

# Mini-Micro Systems

A CAHNERS PUBLICATION

APRIL 1985

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industrial worlds**

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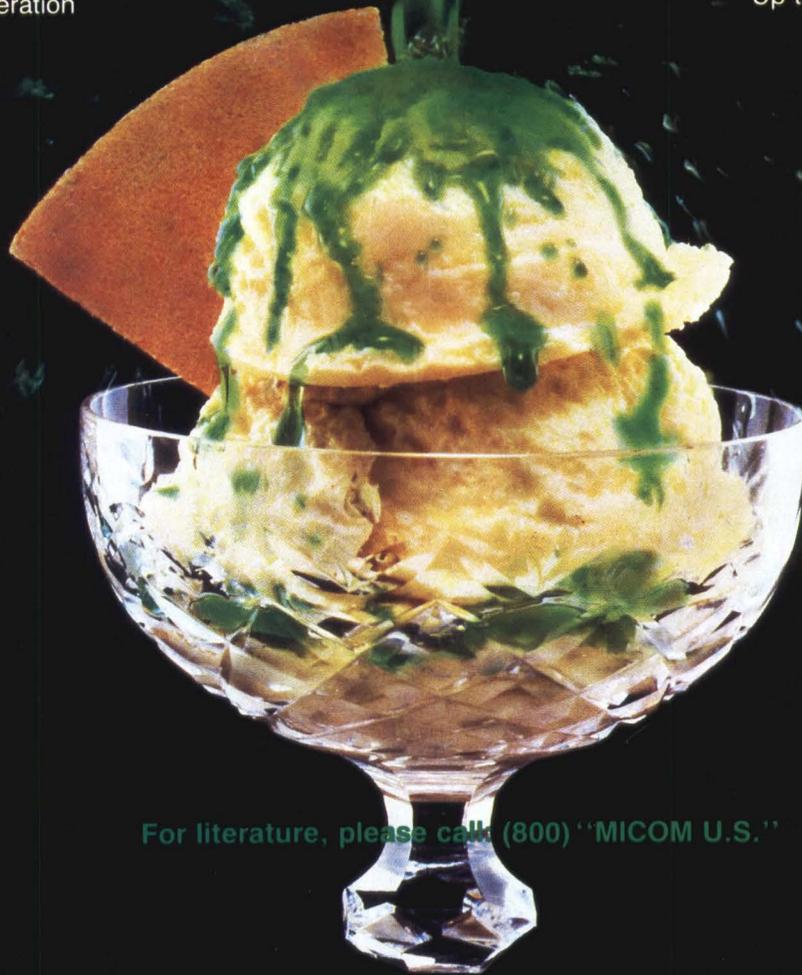
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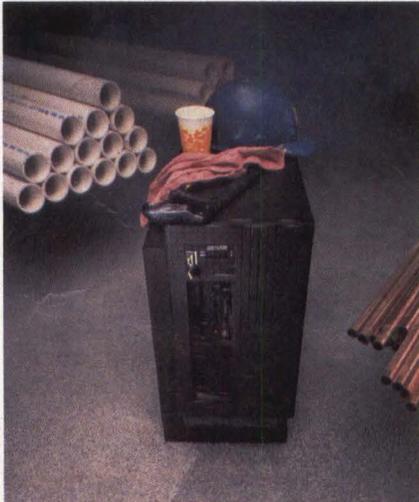
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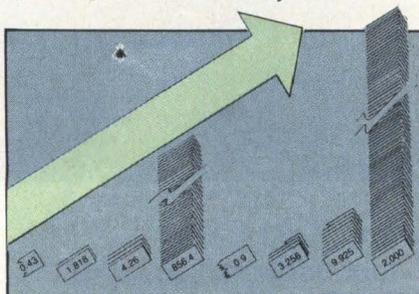
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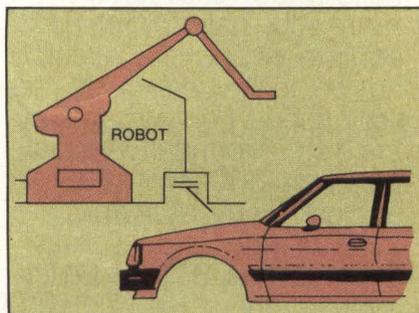
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MINI-MICRO SYSTEMS (ISSN 0364-9342) is published monthly (with 4 special Digest issues) by Cahners Publishing Company, Division of Reed Holdings, Inc., 221 Columbus Avenue, Boston, MA 02116. Norman L. Cahners, Chairman; Saul Goldweitz, President and Chief Executive Officer; Ronald G. Segel, Executive Vice President and Chief Operating Officer. MINI-MICRO SYSTEMS is published by the Cahners Magazine Division: J. A. Sheehan, President; William Platt, Executive Vice President. Circulation records are maintained at Cahners Publishing Co., 270 St. Paul St., Denver, CO 80206. Second class postage paid at Denver, CO 80202 and additional mailing offices. Postmaster: Send address changes to MINI-MICRO SYS-

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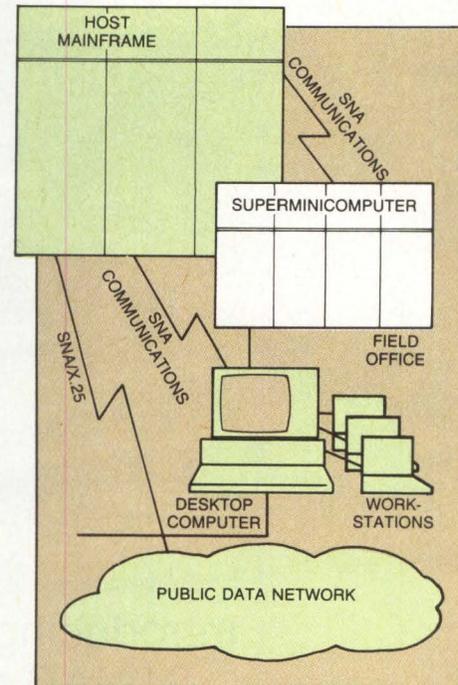
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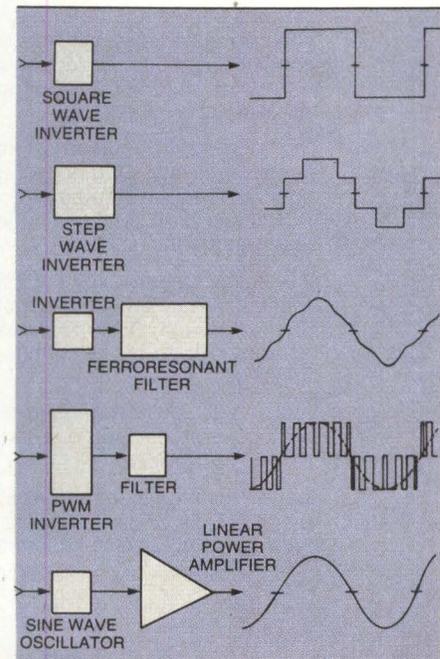
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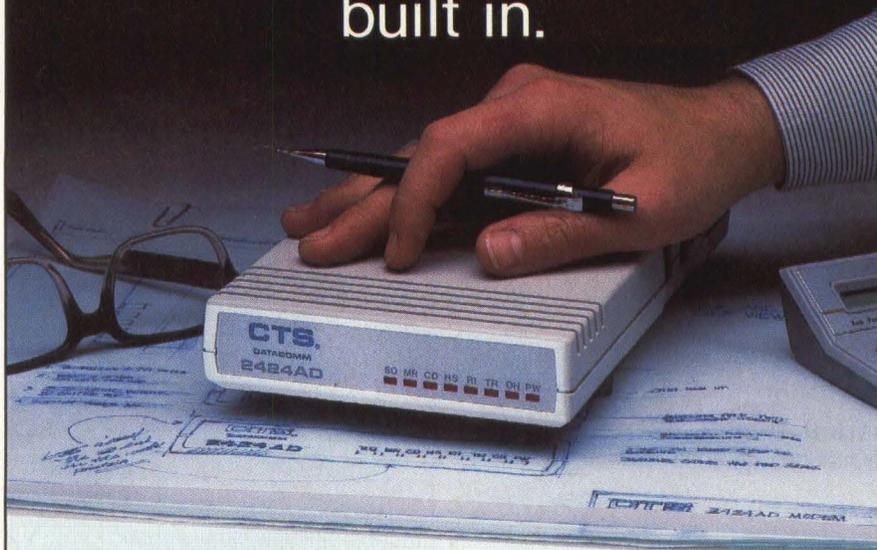
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**Reprints** of Mini-Micro Systems articles are available on a custom printing basis at reasonable prices in quantities of 500 or more. For an exact quote, contact Art Lehmann, Cahners Reprint Service, Cahners Plaza, 1350 E. Touhy Ave., Box 5080, Des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

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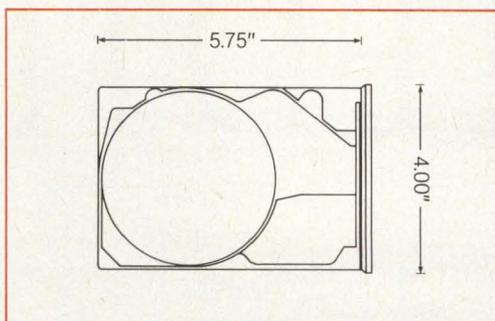
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CIRCLE NO. 6 ON INQUIRY CARD

# EDITORIAL



## MINICOMPUTERS ROLL ON

Microcomputers get the laurels, but minicomputers get the job done. Habitually predicted as heading for the scrap heap by industry pundits, minicomputers in general and superminicomputers in particular continue to solve users' problems. By consistently improving hardware and software price/performance, minicomputer OEMs and system integrators keep meeting new application challenges while still satisfying established applications.

And the marketplace agrees, too. The number of superminicomputers shipped in 1983 totaled 15,500 units at a \$3.65 billion price tag, states Dataquest Inc., a San Jose, Calif., market research company. However, Dataquest predicts that by 1989, superminicomputer shipments will increase 92 percent to reach 199,000 units shipped, creating a \$19 billion market.

In this issue of *Mini-Micro Systems*, two staff-written special reports on minicomputers offer insights into the whys and wherefores of this renewed market. One report, written by Associate Editor Lynn Haber, covers the hardware side. Haber points out that the major minicomputer vendors are pushing integrated office solutions based on the superminicomputer acting as a departmental CPU. As such, the superminicomputer performs various functions, including database management and control, networking and communications, workstation support and documentation processing.

The proliferation of desktop microcomputers has only enhanced the usefulness of superminicomputers. More microcomputers mean more data generated, prompting a more urgent need for sharing data. The needed horsepower per dollar comes from the superminicomputer. It provides the required computational power, flexibility and software at a reasonable price. According to William C. Rosser, vice president of the Gartner Group Inc., a Stamford, Conn., research and consulting company, the departmental superminicomputer is a better dollar-per-job

solution than micro-to-mainframe links and microcomputer-based clusters. Get all the details of Haber's report beginning on Page 109.

The second minicomputer report, generated by Associate Editor Michael Tucker, focuses on the software side of the minicomputer industry. In this arena, integrated software and multiuser minicomputers are stealing the thunder from their microcomputer cousins. Microcomputers have had their chance to conquer office automation and have been found wanting. "On the departmental level," claims Peter Lowber, a senior market analyst with the Yankee Group, Boston, "you need a processor big enough to act as a file server and as a gateway to the outside world."

The major minicomputer vendors—IBM Corp., Wang Laboratories Inc., Digital Equipment Corp., Data General Corp., Hewlett-Packard Co. and Prime Computer Inc. —have recently produced a flurry of new software products. These products now handle voice integration, data communications, electronic mail and file management, as well as word processing, database management, spreadsheets and graphics. But, whereas microcomputers with limited computational power have struggled to thoroughly integrate these software capabilities, minicomputers have simply brought their might to bear. Look for Tucker's report on Page 95.

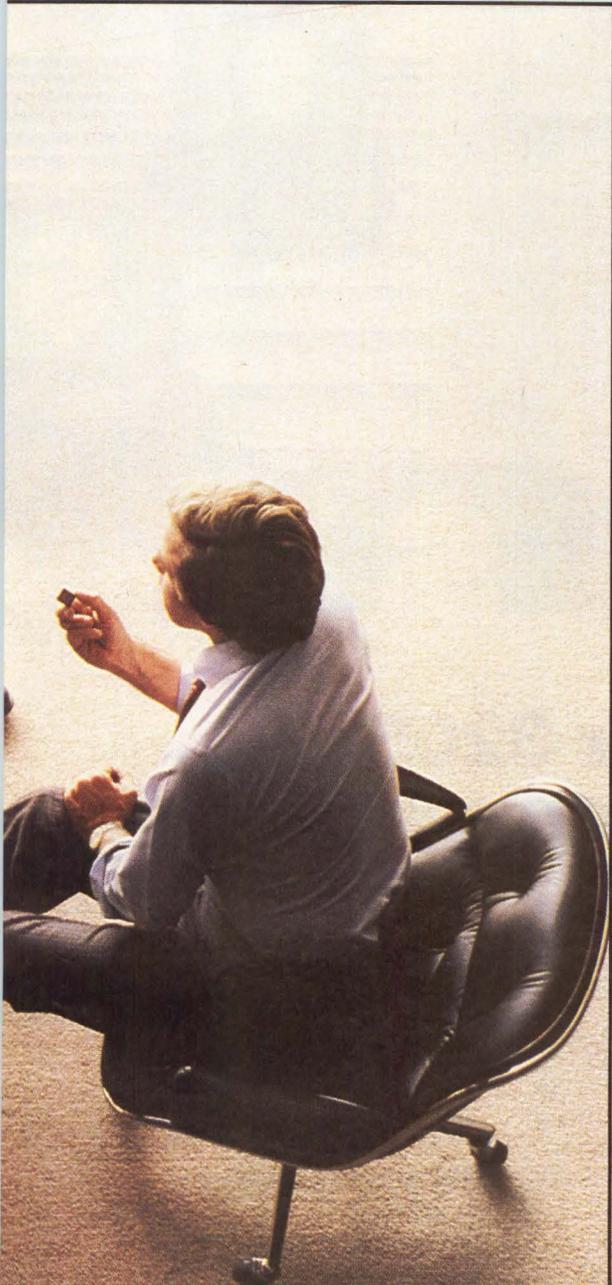
Every monthly issue of *Mini-Micro Systems* contains two staff-written special reports on computer hardware and software. Let us know what subjects you would like these reports to cover in future issues; we're here to serve your needs.

*George V. Kotelly*

**George Kotelly**  
Editor-in-Chief



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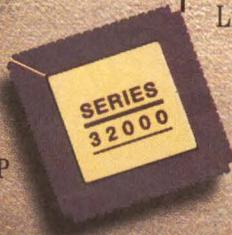
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# **PERKIN-ELMER**

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# BREAKPOINTS

## **VERTICOM BOOSTS PC GRAPHICS**

Verticom Inc., the Sunnyvale, Calif., supplier of computer-aided engineering hardware, is planning to announce a line of graphics plug-in products for PC-DOS and MS-DOS computers that it feels are an improvement over IBM Corp.'s recently announced graphics board enhancements for the PC family. Verticom claims its piggy-backed controller boards will drive 31- and 60-kHz monitors four to five times faster than will Big Blue's enhanced and professional boards. Verticom also expects its prices to be as much as 30 percent lower than IBM's. Besides running PC graphics software and supporting the virtual device interface and graphical kernel system graphics standards, Verticom's proprietary graphics board, which includes an MC68000 processor, will emulate Digital Equipment Corp. VT100 and Tektronix Inc. 4100 series terminals.—A. Kaplan

## **50M-BYTE DRIVE FOR IBM PC-AT RUMORED**

IBM Corp.'s Rochester, Minn., small disk drive development group reportedly is preparing a full-height, 50M-byte (unformatted), 5¼-inch Winchester drive for shipment late this spring. The four-platter drive, which is expected to be used in a forthcoming PC-AT upgrade model, is believed to use standard oxide media, a closed-loop servo and a linear voice-coil actuator that gives the drive a 40-msec average access time. Observers in the disk-drive industry speculate that the drive will use the enhanced small disk interface to achieve a 10M-bit-per-second (bps) transfer rate. The first models shipped to a Northern California controller manufacturer are said to have the standard ST506/412 interface and a 5M-bps transfer rate. Sources say the production model drive will have an embedded controller and a small computer systems interface.—C. Warren

## **BRITISH SOFTWARE HAS MORE FEATURES THAN IBM'S NETWORK PROGRAM**

American personal computer users planning to install IBM Corp.'s PC Network broadband local area network hardware should soon have a British alternative to IBM's Network Program software. Tapestry, a program based on the Icon software from Torus Systems Ltd., Cambridge, England (MMS, November 1984, Page 83), provides more features than IBM's software, including icons to help users tap into functions such as disk sharing and electronic mail. The new software should be available in the United States in a few weeks from Torus Systems Inc., Redwood City, Calif., Torus' U.S. subsidiary, which is establishing a dealer network stateside. Tapestry will be priced at \$400 for the software that runs on the network manager PC and \$400 per workstation for workstation software. In Europe, IBM sells Tapestry and the Network Program and acknowledges that the former has more facilities.—K. Jones

# BREAKPOINTS

## **AUTOCAD PROGRAM ENHANCED TO DIGITIZE PAPER DRAWINGS**

Computer-aided-design software manufacturer AutoDesk Inc., Mill Valley, Calif., plans to introduce and ship in May improvements to its AutoCAD microcomputer software. The first is AutoCAD 2.1, which now permits 3-D modeling, hidden-line removal, polylines and curves. The second is a CAD camera that combines hardware and software to digitize a paper image using a video data scanner. Once a picture is digitized, it is converted by software from a dot-by-dot raster image to a point-by-point vector image that can be manipulated by AutoCAD software. AutoCAD 2.1 is priced at \$2,500. The price for the CAD camera has not been set.—*C. Warren*

## **LIQUID CRYSTAL SHUTTER PRINTER EXPECTED FROM CASIO**

Casio Inc., Fairfield, N.J., this month should introduce a desktop, liquid crystal shutter (LCS) page printer said to provide clearer output than the laser printers with which it will compete. The device is expected to produce 9 pages per minute (ppm). The model LCS-2400 reportedly has a resolution of 240 dots per inch on any size paper and has a noise level of less than 50 dB, making it quieter than most daisywheel printers. The unit has Centronics-compatible and RS232 serial interfaces. The price had not been set at press time, but a competing LCS printer from Epson America Inc., the 7-ppm GQ 3000, is priced at \$5,000. Shipments of the Casio unit are scheduled for October.—*D. Bright*

## **DEC MAKES VAX MANUFACTURING ARRANGEMENT IN BRAZIL**

An agreement whereby a new Brazilian company will begin making an unlimited number of Digital Equipment Corp. VAX-11/750 midrange superminicomputers was recently signed by DEC and Elebra Computadores, Sao Paulo, Brazil. This is DEC's first large-scale technology transfer of know-how outside the United States, a company official says. Elebra, which is owned by three large private Brazilian companies, will also service the VAXes.—*L. Valigra*

