAM: Where's the Fit?" by Joel N. Orr of the CAD/CAM Institute, and "Artificial Intelligence: Vision, Brain and Robotics" and "Artificial Intelligence: Expert Systems and Natural Language Processing," both by professor Michael Arbib of the department of computer and information science at the University of Massachusetts at Amherst.

Another seminar will deal with the rise of the 32-bit standard microprocessor, which has resulted in a new generation of products. John Payne, director of strategic product development at National Semiconductor Corp., Santa Clara, Calif., will examine these trends in a session on "Multiprocessor Architecture."

"On an aggregate-performance level, a multiprocessor architecture exceeds what the higher performance minicomputers can do," says Payne. "And what's more, the price/performance is dramatically improved compared to minis," says Payne.

According to Payne, a new industry—the multicomputer—has been created as a result of multiprocessor architectures. The panel will examine how companies can incorporate existing standards, commonly used programming languages and current operating systems. The session also will look at how standards create new markets by allowing companies to quickly develop products.

AI rates top priority

Artificial intelligence, a primary concern at last year's NCC, still remains a high-priority topic because AI applications are just starting to become available. David R. Brodwin, a senior consultant at Arthur D. Little Inc., San Francisco, will chair a panel on "Artificial Intelligence for Personal Computers."

According to Brodwin, a half-dozen AI packages are now available that introduce this advanced concept to the personal computer user. "We've reached the point where personal computers are powerful enough—and AI developers clever enough—so that the two segments of the industry are beginning to overlap," he comments.

Products such as Timm from General Research Corp., Clout from Microrim Inc. and M.1 from Teknowledge Inc. will be discussed. "These products illustrate the range of what's going on in this market segment today," says Brodwin. "We will look at these products, their commonalities, and determine what direction this market might take in the future."

Also included within the session will be a discussion of how AI relates to expert systems and natural languages. "There's a movement afoot to develop a system on a specialized hardware system, such as a symbolics machine, and then translate it down to a run-time version for the personal computer," Brodwin explains. "That will probably happen in calendar-year '85 and will dramatically speed up the use of AI on personal computers."

SNA connects at NCC

In honor of the 10th anniversary of IBM Corp.'s Systems Network Architecture, the industry giant, in conjunction with NCC, will present a session called "IBM's SNA: Meeting the Challenge of Change."

There will also be a discussion entitled "Arrival of LAN Operating Systems," led by Noel E. Schmidt, director of major products at Architecture Technology Corp., Minneapolis.

Schmidt maintains that one of the major obstacles preventing local area network technology from taking hold is the insufficient functionality of operating systems for developing applications on top of those networks.

"Now that a few products are available that provide the necessary functionality, we can discuss a few of the issues involved in selecting one of those systems, and the things people should look for in those products," Schmidt says. The panel also will look at several products, discuss their important features and consider what makes superior products.

Despite low attendance and a lack of new product announcements at other computer shows this year, officials from the American Federation of Information Processing Societies Inc.—the sponsors of NCC—remain optimistic about the conference. Although they won't speculate on the number of attendees, spokesmen point out that more than 700 exhibitors will be present. □

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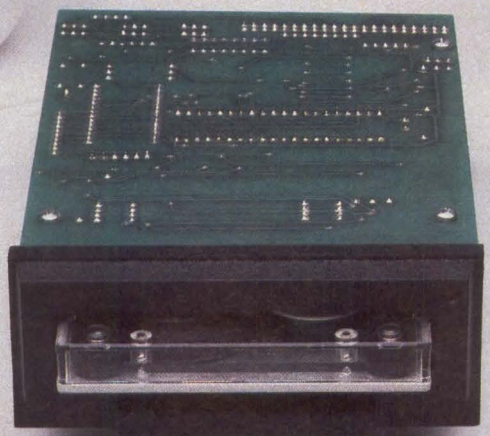
High 480 Medium 481 Low 482

Introducing the little backup with the 20 megabyte appetite.



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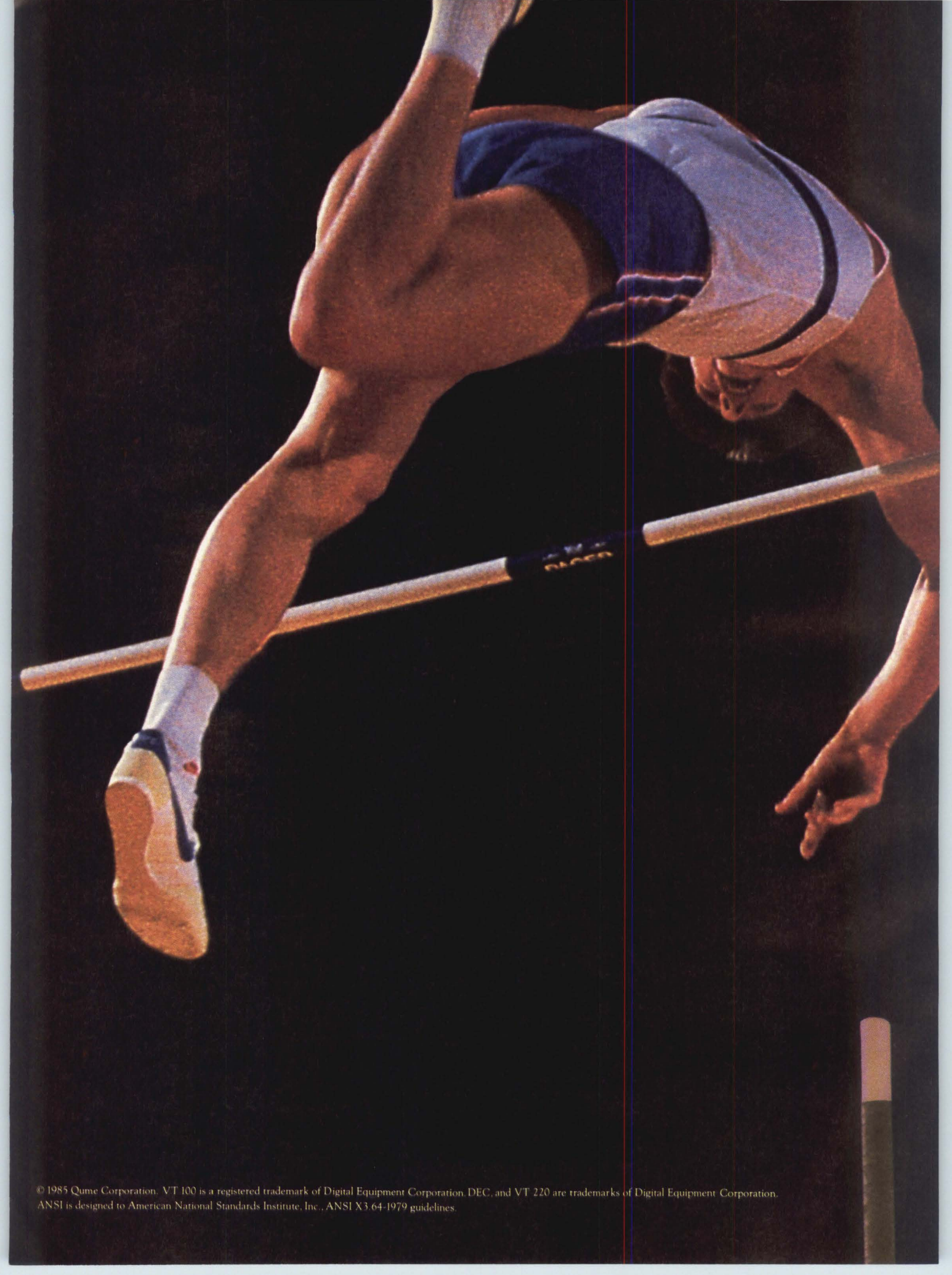

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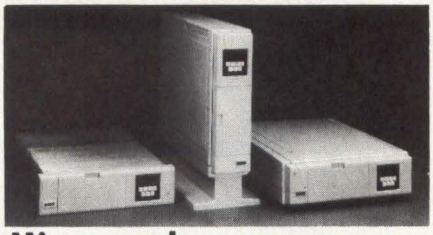
CIRCLE NO. 79 ON INQUIRY CARD

NEW PRODUCTS

SYSTEMS

Eileen Milauskas, Assistant Editor



Micro works with Multibus

- Foundation Module
- 512K-byte memory
- 12M-byte Winchester

Multibus compatible, the SMS 8000 model 40 microcomputer system runs CP/M-86 operating system and application software developed for Intel's RMX 86 or XENIX operating systems. Employing either the 8086 or the 80286 processor, the system comes with 512K bytes of main memory, expandable to 6M bytes. Storage capacities include a 12M- to 128M-byte Winchester disk drive, a 1.2M-byte, 8-inch or 1.6M-byte, 5¼-inch floppy-disk drive and a 60M-byte streaming tape drive. An integrated, single-board Foundation Module, requiring no backplane slot, includes peripheral controller, backplane interface, parallel priority resolution circuitry and the Support Monitor Subsystem, which contains software used for system analysis, system utilities and diagnostics. $5,900. **Scientific Micro Systems Inc.,** 339 N. Bernardo Ave., Mountain View, Calif. 94043, (415) 964-5700.

Circle 300

Display system meets IGES standard

- 512-color display
- 13-inch monitor
- Digitizer tablet

Accepting CAD/CAM drawings produced by IBM mainframe software such as CADAM and converted to the Initial Graphics Exchange Standard (IGES) data format, the Vectrix display system displays the drawings with variable viewing transformations, annotates and highlights the drawings and generates hard copy output without mainframe support. The base of the system includes a personal computer storing 256K bytes of main memory, one 360K-byte floppy disk and one 10M-byte hard disk, with two RS232C interfaces and one parallel printer interface. The proprietary VX/PC graphics processor supports 80 internal graphics primitives, 672-by-480-pixel resolution and 9-bit planes for 512-color display from a palette of 4,096 colors. The 13-inch, RGB monitor achieves a 42-Hz video-scan rate. Other system components include an 11-by-11-inch digitizer tablet with 200-point-per-inch resolution and an inkjet printer and plotter accommodating 8½-inch-wide rolled paper and four ink colors. Software executes personal-computing, communications, terminal-emulation, file-transfer, IGES-plotting and IGES data-conversion functions. $17,000. **Vectrix Corp.,** 2606 Branchwood Drive, Greensboro, N.C. 27408, (919) 288-0520.