## **IBM MICROFLOPPY DEAL MAY HERALD LAPTOP COMPUTER FOR UNITED STATES**

IBM Corp. reportedly has inked a \$40 million dollar contract with Toshiba Corp., Tokyo, for 3½-inch, 500K-byte flexible drives. The drives aren't expected to be used in a new product, but in existing PC/XT systems to provide an interchange to the IBM JX lap-sized computer currently being manufactured by Matsushita Communication Industrial Co. Ltd., Yokohama, Japan. Some IBM watchers speculate that the JX will soon be introduced in the United States.—*C. Warren*

## **PROBLEMS REPORTED WITH SONY DRIVES FOR APPLE**

Sony Corp., Tokyo, the supplier of 3½-inch flexible drives to Apple Computer Inc., Cupertino, Calif., has, according to a source close to Apple,

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

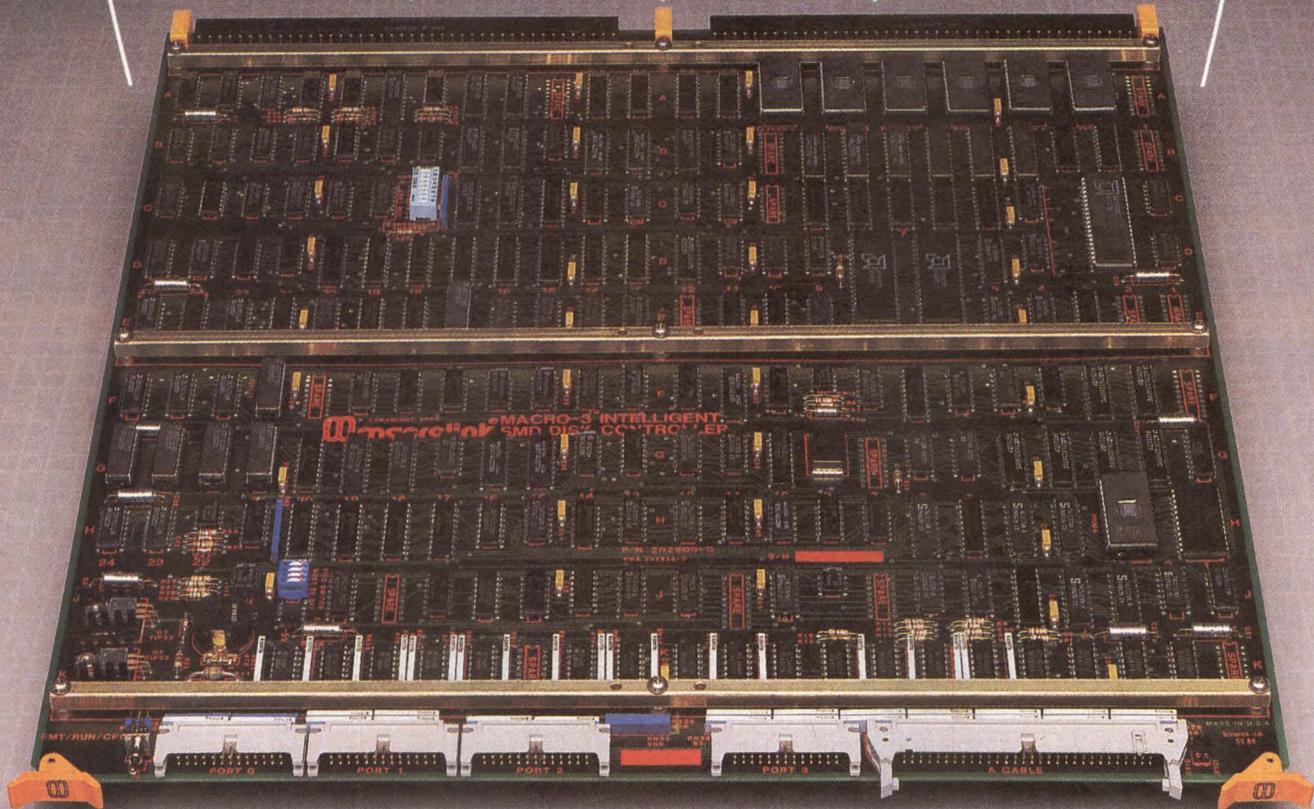
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# BREAKPOINTS

recently run into quality-control problems with the small drives. Apple reportedly has returned more than 28,000 of the drives due to failures. Neither company will comment on the report.—*C. Warren*

## **RODIME TO UP MICRO-WINCHESTER CAPACITY TO 20M BYTES**

Rodime Plc., Glenrothes, Scotland, is expected to unveil a 20M-byte, 3½-inch Winchester drive this month. The drive, which industry watchers have expected for more than a year, is still only in the prototype stage, and production units probably won't be available until late in the fourth quarter of this year. Rodime joins MiniScribe Corp., Longmont, Colo., and a handful of others that have announced 20M-byte drives, partly because IBM Corp.'s PC-AT computer is expected to set a standard for drives of that capacity.—*C. Warren*

## **AT&T PREDICTED TO RANK SECOND IN PERSONAL COMPUTERS**

Jean Yates, president of market research company Yates Ventures, Palo Alto, Calif., predicted at a March conference in Washington, D.C. that AT&T Information Systems would sell more than 200,000 personal computers in 1985. "By the end of the year," she said, "AT&T will likely be the No. 2 supplier, or No. 3 at least, in personal computer sales." IBM Corp. would still rank first. Yates also estimated that AT&T would sell 60,000 to 100,000 units of its forthcoming 7300 personal computer, which integrates a telephone workstation and a personal computer into a single unit.—*S. Shaw*

## **POINT 4 READIES LOW- AND HIGH-END IRIS-COMPATIBLE MINIS**

Point 4 Data Corp., Irvine, Calif., this month plans to announce the Mark 4 Tower system, a low-priced minicomputer for value-added resellers marketing computers with eight to 16 ports. The Mark 4 should sell for \$22,000 for an eight-port, 256K-byte system with an 86M-byte 5¼-inch Winchester drive and a 60M-byte streaming tape drive. The Mark 4 uses the company's IRIS multiuser, multitasking operating system, which fits into less than 8K bytes of RAM. Production deliveries are slated for August. For those who need 100 or more ports, the company plans to introduce a Mark 10 system in the fourth quarter, with initial deliveries in October. The Mark 10 will feature a 100-nsec cache memory, full instruction pipelining and support of as much as 16M bytes of RAM. It will be priced at \$75,000 to \$100,000.—*C. Warren*

## **IBM EXPECTED TO OFFER UNIX SYSTEM V SUPPORT ON PC-AT**

Having launched a UNIX System V-based operating system called IX/370 for its mainframe computers this year, IBM Corp. should follow up with a System V implementation for its PC-AT microcomputer from the same source, Interactive Systems Corp., Santa Monica, Calif. So predicts James Lawson, vice president of marketing at SCI Systems Inc., Huntsville, Ala.,

# BREAKPOINTS

whose company supplies some of the electronics for IBM's PC/XT and hopes to do so for the PC-AT as well. Additionally, SCI should start shipping its own 80286-based computer, the SCI 2000, by the end of the year. Lawson expects the System V on the PC-AT to be Interactive's IN/ix, the same one SCI has chosen.—*K. Jones*

## **SPEAKING TO THE IBM PC...**

Work toward the first voice-activated typewriter is being conducted by organizations such as IBM Corp., AT&T, Nippon Electric Co., the Massachusetts Institute of Technology and Kurzweil Applied Intelligence Inc. Kurzweil, Waltham, Mass., in which Wang Laboratories Inc. and Xerox Corp. have invested, expected to have its product ready last year but was delayed until at least late this year because the complex technology couldn't be readied in time. However, Kurzweil plans to introduce an interim product this month based on a similar technology and designed for use with the IBM PC. Called Voice 3000, the \$5,000 peripheral recognizes as many as 1,000 spoken words and connects to the PC via an RS232C port. The product is aimed at OEMs, which are expected to build vertical applications in which users will be able to enter data without using their hands.—*D. Bright*

## **PROGRAM CREATES MACRO COMMANDS FOR IBM PC SOFTWARE**

To decrease the number of keystrokes required for popular IBM Corp. PC software programs, Alpha Software Corp., Burlington, Mass., has developed a keyboard-enhancement program called Keyworks. The menu-driven utility program is expected to be announced at the Softcon show in Atlanta this month. Keyworks creates keyboard macro commands for such packages as Lotus Development Corp.'s 1-2-3 and Ashton-Tate's dBase III programs. Keyworks is automatically loaded into the IBM PC when the computer is booted. By consolidating a string of commands into one keystroke, the program is said to facilitate production of reports, graphics and other functions.—*D. Bright*

## **WANG'S THIRD-QUARTER PROFITS TUMBLE**

Industry analysts are assessing the effects of recent announcements of drops in quarterly profits made by major computer manufacturers such as Apple Computer Inc., Data General Corp., Digital Equipment Corp., IBM Corp. and Wang Laboratories Inc. Faced with quarterly sales far below projected figures for 1985, analysts are predicting that the drop in sales presages a slower sales pace for the rest of 1985. The analysts are basing their concern on a recent announcement by Wang that third-quarter profits for that company would be 30 percent to 40 percent below 1985 expectations. This came as a blow to the company, which had been experiencing 10 years of consistently improving earnings. In January, IBM predicted flat sales results for the coming quarters.—*S. Hassell*



# You won't get over what this 350 CPS printer does for under \$2,000.

When you see what the CI-3500 Serial Printer can do, you might not believe it's priced under \$2,000. Besides giving you data processing printing at 350 CPS, the CI-3500 delivers letter quality printing at a rapid 87 CPS—more than twice the speed of most daisy wheel printers.

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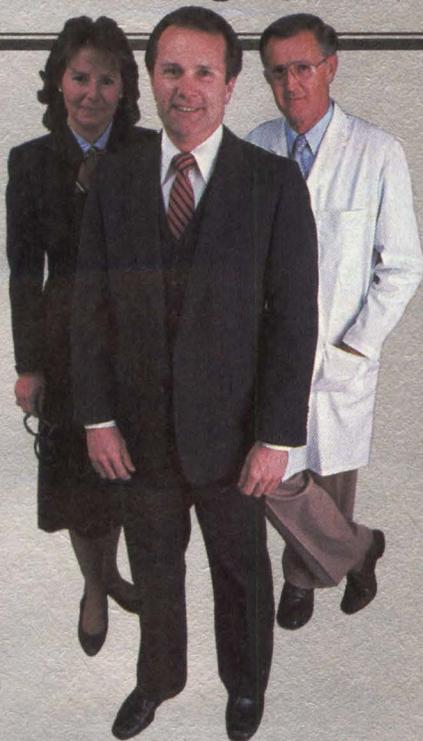
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# BREAKPOINTS

## **TECH FILES: A QUICK LOOK AT INDUSTRY DEVELOPMENTS**

**SOFTWARE FILES:** In a five-year contract worth an estimated \$16 million, **Language Processors Inc.**, Waltham, Mass., will supply seven types of language compilers to AT&T for AT&T's new model 7300 UNIX personal computer. LPI plans to make COBOL, Pascal and C compilers, as well as a debugger, immediately available. FORTRAN, BASIC, RPG II and PL1 compilers will be available to AT&T later this year.—*D. Bright*

**Lotus Development Corp.**, Cambridge, Mass., is launching a series of add-in packages for its Symphony integrated software, the first two of which were recently released. The new Symphony Spelling Checker, including an 80,000-word-plus American and British dictionary, detects misspellings, suggests corrections and flags duplicated words and uncapitalized first words of sentences. Users can also create specialized dictionaries. Symphony Text Outliner creates outlines with subheadings, which can be expanded to finished text with tables of contents. The products work with Symphony's word-processing function. They are priced at \$139 each, require two disk drives, and, respectively, 512K bytes and 348K bytes of memory.—*J. Victor*

**RANDOM DISK FILES:** **Quantum Corp.**, San Jose, Calif., is preparing to announce a family of half-height, high-capacity, 5¼-inch Winchester drives with integrated controllers and full support for the small computer systems interface. The Q200 family now has two members: the model Q250 with 53.4M bytes of formatted storage and the model Q280 with 80.2M bytes of formatted storage. Both drives use thin-film, sputtered media and have a 10M-bit-per-second transfer rate. Quantum plans to have evaluation units ready by September and production units by December. Pricing for both drives should be less than \$1,000 each in 10,000-unit quantities.—*C. Warren*

**MICRO FILES:** **Grid Systems Corp.**, Mountain View, Calif., has become the first computer manufacturer to introduce high-grade, data-encryption capability that meets new communications security standards developed by the National Security Agency. Identical in all other respects to Grid's Tempest-approved 1107 microcomputer, the company's new model 1117 incorporates an encryption system that was specified by the NSA for transmitting classified information. The new unit is priced at \$12,995. Grid is also offering an upgrade of the 1107 for \$1,000.—*S. Shaw*

**NOTES FROM OVERSEAS:** **Nippon Gakki Co.**, Japan, this month is beginning production of CMOS, graphic-processing, LSI components to drive displays on the IBM PC or drive other CRTs or LCDs. Called the V-6356, the component was developed by Nippon Gakki in cooperation with Microsoft

# BREAKPOINTS

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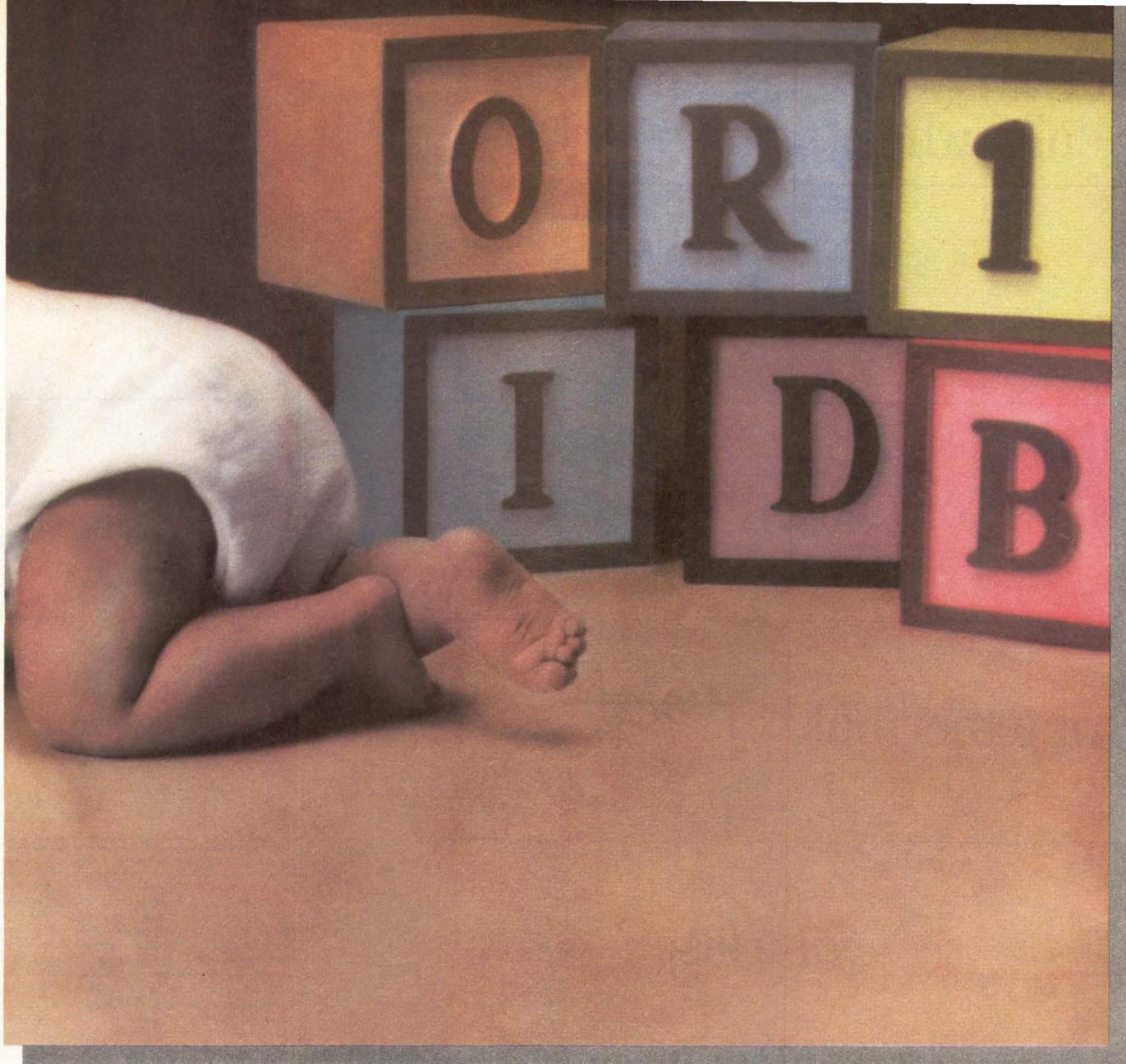
Corp., Bellevue, Wash., and ASCII Corp., a Tokyo software development company. Microsoft and ASCII wrote the display driver software so it would work for either pixel-by-pixel designation for generating graphics on CRTs or line-by-line for LCDs. As many as 16 of 512 possible colors can be set up on a CRT screen; eight shades can be produced on a color LCD. A mouse or light pen can be used. Nippon Gakki's components incorporate 10 LSI chips, as compared with about 70 on the conventional IBM PC graphics board.—*I. Kakehashi*

**NEC Corp.**, Tokyo, is helping Hobei Province in China build and equip a plant that will develop and manufacture Chinese-language versions of NEC's 16-bit PC-9801 microcomputer. NEC is to provide the technical assistance, manufacturing equipment and necessary parts and components to build 30,000 units a year. NEC also will help the Chinese partners with sublicensing of the MS-DOS operating system to be used to write Chinese-language application software. The venture is a renewable five-year agreement, and is the first to involve a Japanese maker of personal computers in China.—*I. Kakehashi*

The success of Olivetti SpA, Ivrea, Italy, in funding high-technology seedling companies is encouraging other large companies to follow suit. The latest is French conglomerate **Compagnie Generale d'Électricité**, which, with American Express as a partner, is creating a \$160 million pool to bankroll needy telecommunications companies. The French company will invest \$60 million, American Express \$20 million, and the rest will come from American Express' Shearson Lehman/American Express subsidiary.—*M. O'Gara*

**Hitachi Ltd.**, Japan, plans to begin selling in June a bubble memory board combining a pair of 4M-byte bubble memories with support peripherals to take up about 20 percent less circuit-board volume than conventional memories of equal capacity. One way the cost-per-bit of memory has been lowered is by packaging peripherals and memories on the same chip, rather than by using discrete components.—*I. Kakehashi*

**Fujitsu Ltd.**, Japan, is looking at whether there is a demand in Japan for a memory system combining 256K-bit, dynamic RAM chips and 5-inch hard disk intermediary storage. Company sources say Fujitsu's two-step system has a 0.3-msec average-access time that is about 80 times faster than conventional magnetic disk drives. Direct access to the semiconductor memories accounts for the speed. The disk serves as a temporary holding area for information being accessed and modified frequently or reassigned in memory blocks in chip modules. Scheduled for availability next December, the Facom 6630A system will store from 16M bytes to 64M bytes.—*I. Kakehashi*



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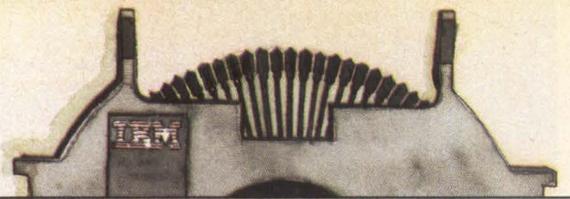
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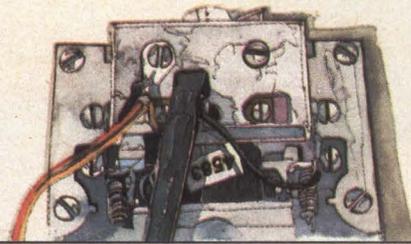
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MM0485

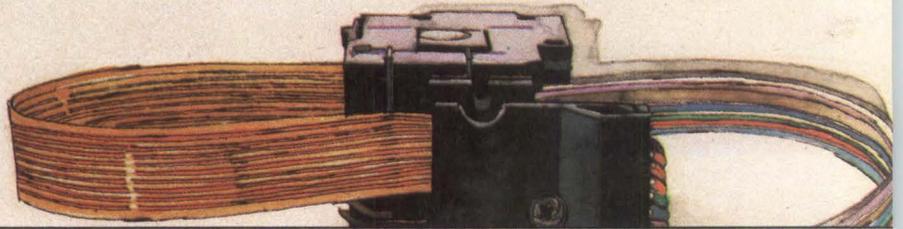
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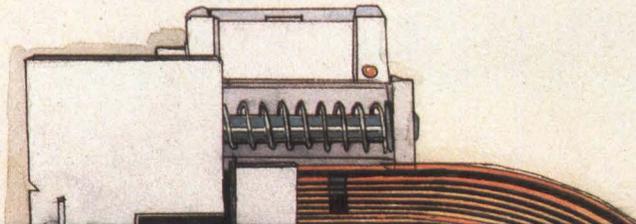
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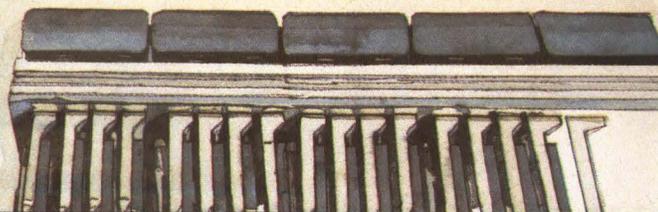
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or an electro-erosion,



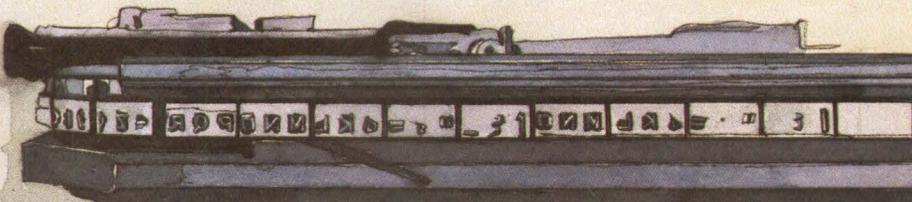
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Data Transfer Rate	5.0 Mbits/Sec	9.0 Mbits/Sec	5.0 Mbits/Sec
Average Access Time	50 msec includes settling	35 msec includes settling	85 msec
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IOMEGA HAS REMOVED CAPACITY AS THE MASS STORAGE ISSUE.

# MINI-MICRO WORLD

## NEWS

# ADAPSO battles micro software pirates

Lori Valigra, Senior Editor

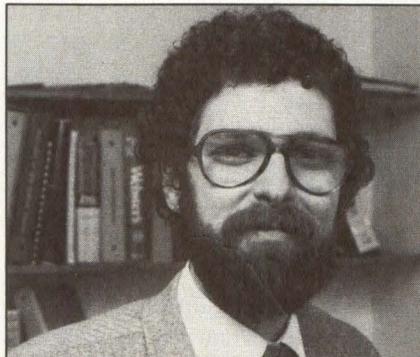
By launching a four-point attack on microcomputer software pirates, the Association of Data Processing Service Organizations (ADAPSO), Arlington, Va., hopes to squelch the illegal copying that could cost software publishers as much as \$800 million in sales this year.

The plan by ADAPSO and its 750 member companies incorporates hardware-protection devices, litigation, legislation and public education. So far, \$165,000 from a dozen companies and ADAPSO's general funds have gone toward the program.

"We're facing an industry-threatening situation in the amount of revenues lost, which is unconscionable," comments Marvin Goldschmitt, vice president of Lotus Development Corp., a Cambridge, Mass., software producer. A recent study of users of office application programs by market researcher Future Computing Inc., Dallas, finds that, for each legitimate program in use, one unauthorized copy also is in use.

### Standardizing on hardware

A survey of 27 popular business applications shows that 89 percent of the packages have a disk-based protection scheme, according to ADAPSO. Yet Lotus' Goldschmitt and others within ADAPSO say that software-based techniques for protecting programs don't work. That's why the organization is behind hardware-protection devices as part of its plan, outlined in a



**Marvin Goldschmitt, Lotus' vice president, says software pirates are causing an industry-threatening situation.**

### Software Authorization White Paper.

So far, at least two microcomputer software suppliers have used hardware-protection devices, but these have proved unsatisfactory, according to the White Paper. The paper outlines standards for hardware protection and includes improved methods to achieve it.

One company cited in the paper, BPI Inc., Austin, Texas, in 1980 issued a device with its accounting package for the Apple Computer Inc. Apple II+ microcomputer. To use the program, the user had to open the computer and install the device in the computer's game-paddle port. Though the hardware device protected BPI's program, it posed an inconvenience to users, who had to remove it if they wanted to play a game. In early 1982, BPI stopped using the device and adopted a disk-based method.

The other company cited in the paper, Sensor-Based Systems Inc., Glenview, Ill., began using hardware protection with its Metafile program in 1979. At first, users had to install a programmable ROM chip in their Vector Graphics Inc. computers in order to use Metafile. This also posed an inconvenience to users. More recently, the company released a Metafile version for the IBM Corp. PC that includes a device to attach to the PC's RS232 port. ADAPSO says this method was well-received.

Many ADAPSO members list user convenience as important to the protection scheme. They say standards guiding the design of the protection devices and establishing how they are to attach to the computer should be in the public domain, so anyone who wants to include hardware-protection products can. Goldschmitt says hardware protection mandates setting some standards so users won't be confused by different attachable devices.

### ADAPSO's key to protection

One approach backed by ADAPSO is a key ring connecting to the computer through the RS232 port. Each ring, which looks like an open-top box with slots inside, holds many cigarette-pack-sized keys. Each program would be sold with such a key. An ADAPSO spokesman says the average price of the key will depend on how many software developers adopt it. The more developers use keys, the less expensive the keys become. Remote Systems Inc., Gaithersburg, Md.,

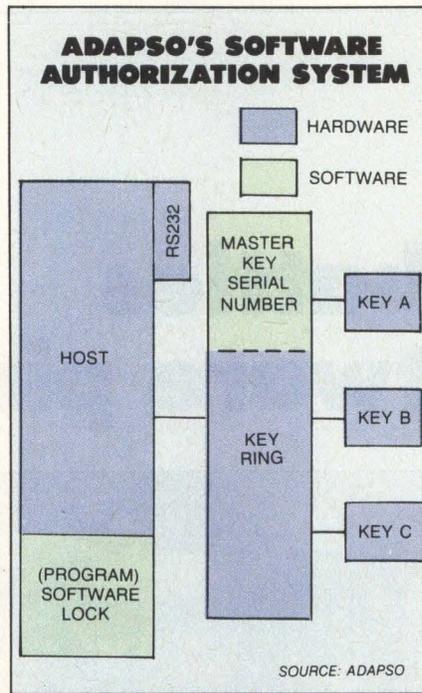
NEWS

which supports the ADAPSO plan, and others offer similar devices.

In the future, ADAPSO members hope to devise a device that will be incorporated in computers. ADAPSO is asking industry participants to submit ideas for protection devices.

Wilton Jones, president of Multi-mate International, East Hartford, Conn., underscores the importance of protection by saying users benefit by adhering to software licenses. "Almost every major customer understands that [software] revenues fuel the [program] updates and support of customers," he explains. He adds that a company purchasing software enters into a five-year relationship, on average, with the program's publisher, including after-sale support.

Leland Strange, president of Quadram Corp., Atlanta, says users concerned about their ability to adhere to license agreements have postponed using certain products, such as local area networks. He claims that all of the Big 8 accounting firms called Quadram for a hardware solution to software protection because they're concerned about such unauthorized and uncon-



**ADAPSO's software access**

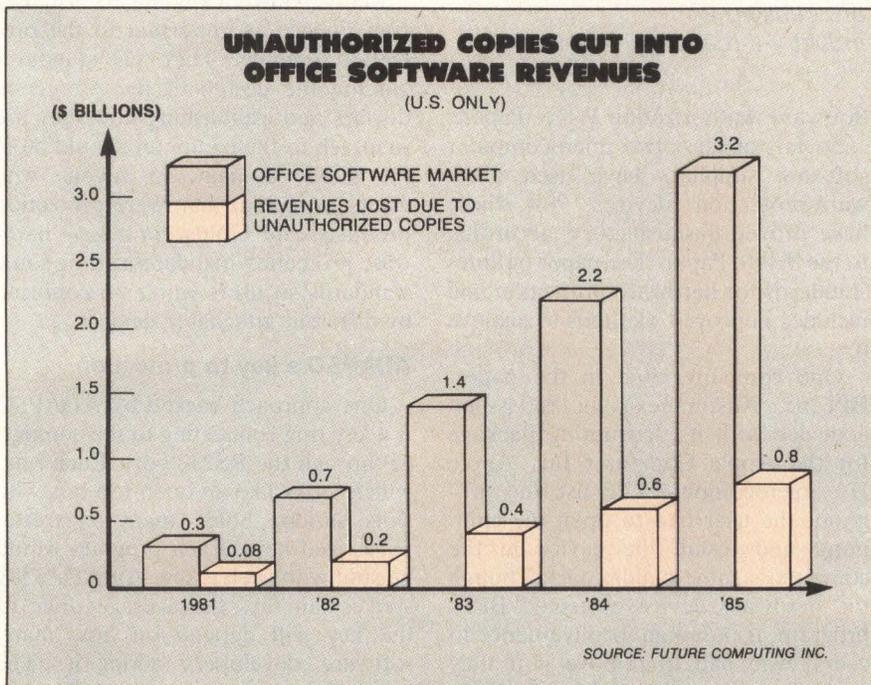
**method** employs two parts hardware—keys and a key ring—and one part software—a software lock with a matching serial number—to “unlock” a program. To access a program on the host computer, the user keys into the ring, which in turn connects to the host's RS232 port. The program includes a software module that checks the serial number on the key ring (and ultimately on the key) and “opens” the program.

trollable use of software. “We can document users that postponed the use of LANs until they could control the use of software,” says Strange.

The day it announced its four-pronged attack and introduced its White Paper, ADAPSO joined MicroPro International Corp., San Rafael, Calif., to file a lawsuit against American Brands Inc., New York, and its Wilson Jones Co. subsidiary in Chicago, alleging 20 counts of copyright and trademark infringement. Included in the lawsuit are complaints about unfair competition and breach of license agreement of several MicroPro programs, including the popular WordStar word processor. ADAPSO's lawyer will not comment on the exact amount of damages, but the complaint filed in the suit asks American Brands and Wilson Jones to pay MicroPro \$250,000 in damages for breaches of its end-user license agreement, plus other damages and profits earned from the alleged infringements.

As well as backing companies that are pursuing possible copyright offenders in court, ADAPSO will support legislation supporting copy protection. For example, ADAPSO chairman Arthur Kramer says the organization is behind two pieces of legislation being considered by Congress this year: stopping short-term software rentals, which foster illegal copying when users try out software at home before purchasing it, and increasing the penalty for copying from \$50,000 to \$250,000.

The fourth element of ADAPSO's attack is educating software users about the fact that copying is wrong. □



**Software publishers stand to make \$3.2 billion this year, but pirates could take an \$800,000 bite out of sales.**

# Apple strengthens Macintosh office bid

David Bright, Assistant Editor

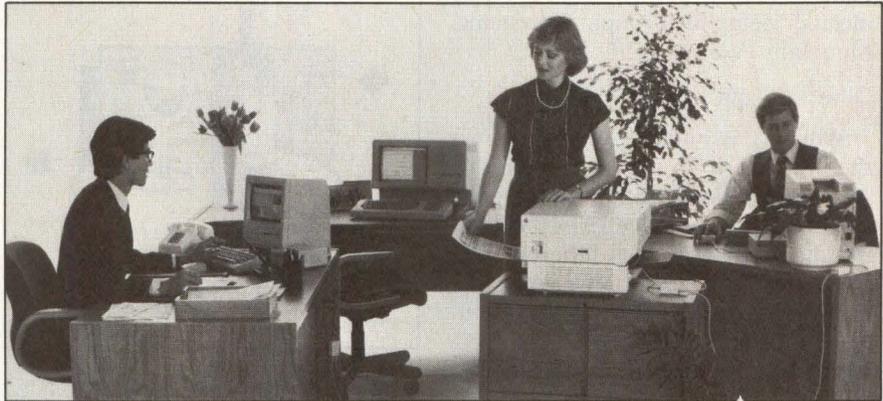
Apple Computer Inc. is no longer pitting its Macintosh computer head-to-head against IBM Corp.'s PC in the office personal computer market. In a recent Macintosh Office package announcement, Apple officially acknowledged the presence of the IBM PC and revealed plans for connecting the Macintosh computer to the IBM PC world. But there are worse fates than coexistence with IBM, points out Timothy Williams, a senior analyst at Future Computing Inc. According to the Dallas-based market research company's figures, Apple sold about 250,000 Macintoshes in 1984, and, despite IBM, sales should double to 500,000 in 1985.

At the announcement, which took place at Apple's fourth annual meeting, chairman Steven Jobs and president John Sculley outlined the \$1.5 billion company's plans for a stepped-up attack on the business markets. The Macintosh Office is based on the Macintosh computer and the Winchester disk-based Macintosh XL, which is a renamed Lisa 2/10 computer. The price of the XL was reduced from \$5,495 to \$3,995. The Macintosh 512K is now \$2,795, down from \$3,195, and the price of the 512K upgrade was cut \$295 to \$700.

The Macintosh Office also comprises the AppleTalk Personal Network and the LaserWriter laser printer. With AppleTalk, as many as 32 nodes can be plugged together for as little as \$50 per physical connection. The high-quality \$6,695 LaserWriter is expected to set a standard for desktop laser printers.

## The IBM connection

Apple already has products—MacTerminal and the Apple Cluster Controller—for connecting the Macintosh to IBM mainframes. New products from Apple and third-party developers will make the IBM PC (and IBM System/36) connection and enable document exchange with IBM systems



**The AppleTalk Personal Network** connects as many as 32 devices, which can be Macintoshes, Macintosh XLs (formerly the Lisa 2/10), disk and file servers or the LaserWriter printer.

through IBM's document-interchange architecture (DIA) and document-content architecture (DCA) protocols.

Sytek Inc. will provide the link from AppleTalk to Sytek's LocalNet/PC line connecting IBM PCs into a network. In addition, Apple is designing an add-in board and software for the IBM PC that will integrate it into the AppleTalk network. Apple is also planning a 20M- and 40M-byte file server for the network. These products are all scheduled for introduction this year. In the meantime, a few other companies, such as Micro-Design, Austin, Texas, and Iomega Corp., Roy, Utah, are offering file and disk servers that support AppleTalk. Apple has enlisted the aid of several other third-party vendors in its quest for office space. 3Com Corp., Mountain View, Calif., is planning software for connecting several AppleTalk networks via Ethernet, and Hayes Microcomputer Products Inc., Norcross, Ga., has redesigned its Smartcom II communications software to take advantage of the Macintosh's icon-based user interface.

Independently of Apple, Dayna Communications, Salt Lake City, has developed an external attachment to Macintosh that reportedly allows Macintosh systems to run MS-DOS programs. Called MacCharlie, the \$1,195 unit includes 256K bytes of RAM,

MS-DOS, one disk drive and an Intel Corp. 8088 processor. Dayna planned to supply retail stores with demonstration units this month.

## Brings letter-quality output

The LaserWriter brings much-needed, letter-quality output to the Macintosh, notes Raymond Falls, associate editor at Datapro Research Corp., Delran, N.J. Since most offices demand letter-quality output, a computer cannot compete in business markets without it, he says.

Like Hewlett-Packard Co.'s LaserJet, the LaserWriter is based on Canon USA Inc.'s LBP CX print engine. The LaserWriter produces both text and graphics at a resolution of 300 by 300 dots per inch (dpi). While HP's LaserJet prints text at the same 300-by-300-dpi resolution, its graphics resolution is only 75 by 75 dpi. The intelligent LaserWriter includes a Motorola Inc. MC68000 processor, 1.5M bytes of RAM, 0.5M bytes of ROM and the PostScript page-description software, which is responsible for much of the peripheral's advanced performance. With its ability to print characters of almost any size in several different fonts, such as Helvetica and Times, the LaserWriter can be used for in-house typesetting.

Non-Macintosh computers can also

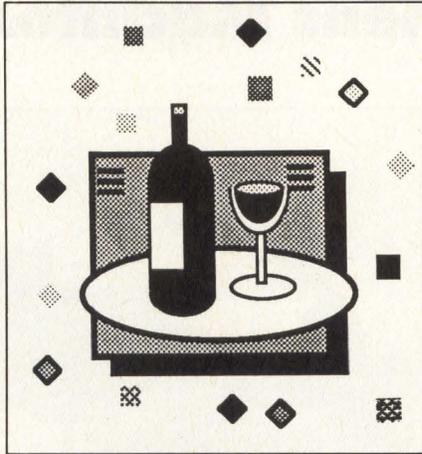
NEWS

use the LaserWriter by connecting to the printer's RS232C port. Apple has already picked up some value-added resellers (VARs) for the printer. These include Metaphor Computer Systems, Mountain View, Calif.

**Different role from IBM PC**

Williams at Future Computing says the Macintosh Office is a "positive step" toward penetration of the business markets, but he believes the Macintosh will play a much different role from the IBM PC in large corporate environments. The IBM PC will continue to be the workhorse for number-crunching and vertical-business applications, while the Macintosh, especially with the new printer, will be used more as a presentation tool for developing charts and overhead transparencies. Such materials will often be based on information pulled from IBM PC and mainframe databases, Williams notes.