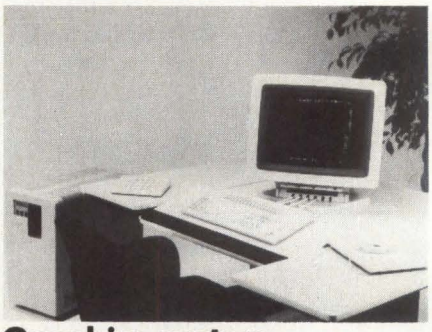
Circle 301

Workstations suit multiple protocols

- 650K-byte drive
- SNA, BSC compatible
- Dual processors

Compatible with 3270 SNA, 3270 BSC, 3780 and TTY-ASCII protocols, the Concept 1200 and 1400 workstations provide DEC VT100 terminal emulation. Accessing on-line information suppliers, public information utilities and mainframe environments, they support DISOSS and PROFS sessions. Equipped with 256K bytes of memory, the model 1200's dual-processor architecture facilitates compatibility; the 8088 microprocessor handles 16-bit MS-DOS software, while the Z80B delivers CP/M packages. Using the proprietary PC-Touch add-on board, it also runs PC-DOS programs. Both the 1200 and the 1400 run the H-DOS operating system and Lanier office-automation software. Employing the 8086 and Z80B microprocessors, the Concept 1400 operates as a dedicated word processor and as a network workstation. Storing 512K bytes of memory, the system runs the CP/M operating system. A 650K-byte disk drive and a 10M-byte Winchester disk drive are supported by both models. $3,200, Concept 1200; $4,500, Concept 1400. **Lanier Business Products Inc.,** 1700 Chantilly Drive N.E., Atlanta, Ga. 30324, (404) 329-8000.

Circle 302



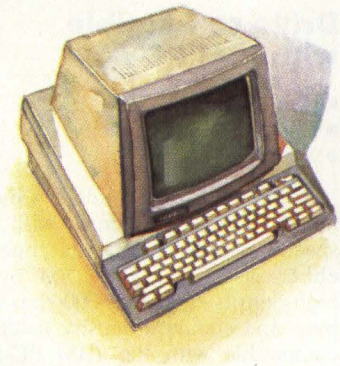
Graphics system emulates IBM 5080

- 256-color display
- VMEbus-based
- Antialiasing capability

Emulating the IBM 5080 Graphics System, the model 6080 workstation employs the VMEbus. Based on the proprietary OCEAN graphics engine, the system comes with 256K bytes of memory, expandable to 1.25M bytes. Its 19-inch, 60-Hz, non-interlaced display produces 256 colors from a palette of 4,096. Pixel resolution is 1,024 by 1,024; drawing speed, at 50 nsec. Compatible software includes CADAM Inc.'s CADAM and IPC packages, SDRC's CAEDS, McDonnell Douglas's Unigraphics and Precision Visual's DI-3000. Features include an antialiasing capability for vectors, multiple highlighting techniques, high-speed circle generation, hardware cursor, alphanumeric keyboard with 32 programmable function keys, 11-by-11-inch data tablet, eight continuous-turn control dials and optional local pan/zoom/scroll capability. $18,000, monochrome system; $22,000, 16-color system. **Adage Inc.,** 1 Fortune Drive, Billerica, Mass. 01821, (617) 667-7070.

Circle 303

Where does the Personal Terminal fit in?



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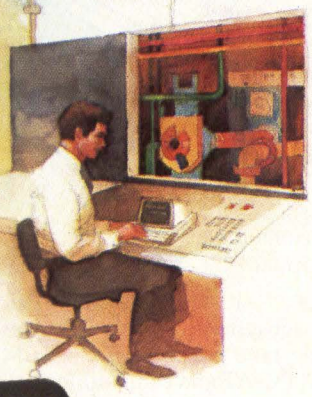

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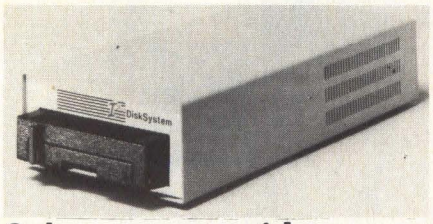
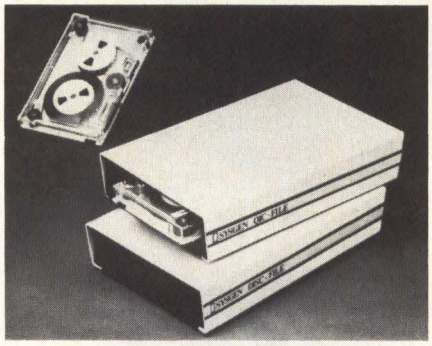
CIRCLE NO. 80 ON INQUIRY CARD



Subsystem provides removable storage

- Cartridge
- 10.5M bytes
- PC-AT-compatible

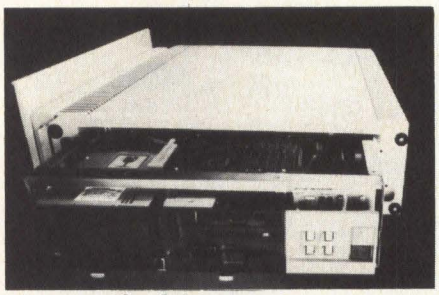
A removable cartridge disk system, the Winchester Disksystem stores 10.5M bytes per cartridge and provides multiuser capability to the IBM PC-AT. Fitting into the B drive of PC-AT, the drive achieves a track-to-track access time of 22.5 msec and an average access time of 90 msec, including head-settling time. Data transfer rate is 5M bps. External version of the unit is available for the IBM PC in primary or slave-drive configuration. $1,695. **Interface Inc.,** 21101 Osborne St., Canoga Park, Calif. 91304, (818) 341-7914. **Circle 304**



Subsystem executes tape backup

- 45M bytes
- IBM PC-compatible
- QIC-24 format

QIC-FILE, a half-height, cartridge-tape subsystem, offers 45M bytes of streaming tape backup for the IBM PC, PC/XT, PC-AT and compatible computers. Restoring and backing up data at 4M bytes per minute via ¼-inch streaming tape, the system offers mirror-image and file-by-file backup. In file-by-file backup mode, files are archived by file, groups of files, date or time. Comment lines for each file can be created. Supporting the QIC-24 format, the unit records in a nine-track serpentine mode. A "verification-on-the-fly," error-correction feature checks and, if necessary, rewrites transferred data. $1,395. **Sysgen Inc.,** 47853 Warm Springs Blvd., Fremont, Calif. 94539, (415) 490-6770. **Circle 305**



Upgrade kit suits DEC systems

- Streaming tape
- Floppy disk drive
- 22-bit addressing

Offering backup capabilities for DEC's Micro PDP-11 and MicroVAX, the Microsafe upgrade kit consists of a half-height, streaming-tape cartridge drive coupled with a half-height, floppy disk drive. Emulating DEC's TS11 contoller command set, the unit executes RT11, 10M-byte file backup in 7 minutes and 10M-byte device backup in 3 minutes. RSX backup of 31M bytes is performed in 8 minutes. The system supports 22-bit addressing. $3,500. **Micro Technology Inc.,** 1620 Miraloma Ave., Placentia, Calif. 92670, (714) 632-7580. **Circle 306**

Drives employ ST506 interface

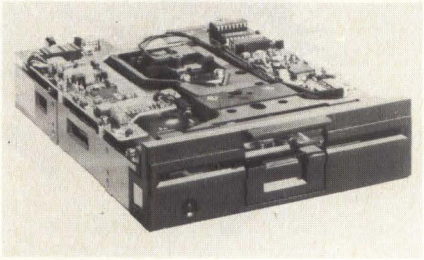
- 10M, 12M bytes
- 11,000-hour MTBF
- Half-height

Incorporating the ST506 interface, the models 512 and 525, 5¼-inch, half-height Winchester disk drives store 10M and 12M bytes, respectively. Model 512, using a linear positioning system, achieves a 23-msec track-to-track access time and a 65-msec average access time. Model 525, offering a 20-msec track-to-track access time and an 85-msec average access time, employs a rotary positioning system. Transferring data at 5M bps, both models reach an 11,000-hour MTBF and are based on a direct-drive, brushless DC spindle motor, a dynamically balanced motor/spindle assembly and shock-mounted baseplate to reduce vibration. The stepper and spindle motors are thermally isolated. $375, model 512, Q1000; $595, model 525, Q1000. **Disc Tech One Inc.,** 849 Ward Drive, Santa Barbara, Calif. 93111, (805) 964-3535. **Circle 307**

File system adds streaming tape

- 30M-byte disk drive
- 45M-byte tape drive
- 64K-byte controller

Combining a 30M-byte hard disk drive with a 45M-byte streaming tape drive, the model 6097 disk/tape file system offers a 30M-byte image backup and restore in 7 minutes. Employing SCSI, the system includes a 64K-byte buffered controller and menu-driven tape utility, file-level restore capability to any device, media and data protection via a dedicated landing zone and 56-bit error detection and correction. $5,700. **NCR Corp.,** Product Marketing, P.O. Box 20077, Wichita, Kan. 67208, (316) 688-8510. **Circle 308**



Drive compatible with IBM PC-AT

- Half-height
- 1M, 1.6M-byte capacity
- 96 tpi

The model M4854-1/3S 5¼-inch, half-height disk drive comes with a dual-speed, spindle motor that operates at either 360 rpm with 1.6M bytes and high-density media or 300 rpm with 1M byte and standard-density media. Plug-compatible with the IBM PC-AT, the unit has two magnetic heads and offers 10,416 bytes per track (high density) and 6,250 bytes per track (standard density). Track density is 96 tpi. A stepping motor and steel band facilitate a 3-msec track-to-track access time. $160. **Mitsubishi Electronics America,** 991 Knox St., Torrance, Calif. 90502, (213) 515-3993. **Circle 309**

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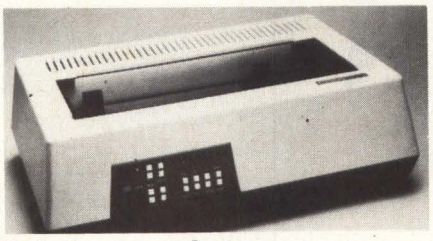
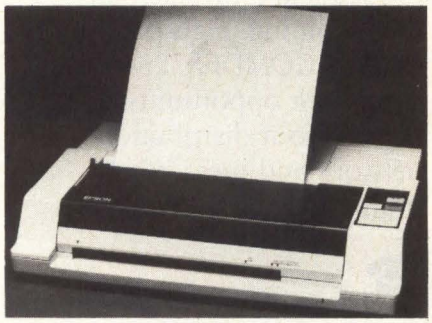
CIRCLE NO. 81 ON INQUIRY CARD