There are several thousand business software applications available for the IBM PC, but at press time only about 200 were available for the Macintosh, according to Apple. Although there



**This sample was printed by Apple's LaserWriter printer. With its high-resolution text and graphics, the \$6,995 device is expected to set a standard for desktop laser printers.**

are some quality packages available for the Macintosh, what is needed is some "hit" software that will appeal to a wide range of users, Williams says. Williams and many observers expect Lotus Development Corp.'s Jazz package to provide that boost. Lotus ex-

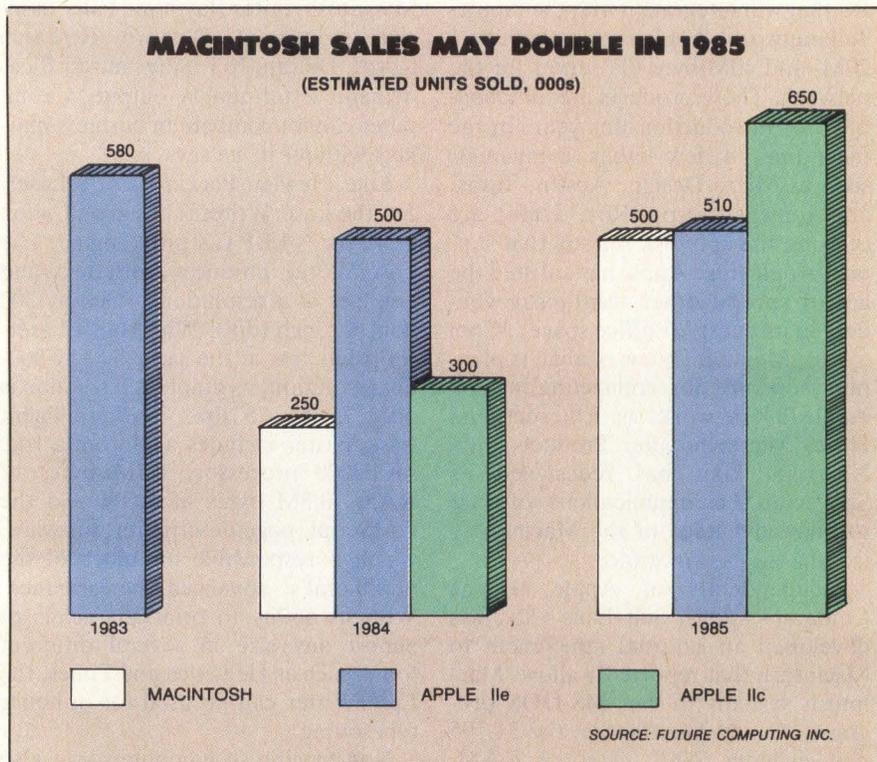
pected to begin shipping Jazz, which integrates spreadsheet, business graphics, word processing, database management and communications, last month.

The Macintosh Office products are being sold through retail computer stores, VARs and Apple's national sales force, but it is unclear how much Apple will rely on its national sales force. Some observers maintain that Apple has not emphasized direct sales strongly enough. The Fortune 2,000 accounts are increasingly becoming the domain of experienced national sales organizations, notes Charles Pesko, president of Charles Pesko Associates, a marketing consultancy based in Marshfield, Mass. Pesko says sales and service staffs at the average retail computer store are too transient to give a business customer that "warm-blanket" feeling that only a large national sales force can provide.

**Further competition arises**

As Apple steps up its Macintosh attack, some Macintosh-like competition is appearing in the form of machines using Digital Research Inc.'s Graphics Environment Manager (GEM) interface to the MS-DOS operating system. GEM, through the use of icons, pull-down menus and windows, enables MS-DOS systems to look and behave much like the Macintosh. Three hardware vendors—Atari Inc., Applied Computer Techniques Ltd. and Commodore International—have signed to implement GEM on their machines. And several software vendors, including Chang Laboratories Inc., Lifetree Software Inc. and Quadratron Inc., are tailoring some of their products for GEM. Most of the software vendors are specifically targeting the new Atari machine—a low-cost system in two models that was quickly dubbed the "Jackintosh" for Atari's flamboyant chairman, Jack Tramiel, and the Macintosh that it imitates.

Williams at Future Computing advises Apple to encourage even more competition by further opening the Macintosh's architecture, much like IBM did with the PC. □



## HEARD ON THE HILL

**Is AT&T pulling its old self together?**

**Stephen J. Shaw**  
Washington Editor

Following his tumble off the wall, not all the king's horses nor all the king's men could put Humpty-Dumpty together again. But AT&T, only one year after its breakup, may be able to show the fairy-tale character exactly how to pick up at least some of the pieces.

Despite divestiture and the shrinking of AT&T to one-quarter of its former size, the evidence is mounting that AT&T has retained substantial clout among Washington regulators and that some reunification may not be far off.

Two major events reshaped AT&T. One was the settlement of a federal antitrust suit in 1983 that forced the company to spin off its telephone operating companies. The other was the 1980 Computer II Inquiry decision by the Federal Communications Commission (FCC) to impose organization and marketing restrictions on how AT&T and the operating companies could sell data-processing services, communications equipment and computer systems.

The most recent example of AT&T's political rehabilitation is the opening of a formal inquiry by the FCC for a review of its Computer II decision. That could result in a re-vamping of the finding that AT&T be barred from selling data-communications services. The FCC has proposed dropping its requirement that AT&T can provide computer and telecommunications equipment only through AT&T Information Systems (ATTIS), a fully separate subsidiary of AT&T's long-distance network operations.

The FCC is also reconsidering its Computer II distinction between basic and enhanced service offerings. Under current regulations, only basic services—those that do not alter the form of information transmitted over the

public network—may be offered by AT&T Communications. Enhanced services—those that require the information to be manipulated by computer-processing techniques—may be offered only through ATTIS. The same restrictions regarding separate subsidiaries and the basic/enhanced service distinctions apply to the divested Regional Bell Operating Companies (RBOCs).

The distinction between the two types of network services is largely artificial: Many offerings don't fit comfortably in either category. Already, the FCC has been forced to decide whether certain types of computer protocol-conversion services should be considered basic or enhanced. Most recently, the FCC granted a waiver to certain RBOCs to allow them to offer X.25-to-X.75 protocol-conversion services as part of their basic services, despite the fact that such conversion clearly falls within the Computer II definition of enhanced services. The waiver requests were granted to allow U.S. X.25-based, packet-data networks to interface with networks compatible with the X.75 network standard.

"The Computer II decision needs substantial revision," says FCC commissioner Dennis Patrick. "I disagree with those who say Computer II is dead, but our rules have rapidly become outdated."

Lobbying hardest for changes in the regulatory treatment of AT&T is, of course, the company itself. Randall Tobias, the new chairman of AT&T Communications, told the recent Communications Network '85 Conference in Washington that the current regulatory restraints were being applied unevenly between AT&T and its competitors. He said the requirements for separate subsidiaries for equipment and long-distance services penalize AT&T's customers who have to foot the bill for costly duplication of

internal services through customer confusion, corporate inefficiency and duplication of staffs. Tobias estimated that, by 1990, AT&T competitors, unburdened by the same restrictions, will have under their control twice as many circuit-miles as ATT. "Computer II," he asserted, "has outlived its usefulness in fostering competition."

The FCC's current inclination to allow the AT&T to reunite its equipment and network-services segments may extend to the divested RBOCs. Under current FCC rules, points out Thomas Bolger, chairman of the Bell Atlantic Corp., RBOC sales personnel cannot volunteer information to a customer.

"The RBOCs have become the victims of inconsistent regulation. What's the government trying to do—protect AT&T and IBM from the telephone companies?" he asks, referring to the government's treatment of the RBOCs.

David Markey, assistant secretary for communications and information at the Commerce Department's National Telecommunications and Information Agency, says that the Reagan administration may back a move to free the RBOCs from some of the current restrictions. The restrictions would be replaced by a formula that would allow RBOC subsidiaries to function as a single company in foreign markets.

"Computer II restrictions must be re-examined. We must also keep in mind that the Consent Decree [settling the government's antitrust suit against AT&T] was not handed down by Moses," says Markey.

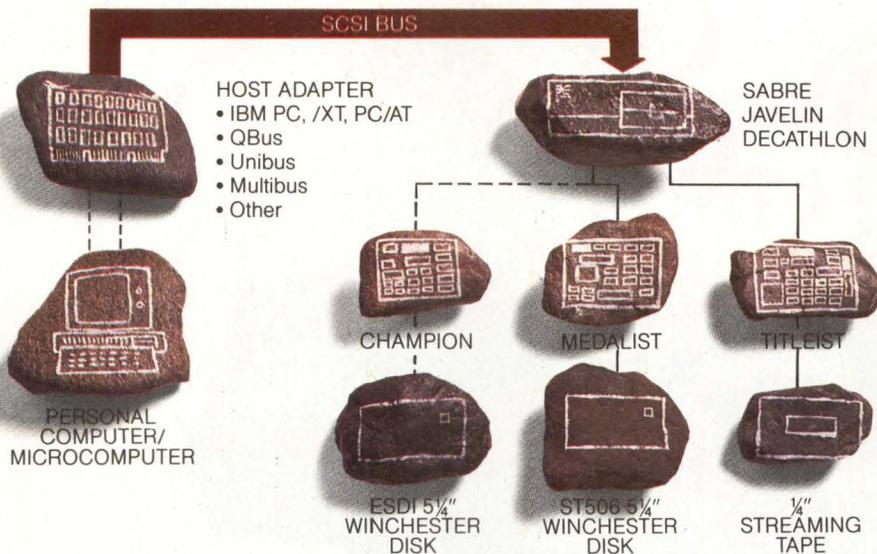
For those who once regarded AT&T as a not-so-benevolent telecommunications despot, imposing its irresistible will on government, industry and customers alike, the switch to viewing AT&T as some shackled giant, willing to compete but unable to do so effectively because of unreasonable government constraints, is not an easy one to make. However, many federal regulators seem ready to take just that view and put many of the pieces of AT&T and its divested RBOCs back together again.

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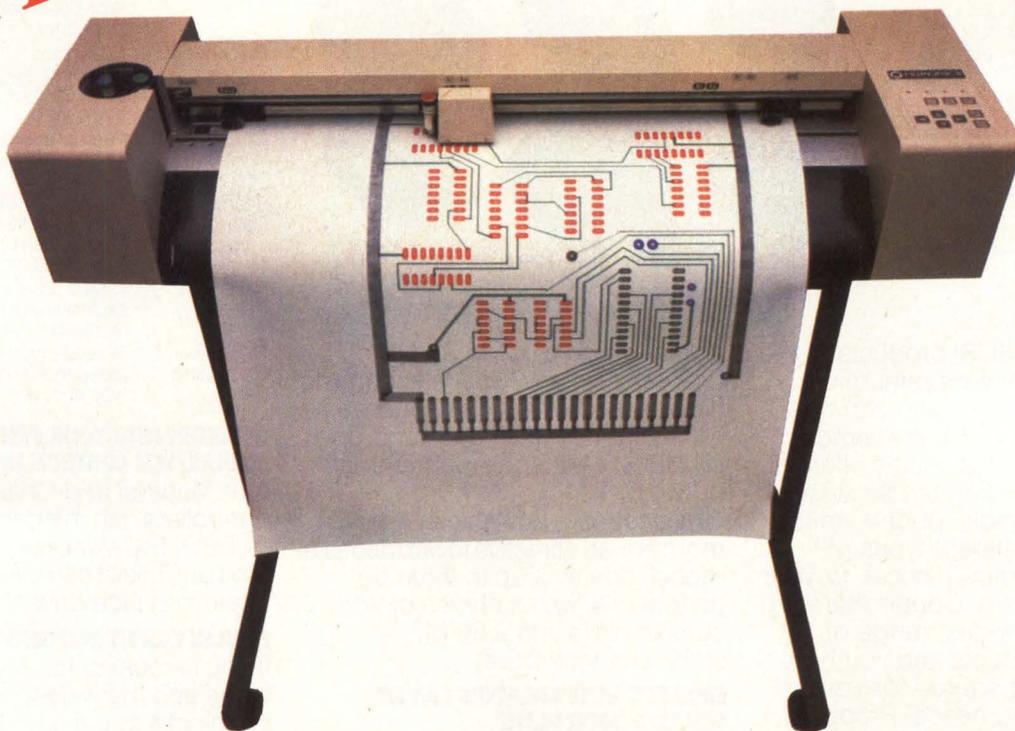
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**CIRCLE NO. 17 ON INQUIRY CARD.**

# Intel's LAN controller chip cuts costs, may ignite sales

**John P. Mello**  
Contributing Correspondent

Many analysts say Intel Corp.'s first single-chip local area network (LAN) controller, the 82588, will be a key in creating low-cost networks for personal computers in the office. With the recently introduced chip, Intel also declares its neutrality in the struggle between AT&T Co. and IBM Corp. for dominance in what some experts believe will be one of the hottest networking markets in the 1980s.

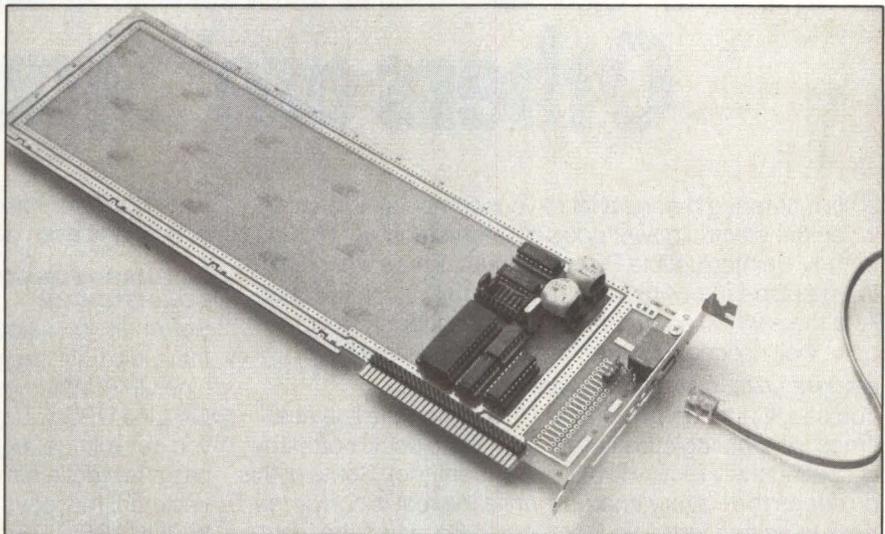
A major obstacle to the growth of LANs has been the price of connecting a device to a system. Intel claims its offering, by moving all the functions of a network controller onto a single chip, can halve such costs.

The catch, however, is that the network must be a "low-speed" one: 1M- to 2M-bit-per-second (bps) transfer rate. A high-speed network like Ethernet transfers data at 10M bps.

According to Bob Dahlberg, product manager for LAN components at Intel,

the 82588 is "supposed to address low-speed networking applications, something that Ethernet hasn't been able to address."

Analysts say LAN shipments will grow 36 percent to 42 percent annually through the 1980s, with LAN sales vaulting from \$27 million in 1983 to more than \$3 billion in the early 1990s. In the minds of these analysts, low-speed networks will be the fuse for explosive growth of LAN markets during this period. And the 82588, they



With Intel's 82588 controller, here's all the circuitry needed to connect an IBM PC to a Starlan network. The chip supports network standards proposed by both IBM and AT&T.

## Nothing's 'for sure' about LAN standards

Reaction to proposed standards for local area networks (LANs) from AT&T Co. and IBM Corp., according to the chairman of the IEEE committee reviewing them, has been "lukewarm." Maris Graube says, "It's not a foregone conclusion those proposals will be IEEE standards at all. It's not a foregone conclusion that, just because Intel has a chip, an IEEE standard will evolve around it."

Ralph K. Ungermann, president of Ungermann-Bass Inc., Santa Clara, Calif., a supplier of general-purpose LANs using Ethernet, observes, "It's not clear to me that a low-speed 1M- or 2M-bit-per-second standard in local area networks is going to become very important in the near future. My view is that the need for speed in local area networks is going to increase dramatically in the next few years because of the proliferation of application software. There is a lot of software that is going to be released in 1985 that is going to take advantage of these local area networks and is going to cause a lot more traffic

to be placed across them, so the demand is going to be for higher, not lower, speeds."

Charles R. Robbins, director of communications services of International Data Corp., a Framingham, Mass., market researcher, and others disagree. Both see low-speed networks—especially Starlan—as garnering a significant share of the LAN market.

"I'm convinced," Robbins says, "Starlan is going to be a very critical local area application because of the twisted-pair relationship."

"There has to be an awful lot of study before we can say the Starlan situation will work," IEEE's Graube says. "I'm not saying it doesn't work. I'm just saying there's an awful lot of questions about it."

The marketplace, though, may force the IEEE's hand. "Starlan is going to be a very high-volume market," says David Potter, vice president for research and advanced development at Interlan Inc. of Westford, Mass., "whether it gets adopted as an IEEE standard or not."

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### ON THE LINE, CONTINUOUSLY

You see, Continuous On-Line UPS are on the line at all times. Alternating current (ac) from the electric company is continuously rectified to direct current (dc). Some of this dc keeps the battery charged while the rest is converted back to ac and fed to your computer. So, when the input ac-power fails, the output ac remains completely unaffected because it is at all times derived from dc. The dc now flows from the battery, to which the dc/ac converter is *wired at all times*. So, there is no fresh connection to be made when the power fails, there is never an interruption — which is what *uninterruptible* is supposed to mean in the first place. Right!?

### STANDING BY UNTIL NEEDED

Standby UPS work differently. They, too, change ac to dc for charging the battery. But as long as the electric company power is on, Standby UPS feed THAT power to your computer. Generally "raw," unfiltered, unregulated. The moment the electric company goes off line, the Standby UPS goes on-line. But not right away!!

### TIME LAG

You see, the Standby UPS's all important dc/ac converter, which has stood by idly since the last power failure, must now be connected so that battery power can flow to the computer after conversion from dc to ac. This takes time! Precious milliseconds. In the meantime, what have you got? An interruption! A power glitch! From your Uninterruptible Power Supply! That's standing by all right!