Printer emulates IBM 3287

- 180 cps
- SNA support
- Nine-wire printhead

The model CX3180 dot-matrix printer, which emulates the IBM 3287 printer, does not require an outboard protocol converter. It attaches directly to the IBM 3274 or 3276 cluster controller or 4331 display printer adapter via an IBM type A coaxial connector. It supports IBM BSC, SNA or SDLC environments as well as a transparent mode. Printing a 9-by-7-dot matrix at 180 cps, the bidirectional, logic-seeking unit generates 132 characters at 10 cpi, 158 characters at 12 cpi or 217 characters at 16.5 cpi. Its nine-wire printhead handles six-part forms and generates 500 million characters. Features include a Centronics-compatible parallel interface, LED indicators and a four-digit display prompt. Settings are stored in non-volatile memory. $3,195. **Datasouth Computer Corp.,** 4216 Stuart Andrew Blvd., Charlotte, N.C. 28210, (704) 523-8500. **Circle 310**



Plotter offers 42 commands

- 9 ips
- 10 colors
- Four pens

Compatible with Epson, IBM and Apple computer systems, this four-pen plotter provides 42 intelligent commands that reduce programming time required to produce pie charts, bar and line graphs, circles, arrows and arcs. Operating at 9 ips, the unit plots four of 10 available colors on U.S. and international-size papers and on acetate for overhead projection displays. It comes with a parallel interface. $599. **Epson America Inc.,** 3415 Kashiwa St., Torrance, Calif. 90505, (213) 539-9140. **Circle 311**

Matrix printer is Epson-compatible

- 130 cps
- 6-by-9-dot matrix
- 2K-byte buffer

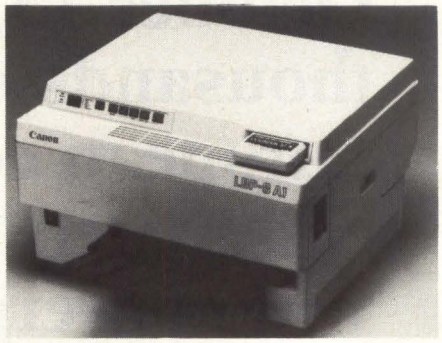
Printing 130 cps, the Alphacom Aero impact dot-matrix printer is compatible with graphics and business software that uses Epson RX80 printing protocols. Employing a nine-wire printhead, the unit prints either 480 or 960 dots per line in an alphanumeric mode allowing 96 ASCII characters or bit-image mode in a 6-by-9-dot matrix. Superscripts, subscripts, double strike, enlarged and emphasized type, underlines and print modes may be mixed on the same line. Pin-on-platen and friction feeds accommodate perforated computer and regular bond paper. The unit can print an original and up to three copies. Operator controls include power, on-line, form-feed and line-feed. Features include self-test, 2K-byte data buffer and path-seeking logic. $399.95. **Alphacom Inc.,** 2323 S. Bascom Ave., Campbell, Calif. 95008, (408) 559-8000. **Circle 312**

Printer creates presentation graphics

- Ink-jet printing
- 154 dpi
- Eight colors

Combining color printing and graphics processing, the LCP01 ink-jet printer forms business-presentation graphics on paper and transparencies. Employing the proprietary J-11 microprocessor and page-buffer memory, the printer requires 2 minutes to provide a hard-copy image on 8½-by-11-inch or European A4-size paper. The unit uses eight colors in up to 216 shades to produce 154-dpi resolution. Connecting to the host CPU via a standard RS232C interface, the printer feeds, processes and stacks 100 sheets of paper or 50 transparencies automatically. Noise level is 58 dB(a). The

proprietary DECslide, DECgraph, Datatrieve and PRO/Graphics Interface Descriptor Instruction Set (PRO/Gidis) software is supported as well as packages based on Remote Graphics Instruction Set, Gidis, North American Presentation Level Protocol and Bit-Map Image protocols. $14,595. **Digital Equipment Corp.,** 146 Main St., Maynard, Mass. 01754, (617) 897-5111. **Circle 313**



Laser printer generates 850 cps

- 300 dpi
- 55 dB(a)
- Electrophotography

The LBP-8 A1, a compact personal laser-beam printer, interfaces with IBM PC-compatible personal computers. Based on a laser-print engine and an electrophotography printing method, the unit uses a semiconductor laser, a rotating multifaceted mirror, focusing optics and replaceable proprietary EP cartridges. Printing over 850 cps or 8 ppm, the printer achieves 300-dpi resolution and operates at 55 dB(a). $3,500. **Canon U.S.A. Inc. Copier Products Division,** 1 Canon Plaza, Lake Success, N.Y. 11042, (516) 488-6700. **Circle 314**

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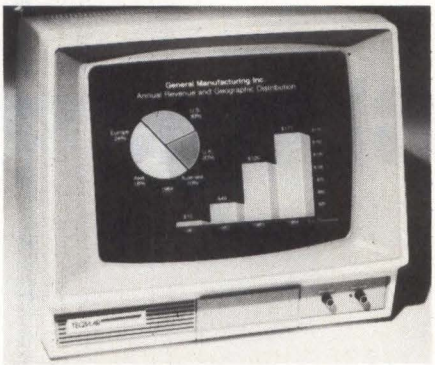

Monitor produces 640 by 480 pixels

- IBM PC-compatible
- High bandwidth
- 16 colors

Suited for engineering, software-development or CAD applications, the Tecmar color monitor's higher bandwidth and long-persistence phosphor reduces flicker and results in a more stable image. Working with the IBM PC and compatible systems, the monitor generates 16 colors and achieves 640-by-480-pixel resolution. The screen is switch-selectable from color to green for text material. The monitor complements the proprietary Graphics Master enhancement board, which is bundled with the PC Paintbrush software program. $795. **Tecmar Inc.,** 6225 Cochran Road, Cleveland, Ohio 44139-3377, (216) 349-0600.

Circle 315

Display station emulates IBM 5291

- Multifunction mouse
- Zoom control
- Light-pen function

The GBT 7700, an IBM System/34-, /36- and /38-compatible display station, offers an optional, 3-button mouse which features zoom control, vertical and horizontal scrolling, multidirectional cursor control and a light-pen function. Emulating the IBM 5291 terminal, the unit's 14-inch, green or amber screen displays 24 lines by 80 characters with a 25th status line in a 7-by-9-dot matrix. Display features include automatic dimming with on/off and individual brightness and contrast control. Operator features include audible alarm volume on/off, keyboard clicker volume and on/off and operator-selectable, IBM 5291 and 5251 keyboard alarm/clicker emulation. A record/play mode consists of a 96-character memory. The terminal provides user-generated characters for custom design of the cursor symbol, alternate, displayed character sets and forms generation. $1,650; $150 for mouse. **General Business Technology Inc.,** 1891 McGaw Ave., Irvine, Calif. 92714, (714) 261-1891.

Circle 316

Terminal handles spreadsheets

- Block mode
- 16 function keys
- 80, 132 columns

Accommodating word-processing, financial spreadsheets and editing functions, the ADM 12plus block-mode terminal is compatible with the TeleVideo 925, 950, 912 and 920 terminals and with the proprietary ADM 2, ADM 12 and ADM 13. The unit provides two pages of 80- or 132-column-by-24-line display memory, plus a 25th status line, or a choice of wide- and long-page memory

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configurations. A four-page memory option adds a 158-column-by-48-line display memory format. Offering a 12-inch, green or amber screen, the terminal includes variable-speed, vertical and horizontal scrolling, 400 bytes of dynamically-allocated, function-key memory and 16 programmable function keys, shiftable to 32. $745. **Lear Siegler Inc., Data Products Division,** 901 E. Ball Road, Anaheim, Calif. 92805, (714) 778-3500.

Circle 317

Terminal offers 64 function keys

- 80 or 132 columns
- Block graphics
- 14-inch screen

Accommodating office-automation applications such as word processing, data entry and information retrieval, model 955 displays 24 lines by 80 or 132 columns in a 7-by-9-dot matrix on a 14-inch, amber screen. Two sets of 32 programmable function keys permit switching between applications without reprogramming. Storing up to four pages of memory, the unit generates 128 ASCII and 128 graphics characters. Features include block graphics, vertical scrolling, silent convection cooling, software-selectable baud rates up to 38.4K bps, cursor control, embedded and non-embedded visual attributes, screen timeout and two RS232C serial interfaces. $699. **TeleVideo Systems Inc.,** 550 E. Brokaw Road, San Jose, Calif. 95112, (408) 971-0255.

Circle 318

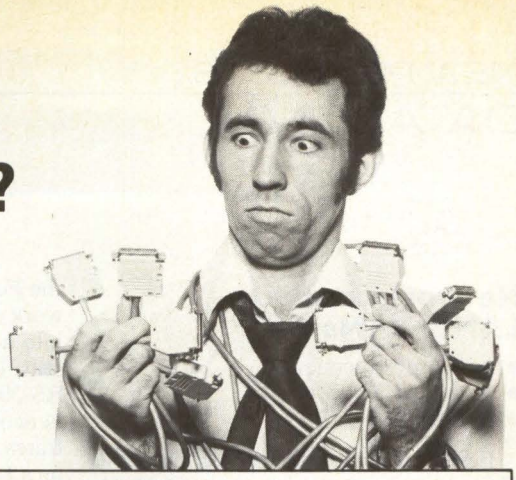
Editing terminal has multiple emulations

- 16 functions
- 14-inch screen
- Block mode

Emulating the Hazeltine 1500, the Lear Siegler ADM 3A/5 and the TeleVideo 910, the QVT-101 terminal provides 16 host or user-programmable functions and a 14-inch green screen. Features include block-mode data transmission, bidirectional printer port, RS232 interface, foreign character sets and a detached, low-profile, DIN-standard keyboard with adjustable height. Amber screen and current loop or RS422 interfaces are optional. $400. **Qume Corp.,** 2350 Qume Drive, San Jose, Calif. 95131, (408) 942-4000.

Circle 319

SWITCHING TERMINALS A PROBLEM?



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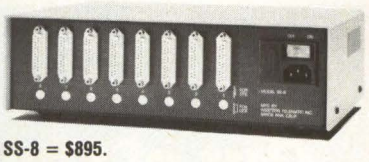
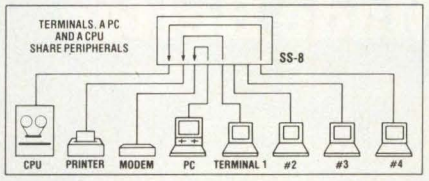
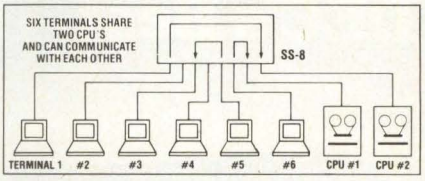


Here's an affordable way to switch up to eight RS232 ports in any interconnection. Any port can select any other port, with up to four pairs communicating at the same time. "User friendly" commands aid in port selection, port status and sign-off. The unit even signals you when the port you wanted is no longer busy. Push buttons define each port as either DTE or DCE, for quick and easy installation.

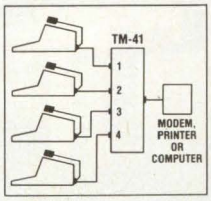
Model SS-8 = $895.





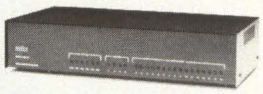
4 PORT PUSH BUTTON SWITCHING

Fed up with the hassle of plugging and unplugging data cables or running around flipping switches on a mechanical box? The TM-41 electronic switch is capable of switching common RS232 signals between 4 input ports and 1 output port to select a printer, modem or computer.



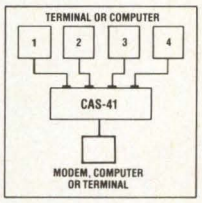
Model TM-41 = $295.

4 TO 64 PORT CODE ACTIVATED SWITCHING



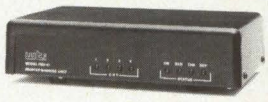
Let your computer do the switching... automatically!

The CAS-41 lets your computer select one or any combination of up to 4 RS232 ports by a user selectable code sequence. The CAS-161 offers the same capabilities with 16 ports which can expand to 32, 48 or 64 ports.



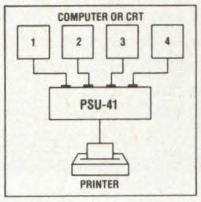
Model CAS-41 = $395.
Model CAS-161 = $795.

PRINTER SHARING UNIT

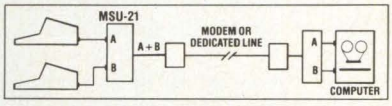


The PSU-41 allows up to 4 computers or CRTs to share one printer. It scans each port until the data has been sent to the printer, then resumes scanning.

Model PSU-41 = $395.



2 TERMINALS SIMULTANEOUSLY SHARE ONE MODEM!



The MSU-21 allows 2 ASCII terminals to simultaneously share one modem or data line. **MSU-21 = $295.**

AB MINI SWITCH...$89.00

The ABS provides economical push button switching between two ports A & B, and a common port.

AND MUCH MORE!

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- Multiplexers
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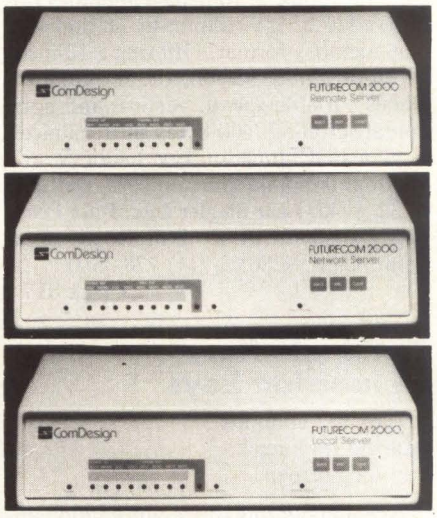
CIRCLE NO. 84 ON INQUIRY CARD

Network connects LANs, WANs

- Password protection
- 19.2K-bps support
- RS232 links

Based on the proprietary Compatible Communications Architecture protocol, the FutureCom 2000 integrated area network connects multiple LANs and WANs into a single network. The network consists of the LS-2000 local server, the RS-2000 remote server and the NS-2000 network server. The local server concentrates data traffic from up to 32 devices on a LAN. The remote server establishes



virtual-circuit connections between user resources in WANs. Working with the network server, the remote server allows access to resources attached to LAN nodes. Dynamic resource access permits request to access to another resource on the same or different on-line nodes. The remote server uses logical names without needing to know where the resource resides. The remote server connects up to 32 channels, with four RS232 concentrated links. As a gateway node bridging different, and normally incompatible, transmission media, the network server functions as an Ethernet controller with one Ethernet link and up to four RS232 wide-area links. Providing password-protection security, the network supports 19.2K-bps data transfer speeds and asynchronous speeds from 300 to 9,600 bps per channel. $5,800, NS-2000; $4,300, LS-2000; $3,800, RS-2000. **ComDesign Inc.,** 751 S. Kellogg Ave., Goleta, Calif. 93117-3880, (805) 964-9852. **Circle 320**

Concentrators handle 16 terminals

- X-on/X-off support
- CTS/DTR control
- 9,600-bps lines

Enabling from two to 16 asynchronous terminals to share a single transmission line, the Series B line of data concentra-

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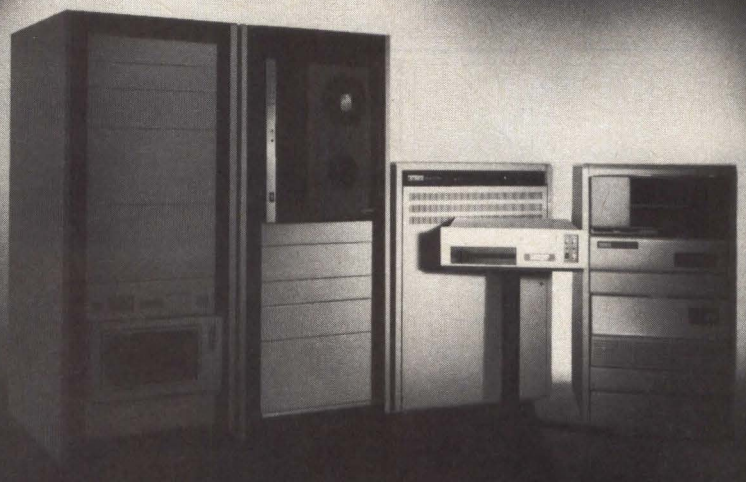

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tors buffers data prior to transmission, transmits variable-length blocks, checks data received on 9,600-bps lines and requests retransmission in the event of error. Features include command port, autobaud and speed conversion, satellite transmission optimization, data compression and diagnostics. The command port performs monitoring, test and control functions while the terminal-activated channel test allows any terminal attached to the concentrator to check the system. The concentrators support X-on/X-off or CTS/DTR flow control. $1,450 to $7,050, two-to-eight-channel versions. **Black Box Corp.**, P.O. Box 12800, Pittsburgh, Pa. 15241, (412) 746-5500. **Circle 321**

Modem runs at 19.2K bps

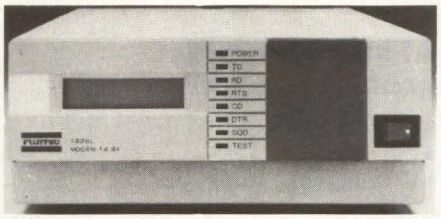
- Multiplexer
- Addressable analogs
- Digital loopbacks

Operating synchronously at 9,600, 12K, 14.4K, 16.8K and 19.2K bps or asynchronously using an async-to-sync converter, the DSP 19200M data modem accommodates four-wire, type 3002 leased telephone lines with D1 conditioning. Offering an eight-port data multiplexer, the modem employs error correction based on trellis coding. Diagnostic tests include addressable analog and digital loopbacks, bit-error rate and polling tests with error-count display on the front panel. $12,000. **NEC America Inc.**, 8 Old Sod Farm Road, Melville, N.Y. 11747, (516) 753-7000. **Circle 322**

Modem operates at 14.4K bps

- Full-duplex
- CCITT V.29 standard
- Six-channel multiplexer

Accommodating four-wire, leased lines, the model M1926L 14.4K-bps, full-duplex, Trellis-coded modem runs at fallback speeds of 9,600, 7,200 or 4,800 bps. Conforming to the CCITT V.29 standard, the modem includes a six-channel multiplexer that allows up to six 2,400-bps channels to be transmitted simultaneously over a single leased telephone line. The unit serves point-to-point, multiport or multiport polling system configurations and provides an automatic adaptive equalizer that adapts to transmission line characteristics on a



continual basis. It can bridge dropouts of up to 2 seconds. Features include LED indicators, an LCD, an eye-pattern generator and diagnostics that test six different loops and complete network bit-error rate. $6,875. **Fujitsu America Inc.**, 3055 Orchard Drive, San Jose, Calif. 95134-2017, (408) 946-8777. **Circle 323**

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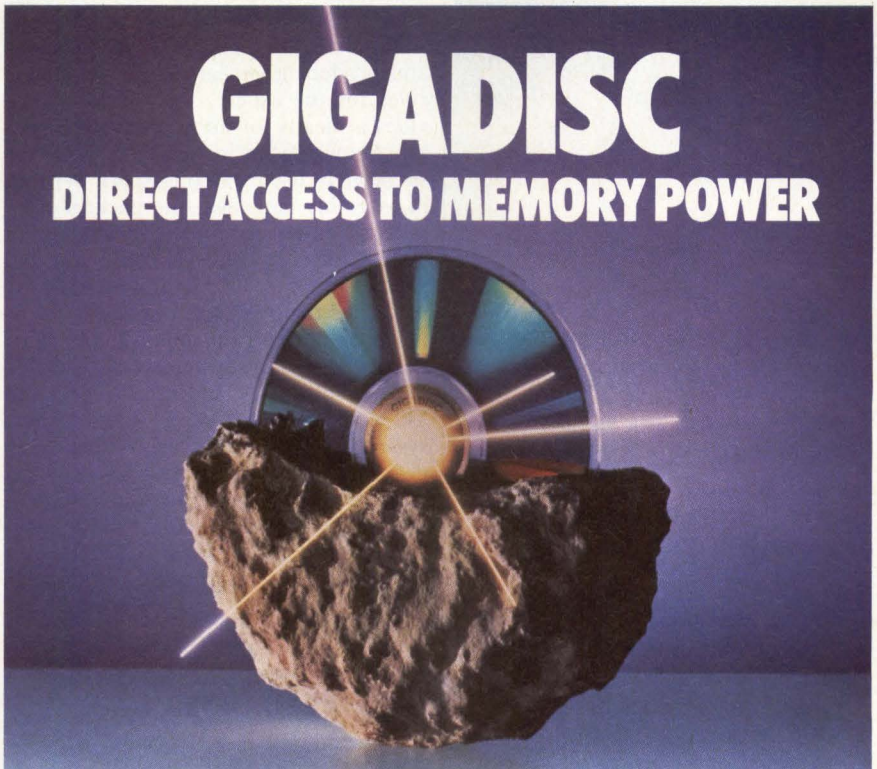