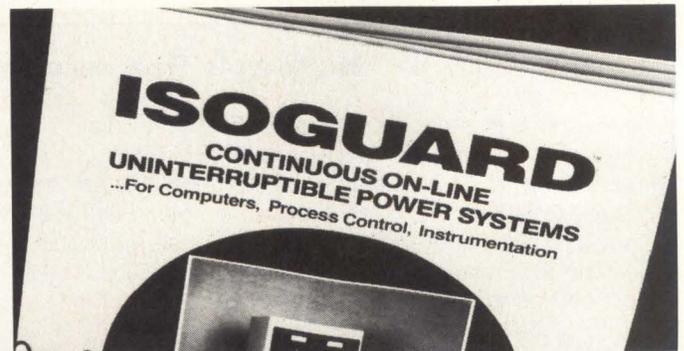
### TOUGH ON SEMICONDUCTORS

And when a Standby UPS fails, it's most often at the moment when it switches from Standby to On-Line — or is supposed to. That's not surprising; switching kilowatts electronically can be quite stressful to semiconductors, and switching can create quite nasty spikes. Computers

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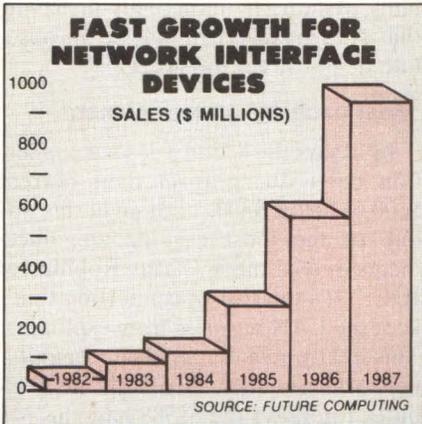
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**Future Computing** defines network interface devices as interfaceladapters used to connect personal computers to local area networks. The price is \$500 to \$700 each.

contend, could ignite that fuse.

"This could be the kind of catalyst the market has needed because it means any terminal can connect to the LAN environment—even the cheapest terminal," observes Charles R. Robbins, director of communications services for International Data Corp. (IDC), a marketing research and consulting company in Framingham, Mass.

The new chip, says Randall L. Sherman, vice president for telecommunications and office automation at Creative Strategies International, a Cupertino, Calif., marketing and research company, "will stimulate the local area industry because chip technology is driving that application. That lowers overall cost and stimulates demand."

Intel's chip addresses another obstacle to LAN growth: standards. In doing so, it places itself in the middle of a power play by the two industry giants.

The 82588 supports two proposed standards for low-speed networks: AT&T-backed Starlan, a 1M-bps, baseband network, and IBM-backed PC Net, a 2M-bps broadband system. The proposed standards are before the IEEE.

The 82588 is a slave peripheral. It contains a carrier-sense, multiple-ac-

# SWITCHING TERMINALS A PROBLEM?

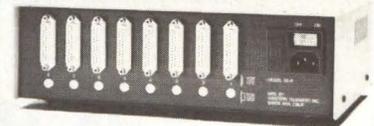
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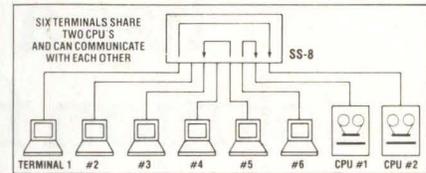
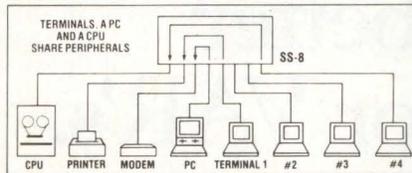
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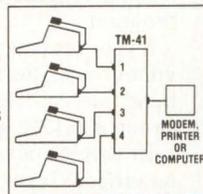
Model SS-8 = \$895.



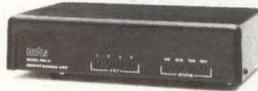
## 4 PORT PUSH BUTTON SWITCHING



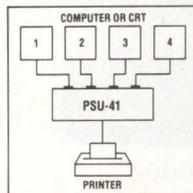
Fed up with the hassle of plugging and unplugging data cables or running around flipping switches on a mechanical box? The TM-41 electronic switch is capable of switching common RS232 signals between 4 input ports and 1 output port to select a printer, modem or computer. **Model TM-41 = \$295.**



## PRINTER SHARING UNIT



The PSU-41 allows up to 4 computers or CRTs to share one printer. It scans each port until the data has been sent to the printer, then resumes scanning. **Model PSU-41 = \$395.**



## AB MINI SWITCH...\$89.00

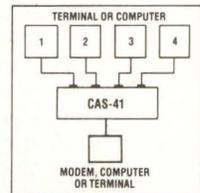


The ABS provides economical push button switching between two ports A & B, and a common port.

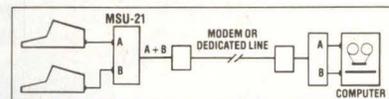
## 4 TO 64 PORT CODE ACTIVATED SWITCHING



Let your computer do the switching... automatically! The CAS-41 lets your computer select one or any combination of up to 4 RS232 ports by a user selectable code sequence. The CAS-161 offers the same capabilities with 16 ports which can expand to 32, 48 or 64 ports. **Model CAS-41 = \$395. Model CAS-161 = \$795.**



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cess/collision detection (CSMA/CD) controller, two logic-based, collision-detection mechanisms and an encoder/decoder for both non-return-to-zero-inverted (NRZI) and Manchester encoding. Manchester encoding is used by Starlan; NRZI encoding, by, broadband networks like PC Net.

"What you're seeing is competition between AT&T and IBM," explains David Potter, vice president for research and advanced development at Interlan Inc., a Westford, Mass., maker of components for LANs using Ethernet. "IBM has come out with a solution for wiring the office with an IBM ca-

bling system. If it succeeds in having that stuff installed, it will be an absolute death threat to AT&T."

#### 'Most exciting' announcement

Intel says the 82588 will send connection costs diving from their current \$600 to below \$300. "I thought this was one of the most exciting announcements Intel's made," says Robbins of IDC. "It's the cost of connection that's kept the LAN business from exploding. This really makes personal computer networks a reality. Given all the attributes Intel says the 82588 has, this is a major breakthrough."

Vendors sellings LANs using Ethernet aren't so sure. "Does Intel really expect the difference to be between \$600 and \$250?" asks Bob Metcalfe, co-inventor of Ethernet and chairman of 3Com Corp., Mountain View, Calif. "I claim that's nonsense. It's misleading garbage."

#### Difference of \$30

"If that chip costs \$20 in quantity," Potter of Interlan explains, "you're looking at a cost for an equivalent Ethernet chip set of \$50 in quantity. There's a \$30 difference. That might be 10 percent or 15 percent of the total interface cost. You're not going to go out and save a whole bunch of money simply because you have a \$20 part. There are too many other things that have to go into it."

"My guess is you won't be able to get a \$250 interface to Starlan until it is a very widely adopted standard. Even then, I think you will be getting something that isn't complete. It will require permanent software. My guess is that's three or four years away. In that time frame, you can get an Ethernet interface for the same price."

Says 3Com's Metcalfe: "The next major cost reductions are not going to come from further chip integration...but [from] building in the local network connection inside the computer, not on a separate card. People should be spending their time getting standard local network interfaces, like Ethernet, built into their computer, where it will be really cheap, instead of looking at cards as the only way of doing that." □

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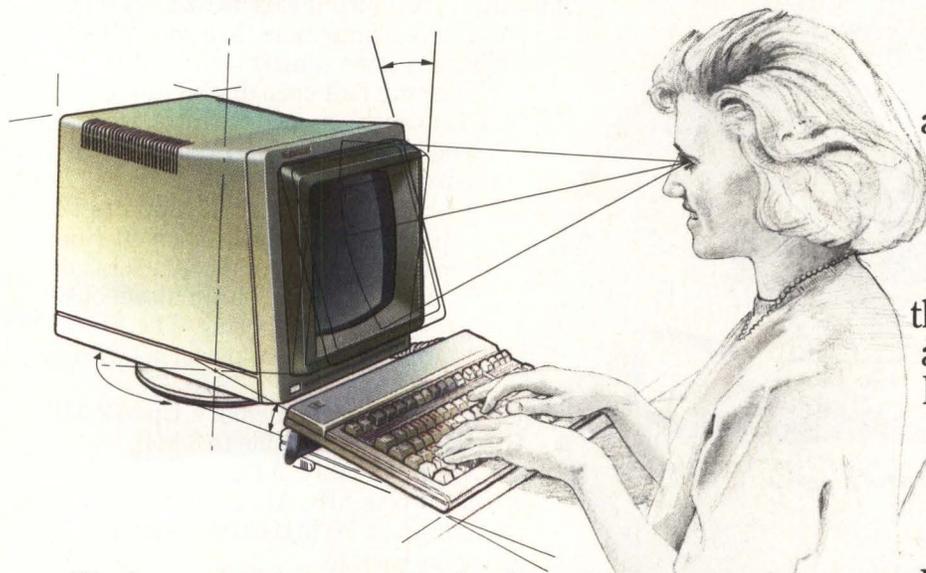
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## ACT starts U.S. bid with three software allies

**Jerry Borrell**, Western Editor  
**Jim Donohue**, Managing Editor

Already a power in Europe, where it competes against IBM Corp., Great Britain's Applied Computer Techniques Plc. (ACT) has set up strategic alliances with three big guns of the U.S. software industry in a bid to enter the U.S. microcomputer marketplace. The three software vendors are Ashton-Tate, Culver City, Calif.; Microsoft Corp., Bellevue, Wash.; and Software Publishing Corp., Mountain View, Calif.

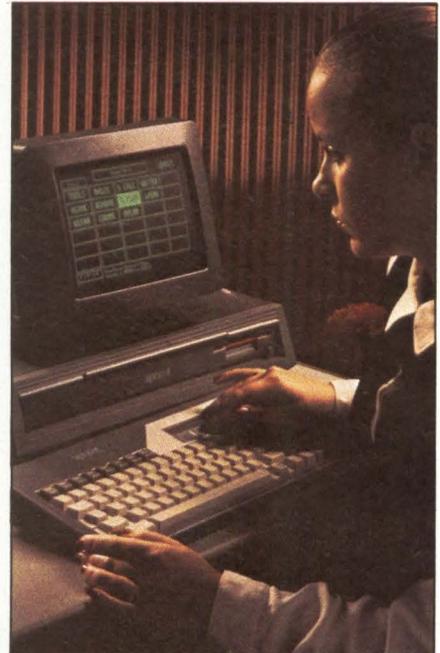
ACT of Birmingham, England, gets to use the good name of the three companies for its push into the United States, along with a commitment from them to keep turning out software that runs on ACT's line of Intel Corp. 8086-based, MS-DOS Apricot business

microcomputers. "It gives ACT access to leading-edge software products at roughly the same time that IBM gets them, and in the 3½-inch media," explains analyst Norm DeWitt, director of the personal computer service for Dataquest Inc., San Jose, Calif. ACT computers use 3½-inch Winchester and floppy disk drives.

For their part, the software companies get access to ACT's large markets in Great Britain and the rest of Europe.

### Tops at home

In its home base in Great Britain, ACT says it holds the top spot in the business microcomputer market with 36 percent of sales, against 33 percent for IBM. In the rest of Europe, says ACT, IBM holds a leading 38 percent share of business microcomputer sales;



The Apricot xi-20s computer, configured with a 20M-byte, 3½-inch Winchester disk drive, is a key player in ACT's bid for American sales.

### ACT aims to double worldwide installations this year

Applied Computer Techniques Plc. (ACT) will ship 75,000 of its Apricot microcomputers worldwide from its plant in Glenrothes, Scotland, this year, says Ed Sherman, managing director of ACT International. Of that number, 15,000 are slated to go to the United States.

These shipments will more than double the number of ACT computers installed worldwide. According to Sherman, ACT had about 50,000 machines installed in Great Britain at the end of last year and about 10,000 in the rest of the world—primarily in France and West Germany.

Sherman estimates, however, that shipments outside Great Britain have climbed to close to 1,500 a month, about on par with shipments inside Great Britain. He says ACT views overseas sales, which did not begin until late 1983, as holding the greatest potential for growth.

ACT targets France and West Germany as its biggest markets in Continental Europe. Gordon Curran, director of Intelligent Electronics Europe, Paris, an analyst of the microcomputer marketplace, estimates that ACT will ship 5,000 computers to France and 8,000 to West Germany this year, almost doubling last year's shipments.

But ACT's Sherman says he thinks dollar shipments will be greater to France than to West Germany: about \$12 million to France and \$8 million to West Germany.

ACT entered the microcomputer marketplace in late 1981 by distributing the Victor 9000 microcomputer from Victor Technologies Inc., Scotts Valley, Calif., in Great Britain under the name Sirius I. ACT introduced its own 16-bit computers, the Apricot line, in 1983.

Last year, ACT tried to buy Victor's financially ailing European distribution network, but the deal fell through over terms for buying Victor's manufacturing operations in the United States. ACT no longer sells the Sirius computers.

This year, ACT hooked up with Tandy Corp., Fort Worth, Texas, in a deal that will open about 450 outlets for ACT machines in Europe. Among these are about 30 Tandy Computer Centers in France, West Germany, Belgium and the Netherlands and 18 in Great Britain, which will sell the Apricot line.

ACT maintains its own distributors in Continental Europe and sells through 20 franchised computer stores in Great Britain.

—Keith Jones, European Editor

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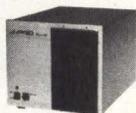
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England-Quant Systems	01-534-3158
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**ACT'S PRODUCT LINEUP AT A GLANCE**

Model	RAM (K bytes)	3 1/2-inch floppy drive (K bytes)	3 1/2-inch Winchester (M bytes)	Price (\$)
F1	256	720	no	1,495
F1s	512	720	no	1,995
Portable	512	720	no	2,495
Apricot PC	256	720	no	2,195
Apricot xi	256	720	10	2,995
Apricot xi-20s	512	720	20	3,995
Apricot xi-20s	1M byte	720	20	4,495

ACT ties with Olivetti SpA, Ivrea, Italy, for second place, with 15 percent of sales. ACT maintains its own marketing organizations in Great Britain and in some countries on the Continent and recently joined with Tandy Corp. in a distribution agreement that will add about 450 outlets for ACT computer products in Europe.

It was ACT's strong position in Europe that led all three software vendors to form the alliances. Ron Posner, vice president and general manager of Ashton-Tate, told attendees of a news conference at which the alliances were announced, "We're moving aggressively to expand our overseas operations." Ashton-Tate has been selling software products, primarily the dBASE II database management system, in Europe since 1983 and says 20 percent of its total revenues now come from foreign sales.

Bill Gates, chairman of Microsoft; Roger Foster, ACT group managing director; and Fred Gibbons, president of Software Publishing, joined Posner at the news conference in Menlo Park, Calif. Gates noted that Microsoft and ACT had been working together for four years and that, largely because of ACT's position in Europe, Microsoft gets 30 percent of its sales in that market. Microsoft developed MS-DOS, the operating system that is sold on the Apricot computers.

ACT's Foster says the British company wants to make MS-DOS the standard operating system for small computers. "By forming alliances," he says, "we demonstrate...our intention to move toward an international stand-

ard for MS-DOS micros."

With \$20 million in start-up capital, ACT has set up a U.S. marketing organization, Apricot Inc., based in Santa Clara, Calif., to push U.S. sales of the Apricot computers. The company will sell into the low end of the small computer market (machines priced at less than \$10,000). The top of the Apricot line, the recently announced xi-20s with a 20M-byte, 3 1/2-inch Winchester disk drive, is priced at under \$5,000.

A spokesman for ACT says the U.S. company plans to compete with Apple Computer Inc. machines, especially the Macintosh. "We don't plan to take on IBM right away," says the spokesman.

"That's wishful thinking," says Bill Meserve, microcomputer specialist at research concern Arthur D. Little Inc., Cambridge, Mass. "If they're going after the Fortune 1,000 companies, they're going after IBM. Even if they go after smaller companies, they're going to find IBM there. How can you not go after IBM? They're omnipresent."

ACT has signed on the North American Manufacturers' Representatives Association (NAMRA) to sell its machines. NAMRA is a group of 15 independent computer sales concerns that sold Apple computers until last year when Apple established its own sales force. As it did for Apple, NAMRA will concentrate on selling to dealers and large accounts, analysts say.

ACT has established what Dataquest's DeWitt describes as "realistic" goals for U.S. sales: 15,000 units this



**ACT wants to establish international standards for MS-DOS microcomputers, says Roger Foster, ACT group managing director.**

year, 40,000 units next year and 70,000 in 1987. "Those numbers may even be conservative," DeWitt adds. ACT sold 110 computers in the United States last year and virtually none before that, according to a company spokesman.

Apricot's competition comes from Apple, Tandy, IBM and Wang Laboratories Inc. Meserve says, "Apple had a very strong position, and they're fighting very hard to maintain it and improve it. Tandy had a strong position, but that's deteriorated over time. Wang has a stronger position than most people visualize. But nobody has the position that IBM has."

Some industry analysts think ACT may be trying to push the 3½-inch drives too soon. Chris Christiansen, market analyst at the Yankee Group, a research concern in Boston, says, "The performance of the 3½-inch floppy disks is low—the I/O speeds are lower than what's available currently in 5¼-inch drives. And there are not many large suppliers."

Among the software products available now or expected to be available early this year from the three vendors:

- dBase II and dBase III database managers and the Framework integrated software package from Ashton-Tate
- The MultiPlan spreadsheet; MultiTool financial programs; and a host of software-development tools for

the BASIC, C, COBOL, FORTRAN and Pascal languages, all from Microsoft

- pfs:Report (report generator), pfs:Write (word processor) and pfs:File (file manager) from Software Publishing.

ACT says two icon-based interfaces, Microsoft's MS Windows and Digital Research Inc.'s Graphics Environment Manager, are available for its computers. These compete against IBM's TopView and the icon-based interfaces on Apple's Macintosh computers. □

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Alonzo Chappel. *Battle of Bunker Hill*. Courtesy The Bettmann Archive.

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# MINI-MICRO WORLD

CORPORATE AND FINANCIAL

## New tax rules govern overseas sales income

**Stephen J. Shaw**  
Washington Editor

Companies that operate on a January-to-December tax year must notify the Internal Revenue Service by April 1, should they have established foreign sales corporations (FSCs). Beyond that date, they risk losing some lucrative tax breaks on revenue from foreign sales.

FSCs were instituted as part of the omnibus tax bill passed in October by Congress. Effective Jan. 1, FSCs replaced domestic international sales corporations (DISCs) as a means to defer taxes on foreign sales revenue. The legislation requires companies to establish offices outside the United States and to meet other criteria in order to exempt a portion of their income from taxation.

### Encourage exports

DISC legislation was enacted in 1972 to encourage exports by offsetting the tax advantages enjoyed by exporters in other countries. DISCs allowed U.S. companies to defer almost indefinitely paying taxes on 95 percent of revenues from the foreign sale of goods produced domestically.

However, members of the General Agreement on Trade and Tariffs (GATT), an international forum which negotiates trade and tariff agreements, complained that DISCs represented an illegal trade subsidy to U.S. exporters. Member countries of GATT, representatives of the U.S. Treasury Department and the U.S. Trade Representative (USTR) met with Congress to draft legislation that would meet GATT objections while retaining export incentives for U.S. companies.