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CIRCLE NO. 86 ON INQUIRY CARD

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CIRCLE NO. 87 ON INQUIRY CARD

NEW PRODUCTS
SOFTWARE

AI software aids problem-solving

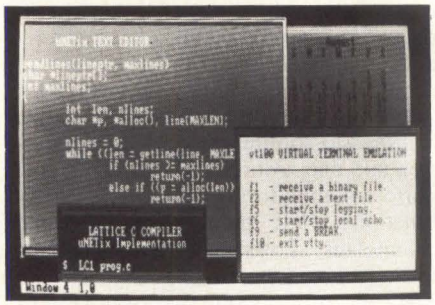
- 16,000 rules
- 256,000 facts
- IBM PC-compatible

Requiring no programming ability, Autologic software helps to solve diagnostic, policy-interpretation and decision-making problems by analyzing cases and producing logical, English-language rules for the expert. The software provides a means for an expert to incorporate knowledge in an "expert system" for subsequent use by a non-expert. Written in assembly language, the package consists of three parts: the development system, the knowledge modules and the playback module. It requires an IBM PC or PC-compatible for development or playback. Producing up to 16,000 production rules, the system stores 256,000 facts, 4,096 cases and conclusions and 512 conditions per case. A full expert system can be stored on a 5¼-inch floppy disk. Each question and answer is explained with a 736-character help screen. $795, development system; $150, playback utility. **KDS Corp.,** 934 Hunter Road, Wilmette, Ill. 60091, (312) 251-2621. **Circle 324**

Windowing software suits XENIX OS

- 10 windows
- Pan function
- Data-transfer facility

Operating on the IBM PC-AT and the

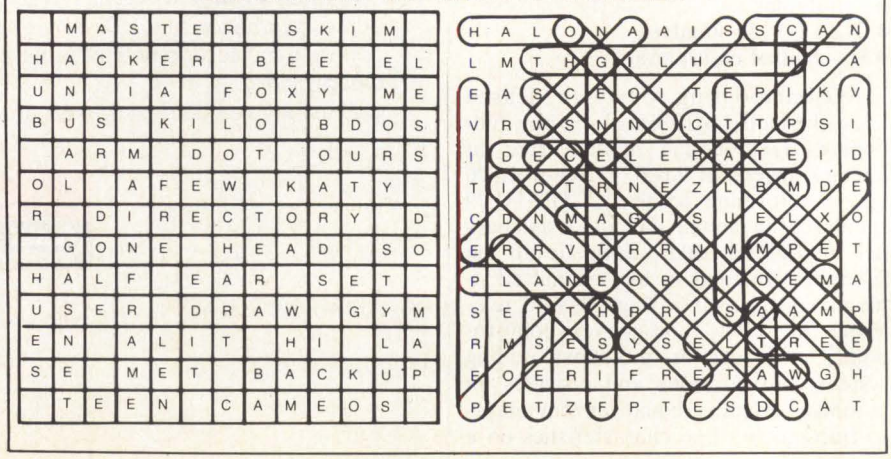


IBM PC/XT running the XENIX operating system, Viewnix software configures up to 10 windows that can be expanded, contracted or overlapped. A pan function scans over a larger, underlying window buffer should too much displayable data appear on the screen. A cut-and-paste capability facilitates integration of data between different applications while a data-transfer facility copies a block of data from one window and types it into a process running in another window. When in window-management mode, a status line displays the currently selected window-management function. Additional features include a border toggle, color monitor support and caps lock and numeric lock settings. $249. **Five Paces Software Inc.,** 9635 Wendell Road, Dallas, Texas 75243, (214) 340-4933. **Circle 325**

Software executes problem-solving

- Report generator
- Linear analysis
- Calculus functions

ANSWERS TO MAY'S PUZZLE

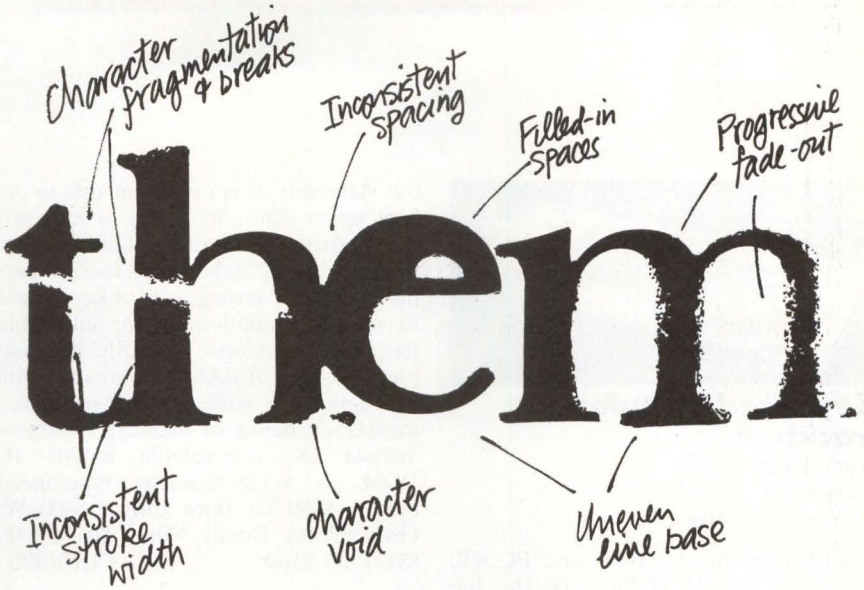


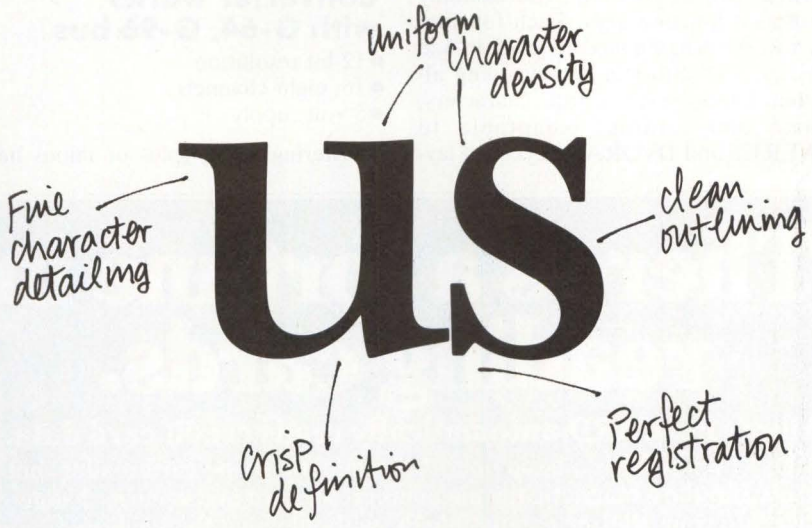
Running on the IBM PC, PC/XT and compatibles with 256K bytes of RAM, the Formula/one problem-solving package calculates complex mathematical equations. DOS-like commands permit on-screen editing of text and data while a "context-sensitive" HELP function provides on-line information clarifying the specific feature that the user is operating on the program. These two features enable setting up problems, varying assumptions, solving equations, plotting graphs and computing unknown variables in formulas and models. The package provides a full set of system-defined statistics, calculus functions and capabilities for performing multiple, linear-regressions analyses. A report generator creates customized displays, reports and graphs without intermediate word processing. Based on a Binary Code Decimal Arithmetic which ensures 14-digit accuracy, the program offers an error-locating feature. $395. **Alloy Computer Products Inc.,** 100 Pennsylvania Ave., Framingham, Mass. 01701, (617) 875-6100. **Circle 326**

Drafting system runs on VAXstation I

- Display control
- Geometric manipulation
- Database management

A 2-D drafting software system for use with DEC's VAXstation I workstation, ANVIL-3000D's geometric-construction capability creates points, lines, circles, conics, splines and polygons. It allows combinations of translations, rotations, duplications, mirroring, scaling and stretching for placement of entities created by construction. A display-control feature generates 3-D drawings, enhanced by isometric projection, automatic shaft end-view generation and sectioning with zoom capability. The package's Interactive Configurator defines the environment to only those portions of the software that relate to a particular design or drafting operation. The analysis portion of the software includes automatic calculation of perimeter, area, center of gravity, moments, radius of gyration and extent on any configuration. Database-management facilities support the Initial Graphics Exchange Standard. $8,750. **Digital Equipment Corp.,** 146 Main St., Maynard, Mass. 01754, (617) 897-5111. **Circle 327**





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CIRCLE NO. 88 ON INQUIRY CARD

SUBASSEMBLIES

Keyboard includes trackball

- 2K RAM
- 4K ROM
- 10 function keys

Suited for the IBM PC and PC/XT, and the Apple II, II Plus and IIe, the combination SmartBoard intelligent keyboard and proprietary Smartball trackball allocates 252 bytes to 10 horizontally positioned function keys. Each function key can be programmed to contain 126 characters of information, including alphabet characters, control characters, spaces and returns. Adaptable to QWERTY and DVORAK keyboard layout standards, it is programmable to accept up to eight characters in four primary directions and includes dual memory banks. A key-swap feature permits exchange among pairs of keys to aid in mouse emulation or for clustering frequently used keys. A BASIC key enables inputting of BASIC commands with two keystrokes while a mode-select key toggles six banks of memory. Features include 2K, non-volatile RAM; 4K ROM; and a 128-character, type-ahead buffer. $399.95. **Wico Corp.,** 6400 W. Gross Point Road, Niles, Ill. 60648, (312) 647-7500. **Circle 328**

Converter works with G-64, G-96 bus

- 12-bit resolution
- 16, eight channels
- 5-volt supply

Offering 12-bit (plus or minus half a bit) resolution, the GESADC-2 analog-to-digital converter conforms to the single-height, Eurocard form factor and is compatible with the G-64 and G-96 bus. Achieving a conversion time of 30μsec, the board accommodates 16 single-ended or eight differential channels. The unit is built around a hybrid analog module that incorporates an input multiplexer, input amplifier, sample and hold and a successive approximation converter. Equipped with a DC/DC converter, the board operates from a single 5-volt power supply and provides a floating analog power supply to the converter module. $695. **Gespac Inc.,** Suite 11, 100 W. Hoover St., Mesa, Ariz. 85202, (602) 962-5559. **Circle 329**

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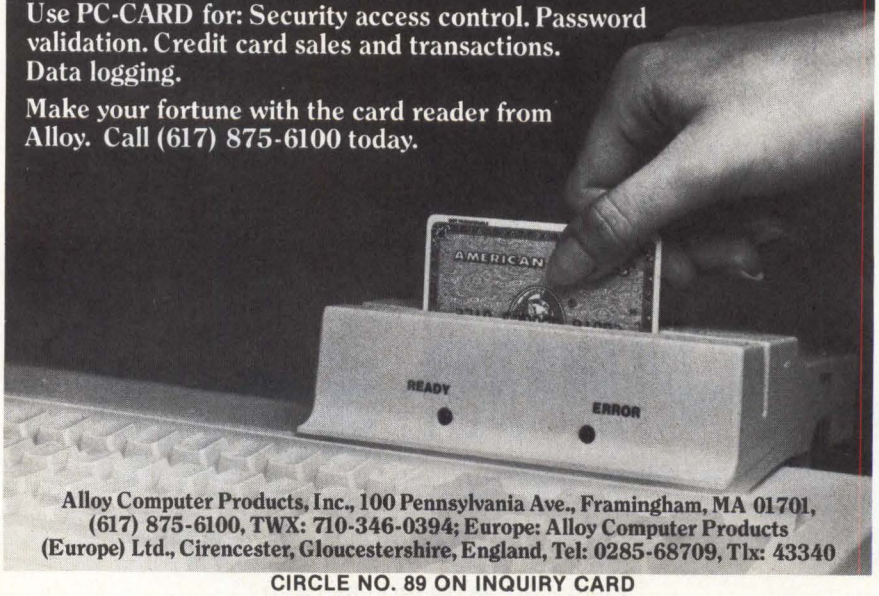
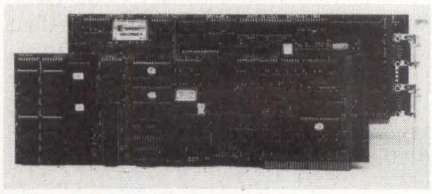


Alloy Computer Products, Inc., 100 Pennsylvania Ave., Framingham, MA 01701, (617) 875-6100, TWX: 710-346-0394; Europe: Alloy Computer Products (Europe) Ltd., Cirencester, Gloucestershire, England, Tel: 0285-68709, Tlx: 43340

CIRCLE NO. 89 ON INQUIRY CARD



Controllers provide 16, 256 colors

- 68000 CPU
- IBM PC-compatible
- CAD/CAM applications

Drawing images at 1 million pixels per second, the M-16 and M-256 graphics controllers offer 16 and 256 colors, respectively, from a palette of 4,096. The controllers, employing the 68000 CPU, suit CAD/CAM/CAE, scientific-engineering, and business-presentation-graphics applications. Working with the proprietary 60-Hz, non-interlaced, model CD-1 RGB display, the controllers produce 640-by-480-pixel resolution. The units are IBM PC/XT- and PC-AT-compatible. $2,250, M-16; $2,850, M-256. **Verticom Inc.,** 545 Wedell Drive, Sunnyvale, Calif. 94089, (408) 747-1222. **Circle 330**

I/O board produces 64 colors

- Image processing
- 60-Hz input
- IBM PC-compatible

A video-frame grabber and display

board for the IBM PC and PC/XT, the model DT2803 captures a 256-pixel-by-256-pixel-by-6-plane, black-and-white image. Its RGB output handles 64 colors by 64 intensities and includes cursor control. Combined with the proprietary Videolab software package, the board meets robotics, image-processing and graphic-arts requirements. Via RS170, 60-Hz or CCIRR, 50-Hz input signals, the board digitizes a video field every 1/30 second. Captured images are converted at 5 MHz into 6-bit pixels, each pixel representing one of 64 possible gray levels. Four input look-up tables control color- and gray-level intensities. $1,495. **Data Translation,** 100 Locke Drive, Marlboro, Mass. 01752, (617) 481-3700.

Circle 331

Disk emulator stores 2M bytes

- CP/M-compatible
- Parity checking
- Battery backup

A computer peripheral hardware and software disk-emulator package that increases computer-system operation rates, the SemiDisk stores 2M bytes and is expandable to 8M bytes. Acting as a disk drive, the board is compatible with the IBM PC, PC/XT and PC-AT; PC-compatible systems; the Epson QX-10 system; the S-100 bus and TRS-80 models II, 12 and 16. The standard driver software links into CP/M and CP/M B operating systems. Drivers are built into TP/M 3 and VALDOCS 2 operating systems. Features include arbitrary drive assignment, battery backup provision and parity checking. $2,499. **SemiDisk Systems Inc.,** P.O. Box GG, Beaverton, Ore. 97075. (503) 642-3100.

Circle 332

MegaRam Disc Emulator

Revolutionary, Non-rotating, Solid-state Replacement for Fixed or Moving Head Discs.

- Capacities from 2 megabytes to 40 megabytes in 2 megabyte increments.
- Up to 10 megabytes in a 7" chassis.
- Battery back-up.
- Streaming drive back-up in 7" chassis.

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• SEL • CDC (System 17)

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• Alpha Data

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• Data Acquisition • Swapping Files • Automated Test Equipment • Graphics • Array Processors

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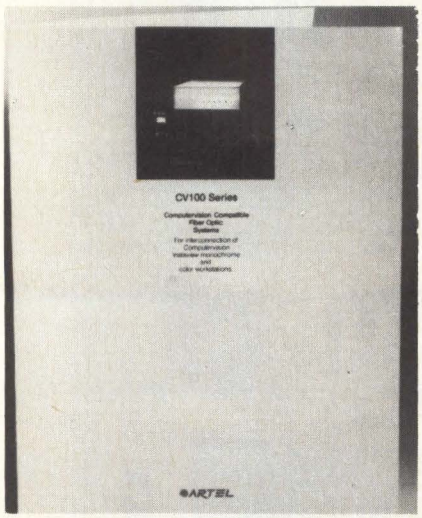
CIRCLE NO. 90 ON INQUIRY CARD



Brochure discusses fiber-optic systems

Describing the first fiber-optic system designed for Computervision Corp.'s Instaview color and monochrome CAD/CAM workstations, the "CV100 Series" four-color brochure explains how the Artel fiber-optic systems replace coaxial and ribbon data cables used to interconnect the Computervision graphics processor and the Instaview workstations. The brochure discusses advantages of using fiber optics over coaxial and ribbon cables. **Artel Communications Corp.,** P.O. Box 100, West Side Station, Worcester, Mass. 01602, (617) 752-5690.

Circle 333

Booklet explains software

"The ABCs of Communications Software" is a 20-page reference guide that covers communications software and outlines the options available for expanding personal computer communications capabilities. Describing the hardware needed to establish communication between a personal computer and mainframes, minicomputers and other personal computers, the booklet discusses communication software capabilities, sending and receiving messages, modems, transmission speed, terminal emulation, text transfer and dialogue support. The booklet provides a glossary of 50 words and acronyms. **Software Synergy Inc.,** 466 Main St., New Rochelle, N.Y. 10801, (914) 633-0400.

Circle 334

Guide profiles public databases

A reference guide for comparing and selecting databases, the *Datapro Complete Guide to Dial-Up Databases* lists more than 1,400 publicly accessible databases in over 200 subjects, discusses 15 major on-line information services and reports on the latest technology affecting the industry. Arranged in alphabetical order by product name or acronym, each database profile provides a description and a name, address, telephone number and contact person of the organization that compiled the database, the type of organization, application emphasis, the scope of coverage, format of storage, frequency of updates, cost to the user, training, installation, documentation services and vendors. $145. **Datapro Research Corp.,** 1805 Underwood Blvd., Delran, N.J. 08705, (800) 257-9406.

Circle 335

Directory details CAE software

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9-12 **"Knowledge-Based Systems and Artificial Intelligence Course,"** Los Angeles, offered by Integrated Computer Systems. Contact: Integrated Computer Systems, 6305 Arizona Place, P.O. Box 45405, Los Angeles, Calif. 90045, (800) 421-8166; inside California, (800) 352-8251. Also to be held July 23-26, Boston; July 30-August 2, San Diego.

10-12 **World Computer Graphics '85 Exposition and Conference,** New York Coliseum, New York, sponsored by the World Computer Graphics Association and the National Computer Graphics Association. Contact: American Communications Group Inc., Suite 690, 8300 Greensboro Drive, McLean, Va. 22102, (703) 893-4545.

14-27 **"Relational Database Machine Architecture" Seminar,** Les Arcs, France, cosponsored by Wayne State University and the NATO Advanced Study Institutes Program. Contact: Arun K. Sood, Department of Electrical and Computer Engineering, Wayne State University, Detroit, Mich. 48202, (313) 577-2150.

15-18 **1985 National Computer Conference (NCC '85),** McCormick Place, Chicago, sponsored by the American Federation of Information Processing Societies Inc. (AFIPS), Association of Computing Machinery (ACM), Data Processing Management Association (DPMA), IEEE Computer Society and Society for Computer Simulation (SCS). Contact: Cathy Shippert, AFIPS, 1899 Preston White Drive, Reston, Va. 22091, (703) 620-8926.

22-26 **Summer Computer Simulation Conference and Exhibits,** Westin Hotel, Chicago, sponsored by The Society for Computer Simulation (SCS). Contact: Charles A. Pratt, SCS, P.O. Box 2228, La Jolla, Calif. 92038-2228, (619) 459-3888.

22-26 **Siggraph '85: The Twelfth Annual Conference on Computer Graphics and Interactive Techniques,** San Francisco, sponsored by the Association for Computing Machinery's Special Interest Group on Computer Graphics in cooperation with Eurographics and the IEEE Technical Committee on Computer Graphics. Contact: Ellen Frisbie or Sheila Hoffmeyer, Conference Services Office, 111 E. Wacker Drive, Chicago, Ill. 60601, (312) 644-6610.

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7-9 National Computer Training and Education Conference and Exposition (COMTRED '85), Philadelphia Civic Center, Philadelphia, sponsored by National Computer Education Expositions Inc. (NCEE). Contact: NCEE, Suite 200, 1411 Walnut St., Philadelphia, Pa. 19102, (215) 972-8792.

13-15 Computer Graphics '85 East, Bayside Exposition Center, Boston, sponsored by the National Computer Graphics Association (NCGA). Contact: Chris Radiske, NCGA, Suite 601, 8401 Arlington Blvd., Fairfax, Va. 22031, (703) 698-9600.

26-29 Integrated Information Technology Conference and Exposition (INTECH '85), Moscone Center, San Francisco. Contact: Jill Nieman, National Trade Productions Inc., Suite 400, 2111 Eisenhower Ave., Alexandria, Va. 22314, (703) 683-8500 or (800) 638-8510.

SEPTEMBER

9-11 The Eighth Annual Federal Computer Conference, Washington, D.C. Convention Center, sponsored by the National Council for Education on Information Strategies. Contact: Dallas Kinney, Conference Communications, P.O. Box N, Wayland, Mass. 01778, (617) 358-5356.