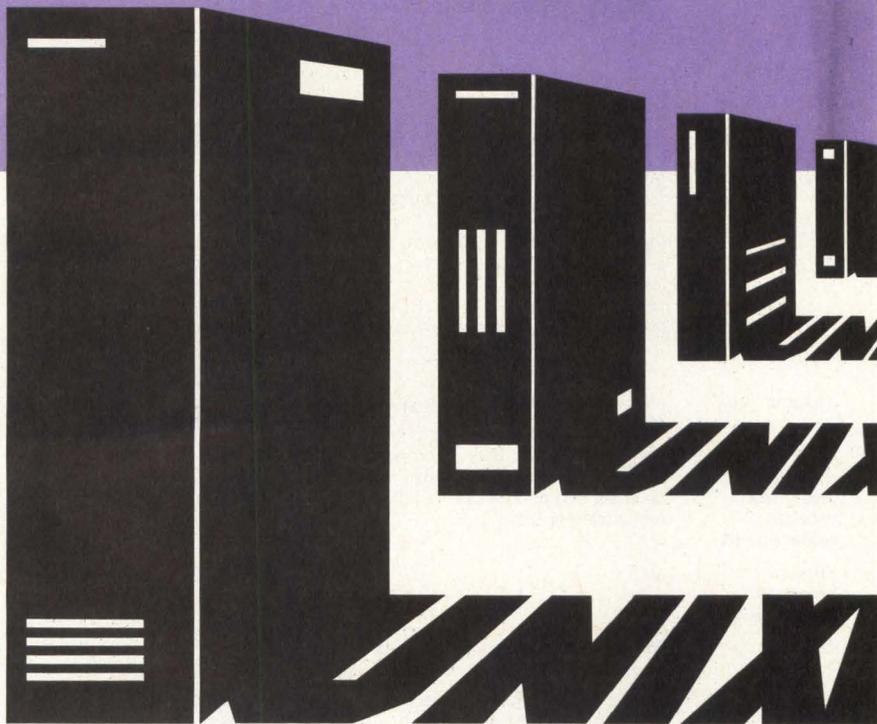
### HOW DISC COMPARES TO FSC

Item	DISC	FSC
<b>Entity subject to Federal income tax?</b>	no	yes (exclusion for exempt foreign trade income)
<b>Type of entity?</b>	(a) a corporation which is incorporated under the laws of any state  (b) that has one class of stock, par or stated value of \$2,500 (c) no restriction on number of shareholders (d) no board of directors restriction	(a) a corporation which is incorporated under the laws of a foreign country or U.S. possession (b) that has no preferred stock (c) that has no more than 25 shareholders (d) that has at least one nonresident individual on board of directors
<b>Taxable year?</b>	need not conform to taxable year of shareholders	must conform to taxable year of majority shareholder
<b>Qualified export assets and gross receipts requirement?</b>	yes, failure to satisfy requirements results in taxation of previously deferred income and may result in termination of DISC	no
<b>Foreign presence requirement?</b>	no	yes
<b>Type of income?</b>	95 percent must be qualified gross receipts	exclusion from income is limited to exempt foreign trade income
<b>Export receipts?</b>	qualified gross receipts are generally gross receipts from the sale, lease or rental of export property and from related services and certain dividends, interest, and gross receipts from qualified assets (other than export property)	foreign trade gross receipts are generally the same as DISC qualified gross receipts but do not include dividends, interest and gross receipts from certain property that is not export property; to qualify, foreign management and foreign economic process requirements must be met
<b>Export property?</b>	property manufactured, produced or grown in the U.S. for use or disposition outside the U.S.	same as DISC
<b>Excluded property?</b>	generally not property for use by a related corporation, intangibles, depletable products, property the export of which is prohibited and property in short supply	same as DISC, except oil and gas are the only excluded depletable products (coal and uranium are not excluded)
<b>Maximum tax benefit?</b>	deferral of tax on 1.7 percent of gross receipts or 21.25 percent of combined taxable income (subject to reduction by incremental rule)	tax exemption on 1.35 percent of gross receipts or 17 percent of combined taxable income

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"DISCs operated on the concept of deferred taxes. FSCs are constructed to exempt [taxes on] a portion of income earned from foreign sales," explains Tim Regan, a USTR tax specialist.

#### Tax debt forgiven

The largest single benefit to companies in the switch from DISCs to FSCs was the forgiveness of the deferred tax debt they accumulated under DISC. A total of \$12 billion was wiped off the ledgers of the IRS. "It sure brightened up the balance sheets for a lot of companies," said one Capitol Hill source.

According to information supplied by the Computer and Communications Industry Association (CCIA), to qualify for tax-exemption benefits under the new legislation, an FSC must meet the following criteria:

- Be organized, and maintain an office outside of U.S. customs areas
- Have at least one non-U.S. director
- Keep records at both its foreign office and its parent company
- Be managed outside the United States, including banking, shareholders' meetings and board meetings
- Transact business outside the United States, including contracting
- Handle orders, advertising charges, transportation, collection and credit-risk assumption outside the United States, according to certain formulas.

A qualifying FSC can have exempted from U.S. taxation either 17 percent of its taxable income or 1.35 percent of its gross sales receipts. Under certain circumstances, FSC sales transactions qualify for higher exemptions: up to 23 percent of taxable income or 1.83 percent of gross sales receipts.

"FSCs are a little more complicated than DISCs and involve a lot more bookkeeping. Essentially, though, FSCs are not much more than DISCs recreated so they meet GATT requirements," comments Stephanie Biddle, CCIA vice president. □

## Strong dollar weakens U.S. sales in Europe

Keith Jones, European Editor

Not even the biggest American computer vendors are immune to problems created by the high value of the dollar against most other currencies. The dollar is especially strong in western Europe, the biggest foreign market for most U.S. suppliers.

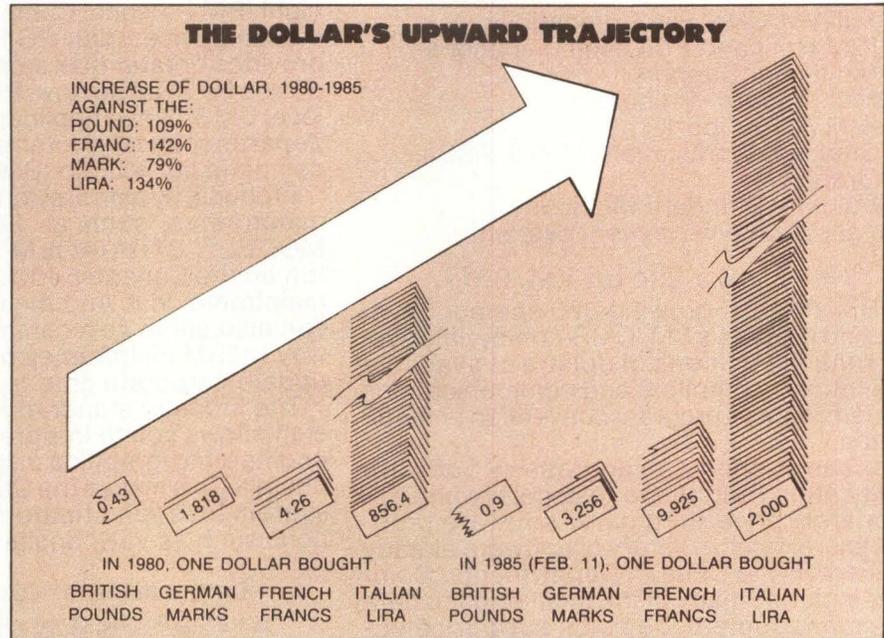
The chairman of IBM Corp., John Opel, notes that his company's performance outside the United States in 1984, measured in local currencies, was excellent. Income rose by nearly 19 percent compared with 1983, and net earnings went up well over 30 percent. But, once those foreign currencies got converted to dollars, the picture changed: IBM's operations outside the United States had risen less than 9 percent and earnings by less than 20 percent.

"The stronger U.S. dollar, relative to the other major currencies, had a severe impact on period-to-period financial comparisons," Opel observes.

### Non-dollar manufacture helps

IBM and many other American computer companies manufacture in Europe—or at least fabricate in Europe—much of what they sell there. Among the companies are Digital Equipment Corp., Honeywell Inc., Hewlett-Packard Co. and Burroughs Corp. Manufacturing costs and sales income are in the same currencies in most cases, and fluctuating exchange rates against the dollar are not a factor. "All non-dollar manufacturing helps," suggests Robert McMicking, business and finance manager for DEC in the United Kingdom.

But many of the components in these products are imported from America. That's especially true, McMicking notes, when European sales of a U.S. company are growing too fast for its European manufacturing operations to keep up. Then more components and even entire products have to be imported from the U.S.



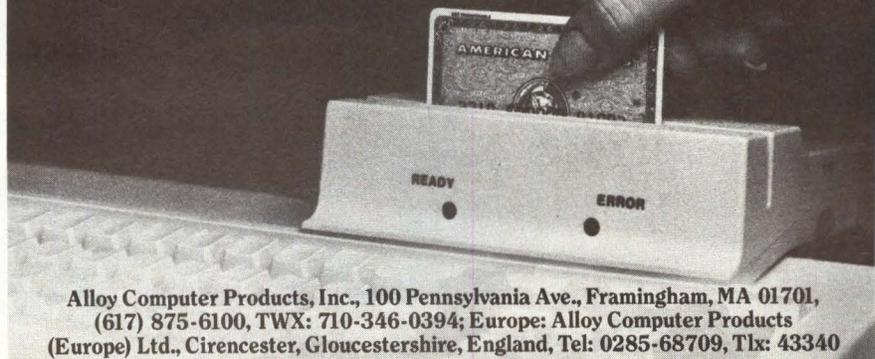
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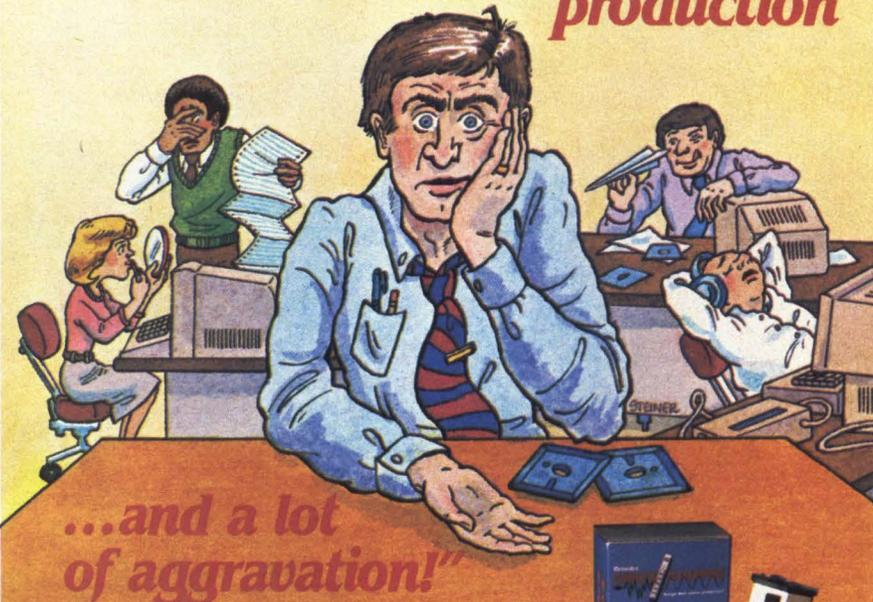
Many U.S. companies that have recently established European manufacturing operations continue to import components from the United States, according to Christopher Wilks, marketing manager in the United Kingdom for the computer systems group of Gould Inc. Gould began assembly op-

erations in Ireland about a year ago.

Smaller U.S. companies also tend to import a large part of their products from the U.S., says Philip Mobsby, European marketing manager for Dataproducts Corp., Woodland Hills, Calif., which has established manufacturing operations in Ireland. If a lot of

the components and labor in a product come from the United States, then what's referred to as the dollar content of that product is high. That wasn't such a problem five years ago when the dollar would buy 0.43 British pounds (meaning the pound was worth a bit less than \$2.40). But today the pound is worth just a dime or so more than \$1.

**"A Brooks Surge Stopper could have prevented 3 days of lost production**



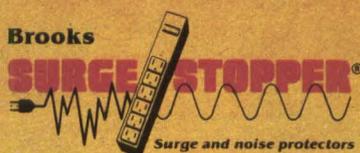
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That means a computer maker in the United Kingdom could buy a U.S. component that cost \$2.40 for about £1 five years ago. The same component at the same dollar price today costs more than £2. The dollar content of any product the computer maker manufactures with U.S. components has more than doubled.

Fluctuating exchange rates make it difficult to run an orderly business. Suppose you make computers in Manchester, England, and you close an order for a system. Half the parts and labor come from Great Britain and cost you £8,000. The dollar content of the U.S. parts and labor is \$10,000. The exchange rate is \$1.25, so it costs you £8,000 to buy the U.S. components. Your costs are £16,000, and you set the price at £18,000 for a profit of £2,000.

By the time you are ready to assemble and deliver the system, however, the exchange rate has changed and the dollar is worth £1. Now the \$10,000 in U.S. parts and labor costs you £10,000. Your UK costs remain £8,000, so it now costs you £18,000 to manufacture and deliver that system that you've priced at £18,000. Your profit has disappeared into the exchange rate.

**Some adopt hedging**

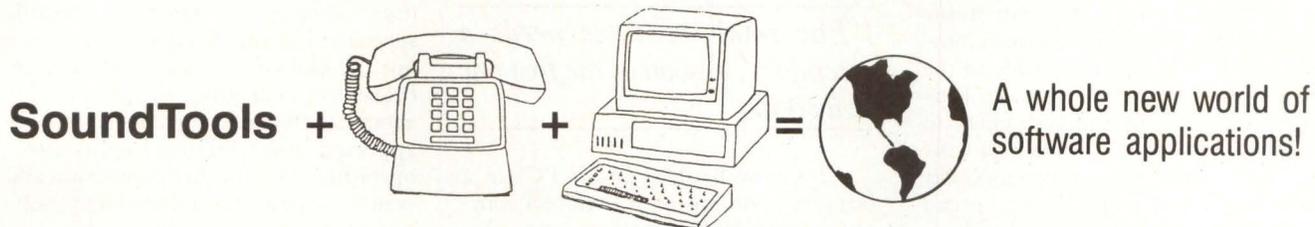
Many U.S. companies that price the bulk of their products in Europe in local currencies have adopted a technique referred to as "hedging" to alleviate the effect of the dollar's upward surge. With hedging, a U.S. company selling in the United Kingdom, for example, knows it will get £8,000 for a product that will be delivered in three months. At that point, the pound is worth \$1.25, but nobody knows what it will be worth three months later. So

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# NOW THAT THE PC FAD IS OVER, IT'S TIME TO GET DOWN TO BUSINESS.

Like hordes of locusts, the PC swept the business community. Corporations bought them like electronic calculators by the thousands to improve the productivity of their executives. Portables were carried home from the office every evening and on trips. Computerization was even affordable to the small business for the first time. Programmers put their unique genius to work to develop some of the best software ever written. Productivity tools like word processing, electronic spread sheets, data base management and accounting was placed into the hands of new computer users. Productivity improved for everyone. From the CEO . . . to his staff . . . to the salesman . . . to his secretary. Forecasts for continued PC growth were nothing but highly optimistic. One at every desk. One in every home. What happened?

---

*"Networking won't solve the multiuser problem either economically or functionally."*

---

Like the first crust of any marketplace it saturated quickly. Those that are the first to buy almost anything new and promising, bought. There are no more computer hackers and hobbyists to sell to. They all have one. Applications for the home that made any sense didn't develop. Corporations found that they needed PCs to "talk" to each other. That solution is distant because networking won't solve the problem either economically or functionally. Most available networking does nothing more than messenger floppies around. The small business found that as soon as its first PC was operational and productive, a second one was needed to satisfy demand usage. The PC, with all its promises, turned out to be a dead end for the business environment. The PC and clones just haven't been the godsend for business that was predicted. Why?

The PC is a personal computer. Just that. Not a business computer. That's because PCs are single user computers with single user software. Good for one person but not good enough for a whole company. Even if the company is two people.

Every computerized business has someone entering information while someone else is looking up information.

That's two users. And every business has more than two users who need access to the computer. That's a multiuser computer environment.

---

*"The small business needs a second PC as soon as the first one is working."*

---

It's now hard to justify PCs in a business environment. A multiuser computer capable of supporting up to five users is available for the price of a single IBM PC XT. It has more storage and a business oriented operating system. Supermicros are available that have the power of minicomputers without the accompanying price tag. Ten unconnected PCs, sitting around worth about \$50,000, doesn't make sense when for much less you can get a lot more computing power in a supermicro that accommodates 20 or more users. But don't let even that price tag scare you. On a per user basis, multiuser computers cost about \$1500 less than a PC. New users can be added for less than \$600 with a dumb terminal. And they're upgradable.

---

*"A six port multiuser computer is now available for the price of a single IBM PC XT . . . micro-computer systems cost \$1500 less per user than multiple PCs."*

---

Multiuser computers communicate with each other. They share the same data base, software and peripherals. They have sophisticated business features such as record locking, user accounting privilege levels and system security. They are business oriented and priced well within the reach of the first time computer user.

But what about all the PCs already in place? Don't ask the PC manufacturer for a solution. They're concentrating on selling more single user systems. The real solution is to get started with a true multiuser computer in the first place. With multiuser business computers now in the same price range as a PC, it doesn't cost any more to make the first step the right step.

The PC has seeded the next wave. It's here now. Supermicro multiuser computers that can support up to 32

users. If you don't believe it just look at the new product introductions from IBM, DEC and AT&T, let alone the smaller companies like Altos, Plexus and IBC. Big system features for every end user. Software for every conceivable specialized business application. That's not the end of it. New challenges are there for everyone. Opportunities abound. Software companies are already applying their talents to multiuser operating systems, disk conversion and even more powerful and productive software. Companies are shifting their emphasis to provide multiuser system enhancements as they did for the PC. Value added resellers and specialist dealers will give the end user the support that's been terribly lacking from department store retailers. It's a great day for someone who needs a multiuser computer. And everyone does.

---

*"Multiuser computers share everything . . . they have business features such as record locking, user accounting, privilege levels and system security."*

---

Thanks PC! You've whetted the appetite of a large new business environment for computerization. One that is bigger, more demanding, and more sophisticated than we've ever seen before. There's no turning back now. You were a fad, but now it's time to get down to business . . . multiuser business.

*Randy L. Rogers*

Randy L. Rogers  
President and CEO  
IBC/Integrated Business Computers  
Manufacturer of Multiuser Computers  
Chatsworth, California.

the company goes to a currency dealer and makes an agreement to buy £8,000 worth of dollars in three months for a negotiated rate—let's say \$1.25 to the pound, making it \$10,000.

Three months later, when the company pays the £8,000, the pound is worth only \$1; it doesn't matter, it still gets \$10,000 from the currency dealer. "Hedging is mainly a vehicle for planning financial results over a limited period," notes McMicking.

Business people observe that hedging is a gamble. If the dollar had weakened over the three months before the product was delivered, so that the pound was worth \$1.50, the deal would have remained the same: The American company would have gotten \$10,000 for its £8,000, not the \$12,000 the money would be worth in the new exchange rate.