16-20 FOC/LAN '85, The Ninth International Fiber Optic Communications and Local Area Networks Exposition, Brooks Hall/Civic Auditorium, San Francisco, organized by Information Gatekeepers Inc. Contact: Information Gatekeepers Inc., 138 Brighton Ave., Boston, Mass. 02134, (617) 787-1776.

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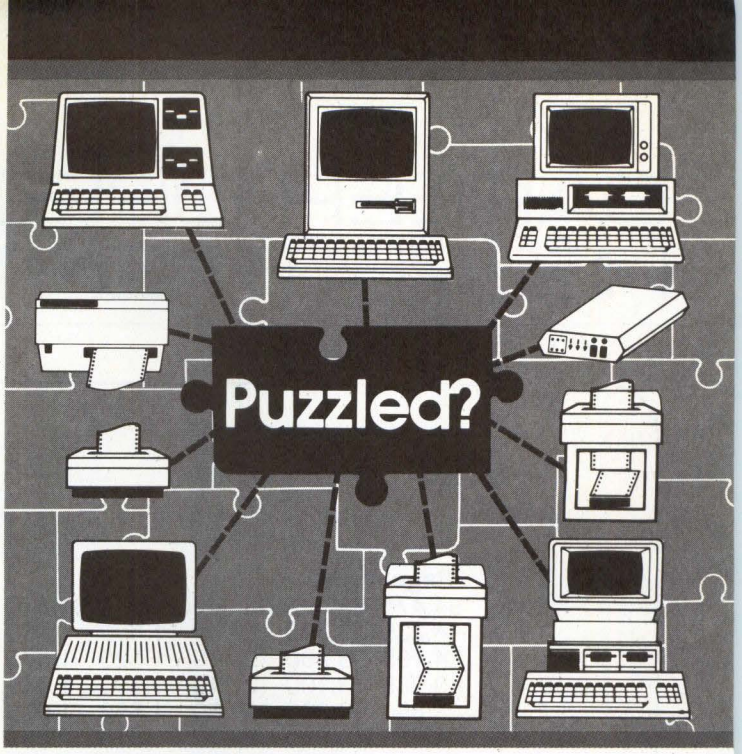

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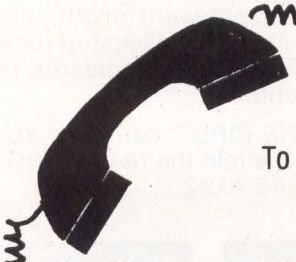

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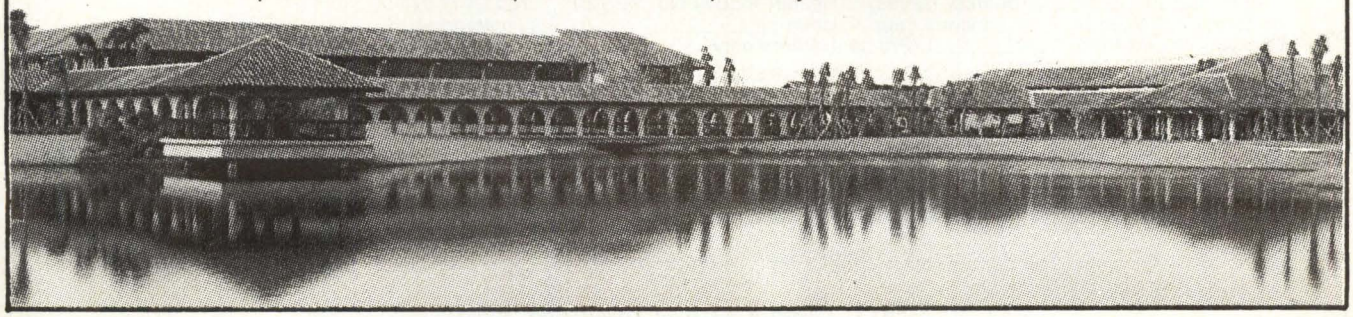

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CREATE A LIMITED AREA NETWORK WITH RS232 PORTS, SWITCHES

Carl Warren, Western Editor

If you're planning on wiring together several systems or peripherals, you might want to consider a less-expensive alternative to local area networks: the RS232C "limited area network (LmAN)."

Unlike local area networks (LANs), which deliver data-transfer rates from 56K bits per second (bps) to 10M bps, LmANs operate at asynchronous serial speeds of 9,600 baud. Although relatively slow, 9,600 baud still delivers information in reasonable time. For example, a 10,000-character file transfers at 9,600 baud in slightly over 10 seconds, which is fast enough for common applications.

Another factor to consider when choosing between a LAN and a LmAN is the cost per connection. LAN connections range from $200 to $5,000, depending on the type of equipment. In contrast, a LmAN connection usually relies on the standard RS232C serial port found on most systems. Thus, the only hardware cost may be a serial cable with DB-25 connectors, which is available for less than $100.

There are other costs associated with the LmAN, however. Typically, those costs are related to the type of extensions used (e.g., cables, switches, etc.), as well as to the complexity of the software.

You can extend the LmAN in a number of ways. On an IBM Corp. PC or similar system, you can add extra serial ports. The PC architecture allows up to two ports (COM1 and COM2), thus limiting the number of serial devices that can be attached. However, the serial ports can be extended to more than two devices by employing RS232C switches, which can be coupled together to form a matrix of devices.

RS232C switches typically come in two forms—dumb (manual) and intelligent—and range from two ports to as many as 16 ports. Thus, by adding switches, a single serial port can be extended to handle many devices.

Obviously, a manual switch isn't as convenient as an intelligent one because it requires human intervention and a detailed understanding of the network matrix. The typical intelligent switch allows defining attached devices by name, thus allowing access by simply requesting "printer1," for example. Multiple intelligent switches can be matrixed together to extend the network. As long as no conflicts in names exist, applications can get to any device on the matrix by name.

However, the software can be complex. Few application programs allow the proper passing of commands to a remote device from within an application. Examples of packages that do are Ashton-Tate's dBASE II/III and Framework.

Application programs such as MicroPro International Corp.'s Wordstar word-processing software will talk to just about any device if a special driver is incorporated in the user-defined function area. Thus, in print mode, you could pass an ASCII string by typing "PRINTERn," where n is the desired printer number somewhere on the LmAN matrix.

What's more, using intelligent RS232C switches allows you to use their built-in device commands for control. High-level languages such as BASIC or Pascal can be employed to create the control program. In addition, you can create tailored files that use your LmAN matrix in different ways, and execute them as the application changes.

For systems that use MS-DOS, or a UNIX-like operating system that allows the creation of batch command files, you can be even more inventive. You could, for example, create a batch file that is a menu specifying a variety of devices and programs. This means that you would use the redirection functions of DOS to define a device.

Another method of creating a LmAN takes advantage of an intelligent add-in board on the system. For the IBM PC environment, the process is fairly simple. Numerous boards that provide 3270 emulation are available for the PC. Typically, these boards, such as the Emulex Corp. DCP88, provide asynchronous/synchronous ports, microprocessor control on the board and RAM for storing programs and data. Due to this extra onboard intelligence, these boards become ideal for creating LmANs.

Solved a hardware or software integration problem lately? If so, other *Mini-Micro Systems* readers would like to know about it. Please send your integration notes to Carl Warren, Western Editor, *Mini-Micro Systems,* Suite 236, 12233 W. Olympic Blvd., Los Angeles, Calif. 90064. (213) 826-5818, Ext. 307.

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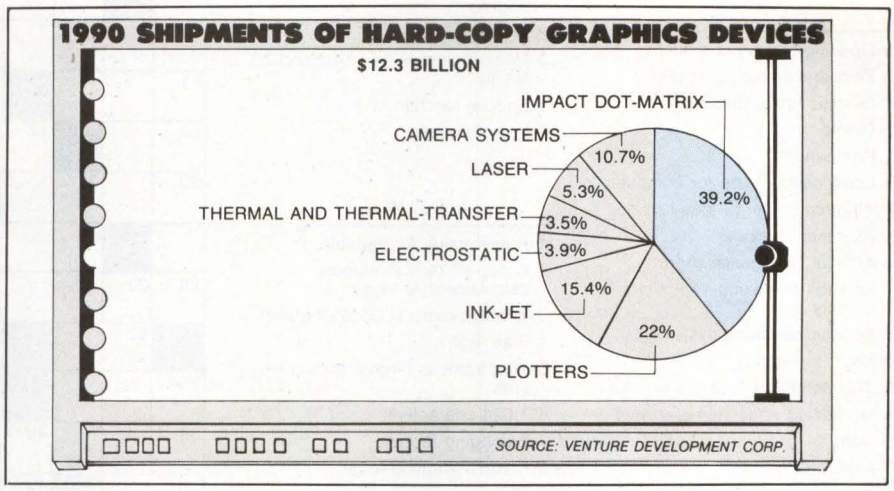
MARKET TRACK

Sharon Hassell
Assistant Editor

Hard-copy graphics market to reach $12.3 billion

The hard-copy graphics market-consisting of plotters, printers and camera systems will be worth $12.3 billion in 1990, according to a recent study by Venture Development Corp. (VDC), Natick, Mass. The 1990 figure represents a 78 percent increase over the 1984 market.

According to VDC, camera systems will be the fastest growing product segment of the hard-copy graphics market. Representing 2.1 percent of the market in 1984, camera systems including entry-level graphics, presentation graphics and commercial graphics will claim 10.7 percent of the 1990 market. Of the four types of camera systems, entry-level graphics will experience the most dramatic growth says VDC. Plotters, including drum, fixed- and moving-media flatbed devices, are expected to be the second fastest growth segment of the market.



Although camera systems and plotters will show the highest growth rates through 1990, graphics printers will continue to dominate the hard-copy graphics market. In 1984, impact dot-matrix graphics printers captured 59.8 percent of the market. In 1990, impact printers' 39.2 percent share will still lead the market, but by a smaller margin.

The VDC study forecasts shipments in units and dollars through 1990 and profiles hard-copy graphics users. The study also gives industry background, a product and technology discussion, recommendations for competitive strategies and vendor profiles. □

Computer graphics boost art, design and drafting techniques

Computer graphics for art, design and drafting will become a mass market between 1985 and 1990 according to consulting company Davis Inc., Washington. Results of a recent Davis study indicate that by 1990, over 20 percent of all artists, designers and draftsmen will regularly use computer graphics to produce commercial art.

The end product in art, design and drafting, traditionally evolves from idea to finished form through a sequence of steps involving paper, pens, templates, transfer lettering and mounting boards. This creative evolution requires highly developed manual skills as well as expertise with low-technology transfer equipment such as photostat cameras.