Another technique aimed at reducing the impact of a dollar surge between order and delivery times is called dollar "pegging." The customer agrees to pay more in local currency should the dollar rise above a certain limit. McMicking at DEC says pegging is normally acceptable to the customer only if the contract involves deliveries over an extended period, say two years.

#### Just boost list prices

When local currency prices are already too low because of the dollar's rise, some manufacturers simply increase their list prices. Wilks at Gould notes that such a move need not harm sales if there are not many alternative suppliers in Europe.

Neil Rowlands, managing director of the British subsidiary of UNIX system vendor Plexus Computers Inc., Santa Clara, Calif., acknowledges that his company has some direct competitors in Europe, but he observes that the products of these competitors also incorporate a significant dollar content in the form of imported components, denying them any great advantages.

Disk drive vendors also face Japanese competition. James Jones, manager of Priam (Europe) Ltd., Reading, England, believes his company and other U.S. manufacturers remain

price-competitive and are holding their own against the Japanese. But Donald Wright, UK and Scandinavia sales manager for Pertec Peripherals Corp., Chatsworth, Calif., believes that the Japanese share of Europe's disk drive market is increasing because the yen is not as strong as the dollar, giving Japa-

nese products a price advantage over American products.

Priam and Pertec bill in dollars rather than local currencies. "The OEM disk drive business traditionally is dollar-based," notes Wright. "Being paid in dollars is a safeguard in long-term contracts." □

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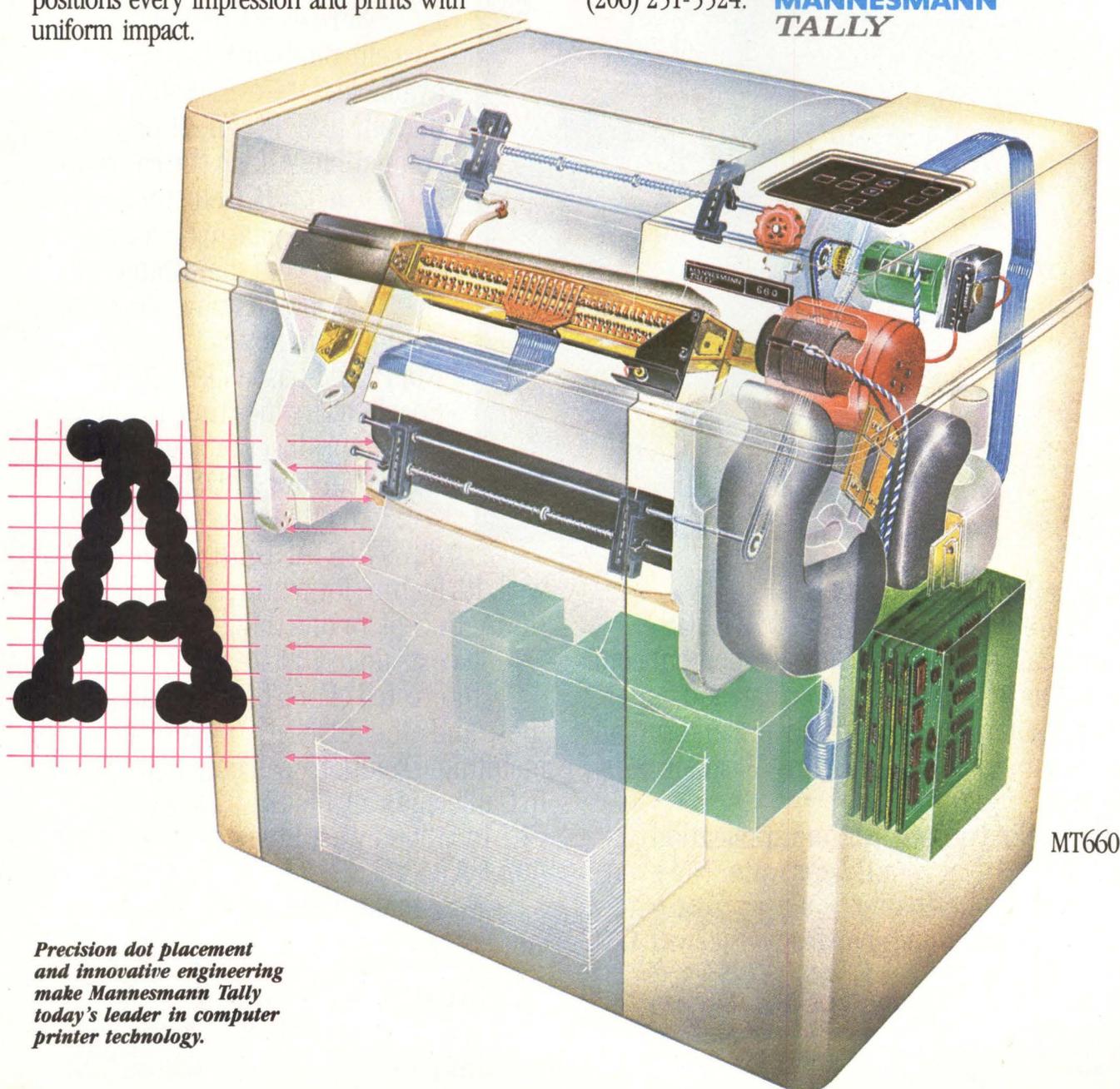
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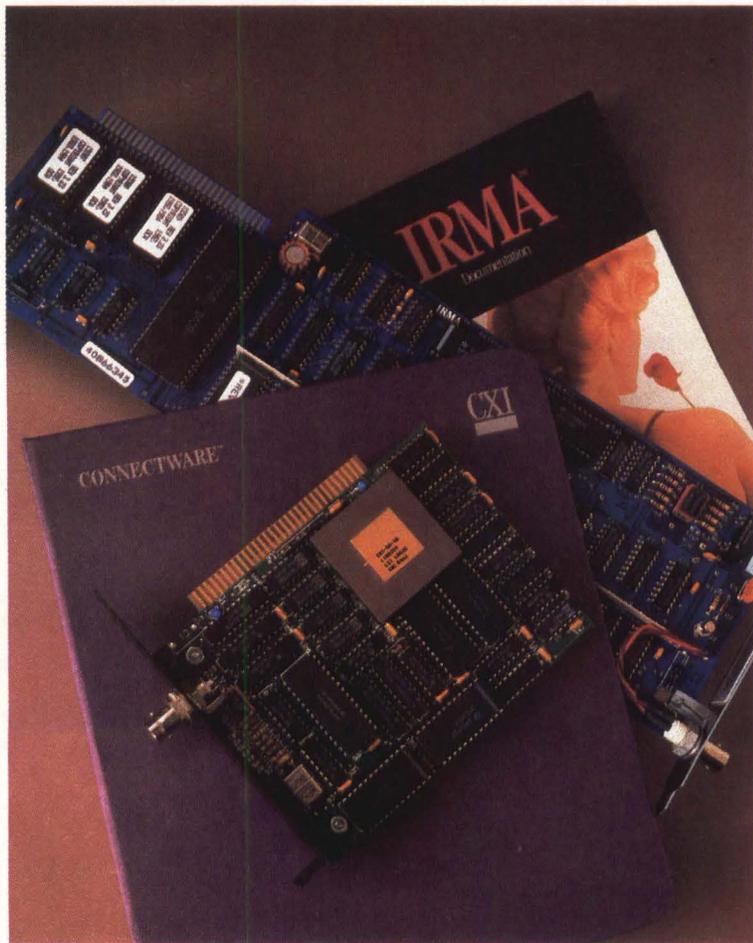
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# MINI-MICRO WORLD

INTERNATIONAL

## Taiwan's first software draws mixed reviews

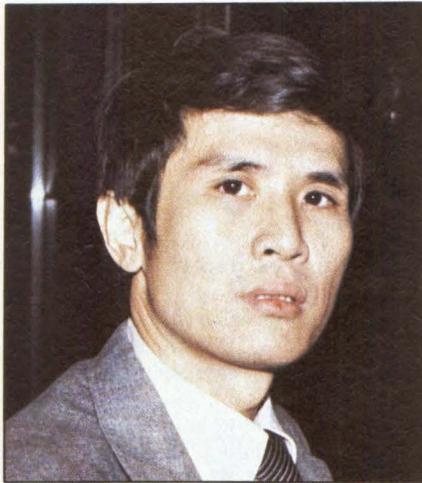
**Charles Hintermeister**  
Taiwan Correspondent

Many view Taiwan as a manufacturing center for microcomputers, terminals and other peripheral equipment, but few system integrators or distributors in the United States have ever purchased IBM PC-compatible application software from Taiwan. They will soon have the opportunity to do so.

Six of Taiwan's larger computer hardware manufacturers decided early last year that one of the chief reasons export sales of their new crop of 16-bit, IBM-compatible microcomputers were sluggish was lack of bundled software. The six companies—AOC Corp., CAF Computer Corp., Mitac Inc., Multitech Industrial Corp., Shinlee Corp. and Tatung Co.—contracted with seven Taiwanese software companies to produce a five-part integrated software package that can be bundled with their systems, and, theoretically, stimulate exports.

Work on the package, known as the "Big Five" software package, was completed recently with technical support from the Taiwanese government. It was scheduled to become commercially available early last month.

It contains word-processing, spreadsheet, business graphics, communications and file-management programs, residing on a total of seven 5¼-inch disks. Written in C, all the programs—except the word-processing program—have file-sharing capabilities. When bundled with a 16-bit system produced by one of the participating hardware companies, the Big Five package will sell for \$90, although the price will drop to less than \$70 for large orders, according to Oliver Lin, a market spe-



**Andrew Chen**, manager of Taiwanese software distributor Multisoft, is not optimistic about "Big Five."

cialist with Systex Corp., one of the Taiwanese software companies involved in the project.

Although most of the sales are expected to be on an OEM basis through the six hardware companies, limited retail sales are also anticipated for the package at \$495 per set. "I think the price is very competitive," says Lin, "considering the other integrated packages now available." According to Lin, sales in the first year are expected to reach \$300,000.

### Copy protection planned

Before Big Five goes on the market, copy-protection mechanisms will probably be added to the package to prevent unauthorized copying, says Lin. The seven software companies that developed the package plan to apply for copyrights in the United States.

The introduction of the package will mark the first time a major English-language software package designed in Taiwan is marketed internationally. Although the package has been criticized as being insufficiently user-friendly and without a high-enough level of integration, it is nevertheless a major step forward for Taiwan's young software industry. A large number of the island's more-than-100 software houses—most of which are understaffed, undercapitalized and underexperienced—have been acting as "software factories." This involves performing tedious encoding and debugging work for foreign software houses that provide a guiding concept and flowchart and that market the product themselves.

While opting to design and market their own product instead of simply providing cheap labor for foreign software houses, the seven Taiwanese software companies in the Big Five project are taking a serious and ambitious gamble, one for which even some of their supporters fear they are not ready.

For starters, says Huang Wei-teh, technical vice president of Taiwan's government-supported Institute for Information Industry and head of its Software Engineering Institute, the seven software companies took far too long to complete the project: "It took them an entire year to finish the Big Five project, but if Taiwanese software companies hope to compete internationally, there should be no more than a five-month period between the conceptualization of a given program and the time the program is ready for the market." Otherwise, he says, the market window of opportunity could well

## INTERNATIONAL

have closed.

Even if the Big Five package succeeds amid a field of high-powered competing products such as Lotus Development Corp.'s Symphony and Multitech Industrial Corp.'s T-Maker, many doubt the ability of Taiwanese

software companies to consistently produce winning English-language programs. They are too far removed from their target market in the United States, many in the industry believe, to keep abreast of the latest trends in application software.

An additional problem is documentation. The user's manual for the Big Five package "still needs some work," admits Andrew Chen, manager of Multisoft, a Taiwanese software distributor that will be active in marketing Big Five. An English-speaking techni-

## OVERHEARD OVERSEAS

## IBM joins ESPRIT to widen automated-factory lead

**Denise Danks**  
European Correspondent

The European Strategic Program for Research and Development in Information Technologies (ESPRIT), an effort to help European companies march in step with technology developments in the United States and Japan, already has attracted one ambitious outsider—IBM Corp. Analysts say IBM, with a main European office in Paris, will use ESPRIT to fund key elements in its factory-of-the-future efforts.

IBM has submitted eight proposals for ESPRIT projects in computer-integrated manufacturing (CIM), two of which were accepted by committees overseeing ESPRIT activities. Non-European companies with substantial research and development facilities in Europe are allowed to participate in ESPRIT projects, provided that they collaborate openly with at least one European manufacturer. IBM sources admit that the "pre-product" research atmosphere of ESPRIT makes it easier to share information freely.

Julian Patterson, a senior researcher for Boston's Yankee Group in Europe, says IBM's collaboration will lead to ambitious plans to dominate the potentially massive CIM market. IBM already ranks first in dollar shipments of computers into Europe. Patterson says IBM hopes to grow to a \$100 billion company by 1990 through sales of industrial-automation products. He adds, "CIM is still a concept. At best, it is a patchwork of individual processes such as computer-aided design and engineering and robotics.

This is as true for IBM as for other manufacturers. IBM involves itself in the ESPRIT CIM projects because it is one of the few areas in which IBM needs, and has displayed a desire, to collaborate."

IBM's enthusiasm for collaboration in the ESPRIT CIM projects is further underlined by Professor Keith Rathmill of the Cranfield Robotics and Automation Group at Cranfield Institute of Technology, Cranfield, England. Rathmill, who is also chairman of Robotics Europe, a platform for European Economic Community collaboration in CIM, says, "I would have been surprised if IBM had tackled anything else within ESPRIT. IBM is extending its territory into the field of factory automation, and ESPRIT is a super way to form user and supplier relationships."

Rathmill adds that IBM already is in a strong position in the CIM market, pointing to the growing use of the IBM PC as a front end in factory-automation systems. But he believes IBM needs partners to develop the hardware and software needed to interface IBM equipment to shop-floor systems. He says that IBM in Europe is seeking to strengthen its position in CIM technology within the worldwide IBM organization.

For instance, IBM Deutschland GmbH, Stuttgart, West Germany, is participating in a CIM architecture venture, with Paris-based Cap Gemini Sogeti SA as the main contractor. Among 15 other organizations in the project are AT&T-Philips Telecommunications NV, Hilversum, the Netherlands, Siemens AG, Munich, and CIT-

Alcatel SA, Paris. IBM is also participating in a project focusing on knowledge and decision support for materials-handling systems with French and German representatives from Compagnie Generale D'Electricité SA, Orleans, France, the main contractor, and Stuttgart-based Fraunhofer-Institut für Produktionstechnik und Automatisierung.

IBM says it sees CIM as potentially important in an area of the industry in which IBM does a large amount of business. "With CIM being a new technological area, there is a real opportunity for Europe to play a significant role in technological leadership and for IBM to contribute to that leadership," explains an IBM spokesman.

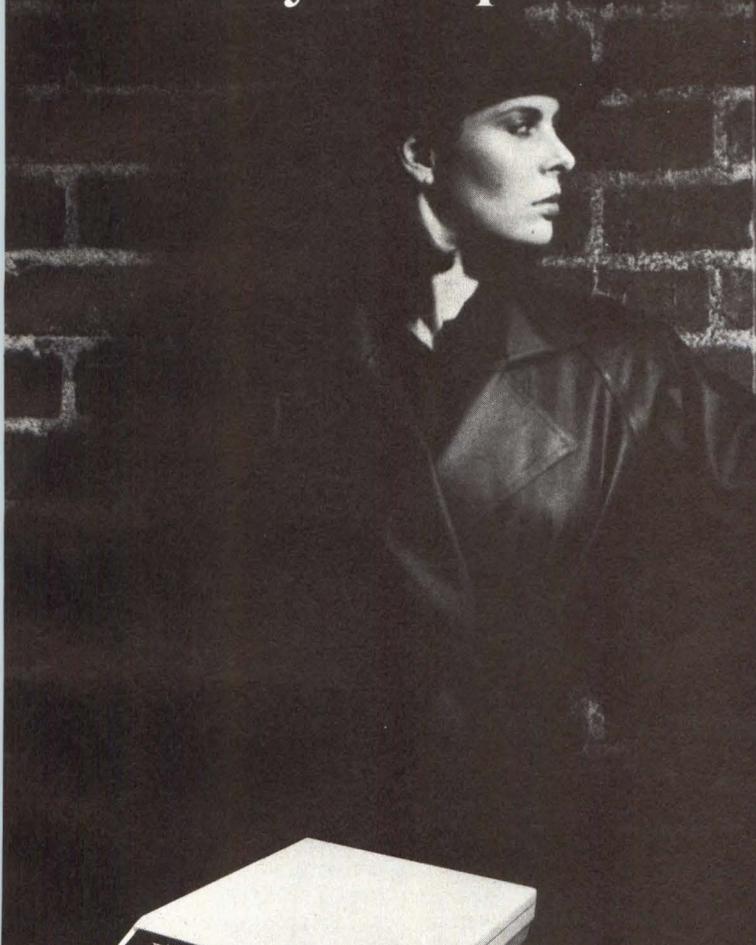
The IBM Deutschland subsidiary is participating in both projects because it was in Germany that IBM developed the concept of Industry Product Centers (IPCs). An IPC is a "gathering of expertise" in a vertical section of industry such as the automobile industry, as opposed to a horizontal section such as robotics or computer-aided graphics and design.

A spokeswoman for Logica Plc., London, one of the several British software houses involved in ESPRIT, says Logica also believes that CIM is the big boom area in the computer industry and adds that IBM's endorsement of it is "a real boost."

Evidence outside ESPRIT further supports IBM's strong moves into CIM. Last year, IBM joined with the STET subsidiary of Italy's government-owned Industrial Reconstruction Institute in Milan, in integrated, factory-automation-systems research, much to the chagrin of the indigenous Italian manufacturer, Olivetti SpA, Ivrea, Italy, and its U.S. partner, AT&T Co.

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cal writer has been hired, says Systex's Lin, to clean up the spelling and grammatical errors in Big Five's menus and user manuals.

Some point out that in the future Taiwanese software concerns will not necessarily be counted on to cooperate with each other as they did during the Big Five project. "Most of these companies are understaffed," notes one industry observer, "and don't have the

ability to undertake a major development project by themselves without government agencies lending them money and holding their hand."

Chen is not optimistic about Big Five's chances for success. He says that the software companies involved may be entering the fast track before they have what it takes to compete. He also has doubts about the Big Five package itself. The command sequenc-

es in the Big Five package are too complicated, the file-sharing capabilities are too limited, and the package is overpriced, he says. "Multitech [the parent company of Multisoft] bundles the T-Maker integrated package with its 16-bit MPF-PC at a cost of about \$40," Chen notes, adding that, "Big Five costs up to \$90, and the capabilities of the package are not necessarily worth the additional cost." □

## PACIFIC PERSPECTIVE

### Japanese, U.S. vendors wary as NTT goes public

Ichiro Kakehashi  
Tokyo Correspondent

Japanese and American vendors of computer and communications products are scrambling to protect their interests, as the Japanese government, having held Nippon Telegraph and Telephone Public Corp. (NTT) as a monopoly for 32 years, begins to sell NTT shares to the public. As a result of the denationalization process that is expected to take five years, NTT will be Japan's largest publicly held company.