In the past, these transfer functions proved easier to automate than did the more creative steps in art and design. However, according to Davis, it is now more cost-effective to execute, store, process, transport and deliver visual information in a digital, computer graphics form than to use traditional creative methods and materials.

Davis says the shift toward increased use of computer graphics will affect art, design and drafting in several important ways. For example, mechanicals for transparencies will become computer graphics titles, charts, tables, diagrams, illustrations and special effects, and archives of maps and engineering drawings will become electronic databases for facilities and products. Press type, stock visuals and plastic templates will become digital typography, symbol and image libraries and electronic design and drafting functions; typesetting, layout and paste-up will become electronic page makeup and image setting; and copy stands and photostat cameras will become solid-state cameras, scanners, computer-data replication and image processing.

According to the study, computer graphics technologies will first assist and then displace conventional methods of generating, changing, converting and distributing art, design and drafting products. Davis says the trend is toward low-cost computer graphics workstations that meld the features of audiovisual, print/publishing, architectural, engineering and design applications and provide capabilities to link personal workstations with remote production and distribution systems.

Interest Quotient (Circle One)
High 486 Medium 487 Low 488

ARTFUL INTELLIGENCE

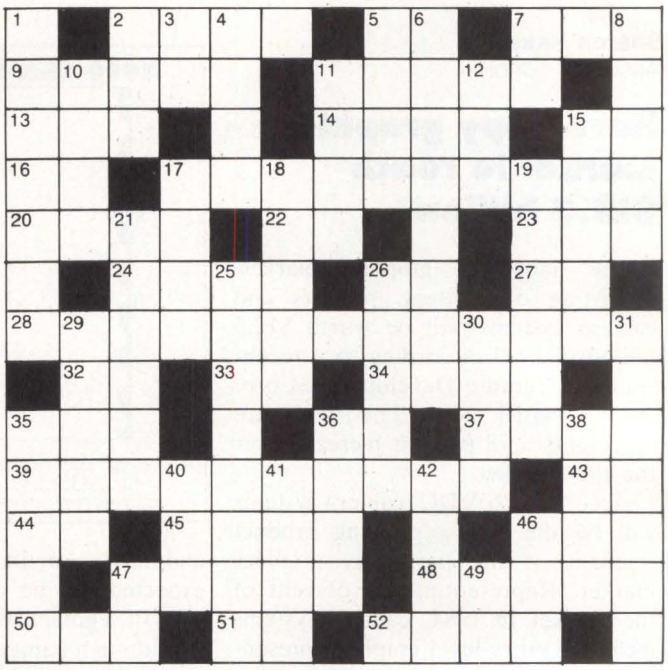
By John K. Young

ACROSS

2 Opening to plug in modem
5 Finnish monetary unit (Abb.)
7 Graphic tablet drawing
9 Delete
11 Print wheel
13 Label scoffers use for computer
14 What computer pirates can do
15 Aluminum (Chem.)
16 Artifical intelligence (Abb.)
17 Science of making computers friendly
20 Popular operating system
22 Short for Albert
23 This John is a fictitious plaintiff
24 He fiddled while Rome burned
26 Near
27 Iridium (Chem.)
28 Interlocking repeating patterns
32 When it is
33 To port (Abb.)
34 Member of a people living in Latvia
35 Station (Abb.)
36 Male hacker
37 Capital of Norway
39 Computer accessory
43 Input/output (Abb.)
44 Lawrencium (Chem.)
45 Group formed to help computer beginners
46 Lowest ranking noncommissioned officer (Abb.)
47 Ancient Hebrew dry measure (Plural)
48 Slip
50 Multiterminal screen-handling facility
51 Special function
52 List of options

DOWN

1 Preset value for variable
2 Group of keys in numeric calculator-style layout
3 Winding, narrow ridge of gravel
4 Rise high
5 This frame is largest computer size
6 1,024 characters
7 Belonging to me
8 Sharp voltage change
10 Shower
11 Popular Broderbund game on disk
12 Schol half-year (Abb.)
15 British microcomputer
17 One's divorced spouses
18 British slammers
19 Very foolish persons
21 Stage of an insect between molts
25 Fell back into bad habits
26 One who bundles hay
29 Restaurant customer
30 Suffix used in forming names of certain alcohols



31 Programs that stores printer-directed characters
35 This kind of screen represents up-to-the-minute enhancement
36 Belonging to that girl
38 One smacks them to express great satisfaction
40 Suffix used in forming names for chemical elements
41 Heath robot
42 Manufactures Q-bus- and Unibus-compatible products
46 Heart of microcomputer
47 Word of affirmation intoned as part of mantra
49 A single

Y	G	U	B	E	D	D	O	S	E	A	O	C	I
R	V	A	R	E	L	E	T	T	E	S	S	A	C
O	S	K	D	E	E	P	S	C	K	R	L	I	I
M	L	O	C	G	I	L	I	B	E	S	S	U	H
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Solution will be printed next month.

Answers to May's puzzles can be found on Page 168.

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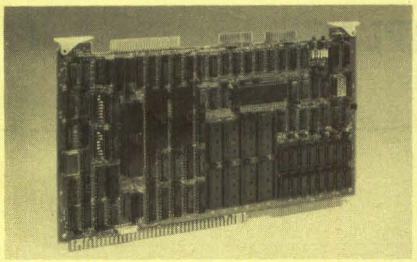

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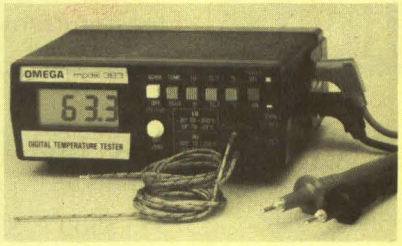

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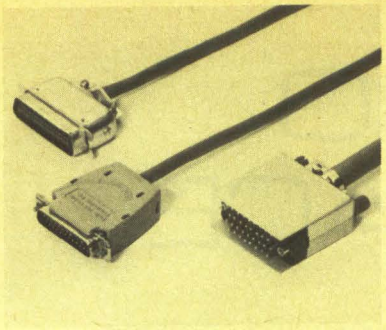

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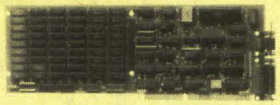

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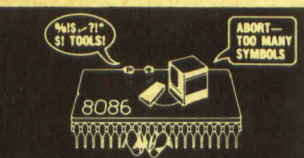

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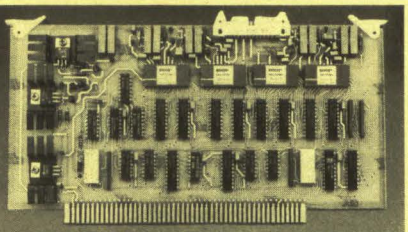

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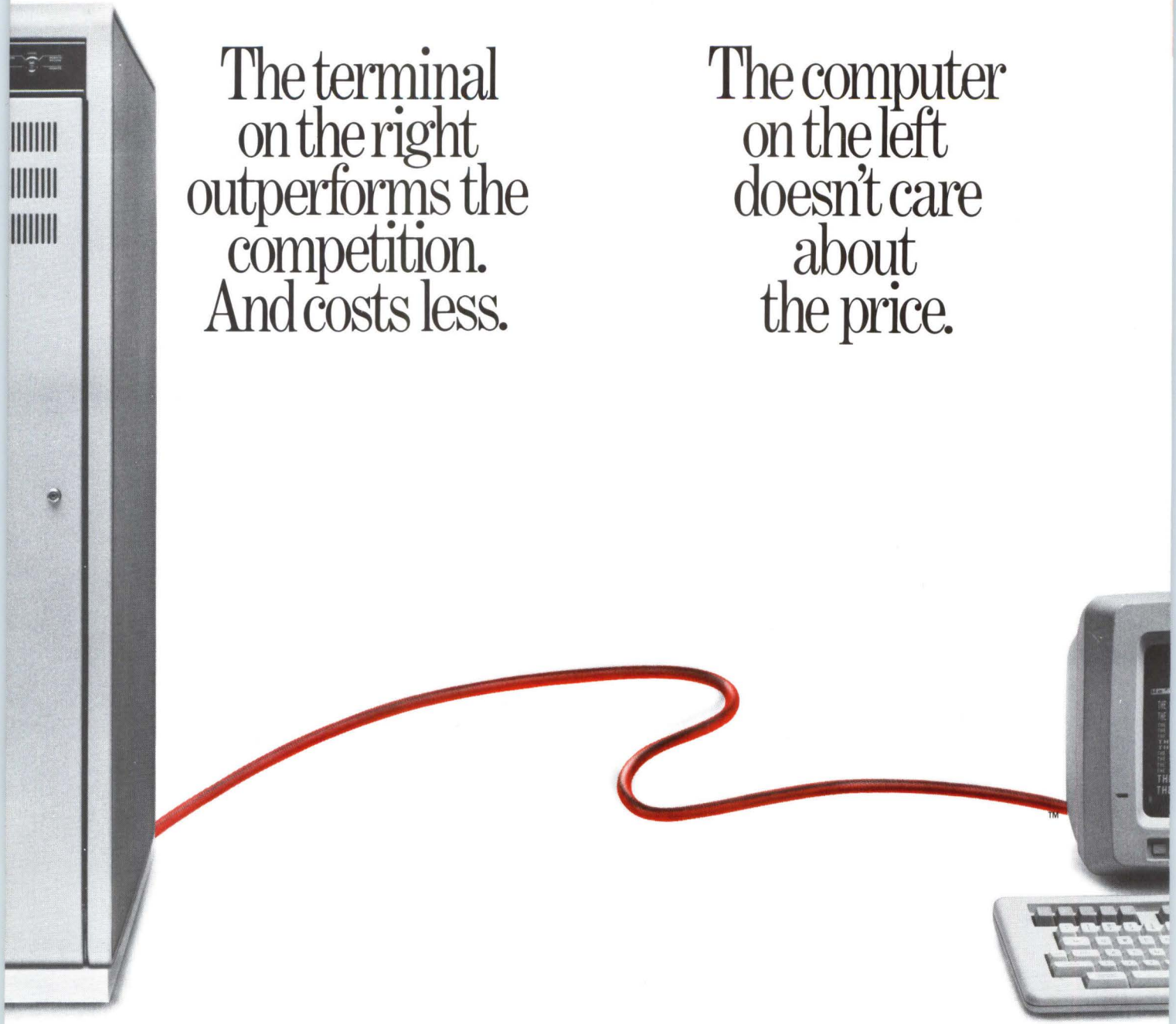

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