Currently, Japanese manufacturers get about 90 percent of the \$1.5 billion computer and communications business, and American companies, chiefly AT&T Co., get what's left: about \$150 million in purchases a year. Vendors expect some upheaval as NTT's denationalization goes along. The Japanese vendors hope to hold onto their sales, while the Americans are looking to boost theirs.

Complicating the issue is growing American impatience with a U.S. trade deficit with Japan (\$36.8 billion last year) and with what is perceived as Japanese reluctance to open their markets to American products.

For the American Electronics Association (AEA), which represents many American vendors looking to sell to NTT, the real target is not to sell telephones and consumer add-ons but to open markets for AEA

members for big-ticket items, such as switching equipment, computers and equipment for the data-communications services referred to as value-added networks.

NTT officials are raising concerns similar to those raised by AT&T in the 1960s when Thomas Carter won the right to attach his Carterfone to Ma Bell's telephone lines. At the time, AT&T warned of malfunction risks if "foreign" equipment was attached to its network. NTT says American equipment might cause troubles if it is attached to the Japanese telephone lines. The AEA and some American manufacturers see those concerns as part of a collaborative effort by NTT and its Japanese suppliers to lock the United States out of the Japanese market.

Saying it wanted to ensure system integrity, Japan's telecommunications hierarchy successfully lobbied a year ago for an agency to test and certify equipment before it could be hooked to the NTT network. The agency, the Japan Approvals Institute for Telecommunications Equipment, is backed by 11 of Japan's largest electronics manufacturers and by six powerful financial institutions.

The AEA, through senior Tokyo representative John P. Stern, is working for assurances that the new agency will be impartial. For its part, the U.S. government wants to be sure the agency will not be just one of many bureau-

cratic, non-tariff trade barriers.

Douglas Newkirk, leading the recent visit of the U.S. trade delegation to Japan, received a pledge from NTT that it would continue to purchase equipment from American companies after the utility turns private. Two years ago, NTT bought mostly pocket pagers and basic voice telephones from the Americans. Last year, purchases included minicomputers and software. However, the total outlay was about the same for both years: \$150 million.

Japanese manufacturers hardly plead for foreign competition, but they are pragmatic enough to recognize that they risk a trade war if they don't liberalize access to their home markets by foreign vendors, especially by the Americans. An executive of one of Japan's largest telecommunications equipment suppliers says privately that Japanese vendors think they ought to separate themselves from the workings of the Approvals Institute. He says the manufacturers currently are members of the institute but serve as little more than figureheads.

The Communication Industries Association of Japan (CIAJ), a trade association, is cautious about handling trade issues with the Americans. A spokesman for the association says some members are willing to accept certification of equipment by the U.S. Federal Communications Commission as well as by the Japanese Approvals Institute.

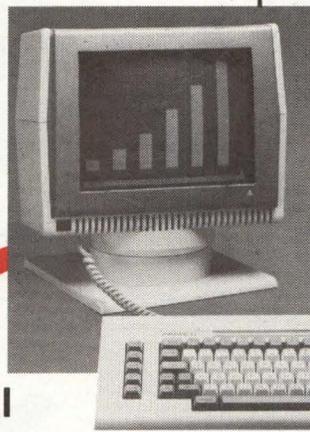
The CIAJ spokesman says, "We know that we must do something to bring in more imports. We just want to get on with business."

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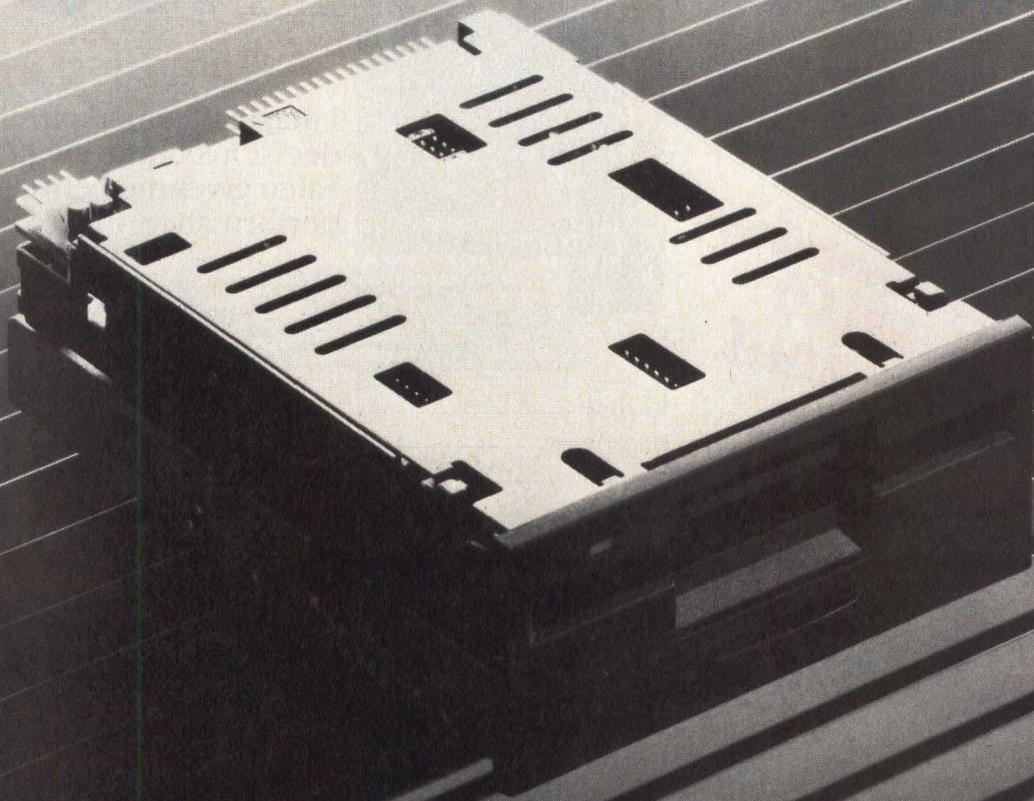
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# INTERPRETER

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

## OPTICAL RECORDING COMES OF AGE

Industry experts expect this relatively young technology to trigger increased demand for data storage

**Raymond C. Freeman Jr.**  
Freeman Associates Inc.

After a decade of research, optical recording is entering the marketplace for data storage. Although several technical and commercial problems remain, the critical mass of players and funding suggests that this budding technology will eventually earn a significant share of the computer-storage market.

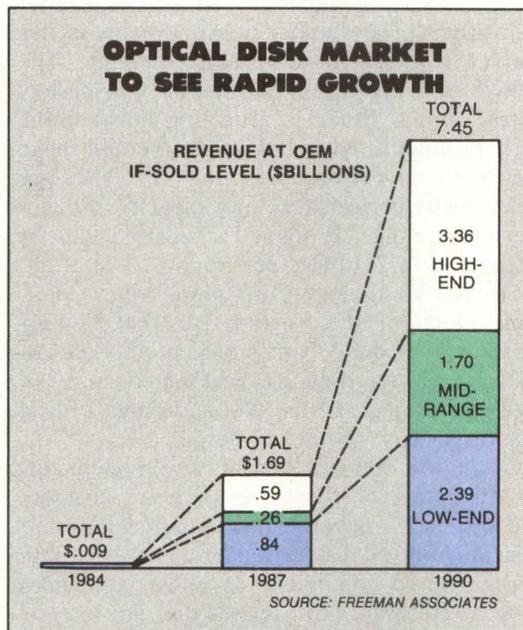
The need for data storage has motivated system integrators to look for devices of ever-higher density—thus, the interest in optical storage. These devices hold the promise of several orders-of-magnitude density improvements, starting at levels 10 to 40 times greater than magnetic disks.

The market for optical disk drives intended for data-storage applications is projected to expand from a total of a mere 600 units worldwide in 1984 to nearly 2.4 million in 1990. Revenue is expected to increase from \$9 million to \$7.4 billion during the same period. (Revenues are stated at OEM, if-sold levels.)

### Technology evolves

Optical recording uses light (a laser source) to transmit digitally coded information. The basic elements of an optical drive are the laser source; the disk; the drive mechanism; read/write spot-forming optics; servo-controlled positioners; and data-channel, encode/decode and error-control electronics.

Three basic types of optical disk systems exist: read-only, write-once and write-many. The first commercial optical disks were read-only. So far,

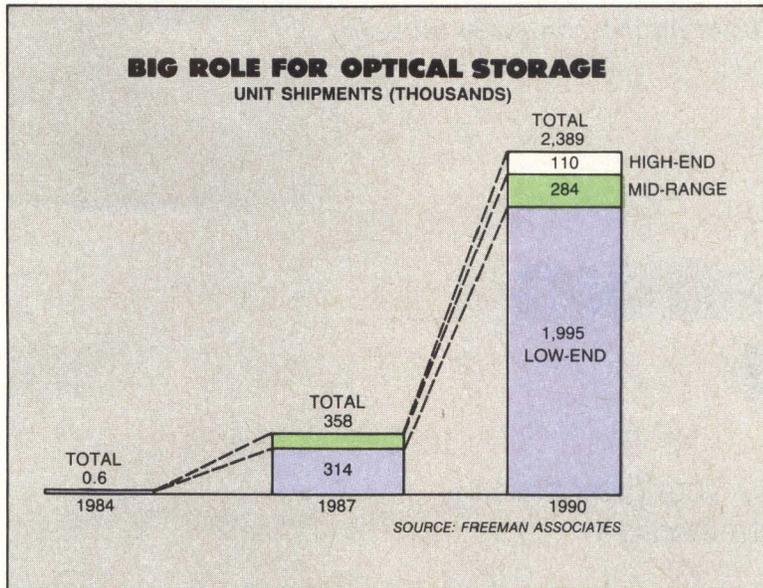


**In optical disks, low-end products are for office applications; mid-range, for super-microcomputers and minicomputers; high-end, for mainframes.**

in production, they have not exhibited computer-standard error rates. Write-once optical disks are just coming to market. Erasable optical devices have yet to appear commercially, but research is being carried out by at least 20 major corporations, including Philips Data Systems, Matsushita Electric Industrial Co. Ltd., Sony Corp. of America and 3M Co.

### Competition should increase

Currently, fewer than 10 manufacturers have announced data-grade, digital optical drives. Data-grade optical drives offer corrected bit-



error rates comparable to today's Winchester disk drives. The number of participants in this market is expected to increase steadily. The growth will occur not only in the low-performance arena, which is attracting most of the early product activity, but also in the mid-range and high-end performance area. (Products are classified by performance, not capacity or diameter. "Mid-range" is defined as having a transfer rate of 1M to 2M bytes per second.)

Storage Technology Corp., Louisville, Colo., a manufacturer of storage devices that filed for Chapter 11 federal bankruptcy protection last Oct. 31, was the only declared manufacturer of high-end optical drives. No mid-range optical disk drives have yet been offered.

Of the low-end optical disk drive manufacturers, two are U.S. companies, two are Japanese and one is European. U.S. manufacturers are designing optical disk drives for general-purpose attachment to computers. Japanese companies concentrate on optical devices that are integral parts of document- and image-storage systems. (The Japanese Kanji character set requires an image-oriented storage process, motivating optical disk makers there to start with these applications.) Many Japanese companies are active in this market segment and indicate interest in eventually offering the drive portions of their subsystems for general-purpose OEM computer use.

Information Storage Inc., Colorado Springs, Colo., expects to have products available by mid-1985. Some companies are delivering early production or evaluation drives; others continue to experiment with the technology.

A number of companies have experimented with optical tape, including DocData N.V., the Netherlands, Laserstore Inc., Princeton Junction, N.J., and 3M, St. Paul, Minn. The claimed advantages of optical tape include high capacity per media unit (estimated 5G to 50G bytes per reel), and low media cost. Optical tape products will probably gravitate toward sequential applications because of relatively slow access times—a problem common to all tape forms. Also, because optical disks afford high storage per removable media unit and the data is more accessible, it remains uncertain how broad a market optical tape will earn.

### Layered market foreseen

The ultimate nature of this fledgling market is still undetermined. Industry analysts believe, however, that the supply-and-demand forces influencing optical data storage will likely vary somewhat by product segment.

Low-end drives will enjoy a fast-growing market in applications such as office automation, in which demand is increasing for devices to store business documents, image-based material, correspondence and graphics. Similarly, these devices could be used to store and retrieve massive amounts of replicated material such as reference libraries and market-data files.

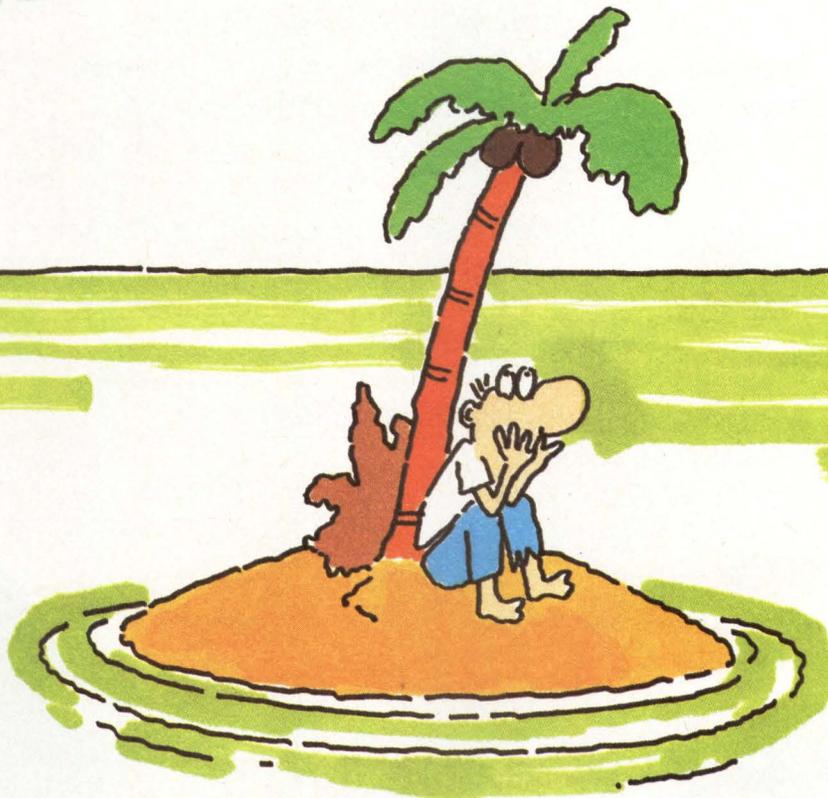
Mid-range optical drives will enter a market populated by supermicrocomputers and minicomputers. These products will be used as network file servers as well as central computer peripheral memory. As multiuser operations become more prevalent, high-capacity, readily accessible storage becomes mandatory. The built-in backup characteristic of optical disks simplifies operational logistics.

High-end optical drives will be used for mass storage in the mainframe environment. Tape files are cumbersome, expensive to maintain and too slow to access. Large organizations need masses of data without extensive labor pools, space and power devoted to them. The sheer size of these systems points to the critical need for a technology change.

### Meets unique needs

Based upon analysis of the unique performance needs of various types of data storage, optical disk drives become attractive product candidates for several applications. The first application is the storage of both structured and unstructured databases. Currently, structured databases are processed on magnetic disks, and unstructured databases are stored on magnetic tape. Unstructured databases are seldom effec-

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tively computerized due to a lack of economical, high-capacity storage and the necessary software to make such a database usable. These unstructured, often-enormous databases are a prime target for optical devices, which offer high capacity and fast access.

Optical products to handle such applications can be tied to a central computer or distributed in the form of network file servers. Customer applications can include graphics, computer-aided design/computer-aided manufacturing, document storage and retrieval, office filing, satellite data and applications in which a mixture of image and data is desirable.

The second application is for journals. Journal information, which is generated sequentially, is currently captured on magnetic tape and stored off-line. Optical products are strong contenders for this type of recording because they offer high-speed transfer of large, sequential files, media removability and a non-alterable audit trail.

Optical disks could also be used for backup. Fixed magnetic disks are often copied onto magnetic tape. Optical disks can be useful in this application because the media is removable and, currently, non-alterable. One prohibitive factor in certain environments may be media cost. Magnetic tape is reusable; optical disks are not.

Another possibility is report storage. Optical storage offers a spacious and accessible repository for management reports that include financial or manufacturing data. Optical storage can alleviate the problem of accessing difficult-to-reach information, often encountered in the current data-processing environment.

Archival storage would benefit from optical storage as well. Today, this application is the exclusive domain of magnetic tape, microform or paper. But records archived this way are not quickly accessible or machine-readable. Optical products bring the potential of storing large amounts of infrequently accessed data in machine-retrievable form.

Reference storage is another possibility. Data for on-line reference storage is most commonly kept on magnetic disk. Applications are limited, however, because of the high cost per megabyte of storage. Optical disk represents an attractive alternative with its high capacity, low cost and reasonably prompt access times.

Optical media can be replicated economically by contact printing, injection molding or stamping. This opens the door for electronic publishing, database and software distribution and information-utility services. End-user applications include legal reference files, medical journals,

X-rays and financial data. Because optical media is removable, it can easily be mailed or shipped.

Optical disk drives could also prove valuable in transportation of data. Today, most data exchange between computers is through magnetic tape. Recording is done in universally accepted formats, and the resultant tape is used for database and software distribution, as well as interchange. Optical disk media is also removable and compact for the amount of data stored. For example, users can mail a compact disk containing about 500M bytes in  $\frac{1}{100}$  the volume and weight required by  $\frac{1}{2}$ -inch tape reels. This option would be far less expensive per byte than transfer via telecommunications.

Other applications that use optical disks' unique performance characteristics are likely to evolve. Electronic mail and voice store-and-forward applications are prime examples. Mail and voice messages could be collected and stored on optical media and then physically transported via carrier.

#### Changes in storage technique

As optical disks move closer to commercial reality, long-term shifts can be expected in data-storage architectures. Magnetic disks will move closer to main-memory-extension functions, and magnetic tape will move toward applications that call for very low-cost, removable, erasable media.

When applications involve large sequential files, optical disks will be more cost-efficient than magnetic disks and will perform better than magnetic tape. Magnetic disks will be used for high-speed, high-volume processing. Tape will continue to dominate sequential storage applications demanding reuse of media.

The maturation of optical-disk storage systems will require architectural changes as well as the development of supporting devices, such as low-cost image scanners, advanced displays, electronic printers, and jukebox loaders capable of feeding several drives concurrently, before this technology's full potential can be realized. □

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**Raymond C. Freeman Jr.** is president of Freeman Associates Inc., a Santa Barbara, Calif., management consulting and publishing company that specializes in data-storage markets and products.

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

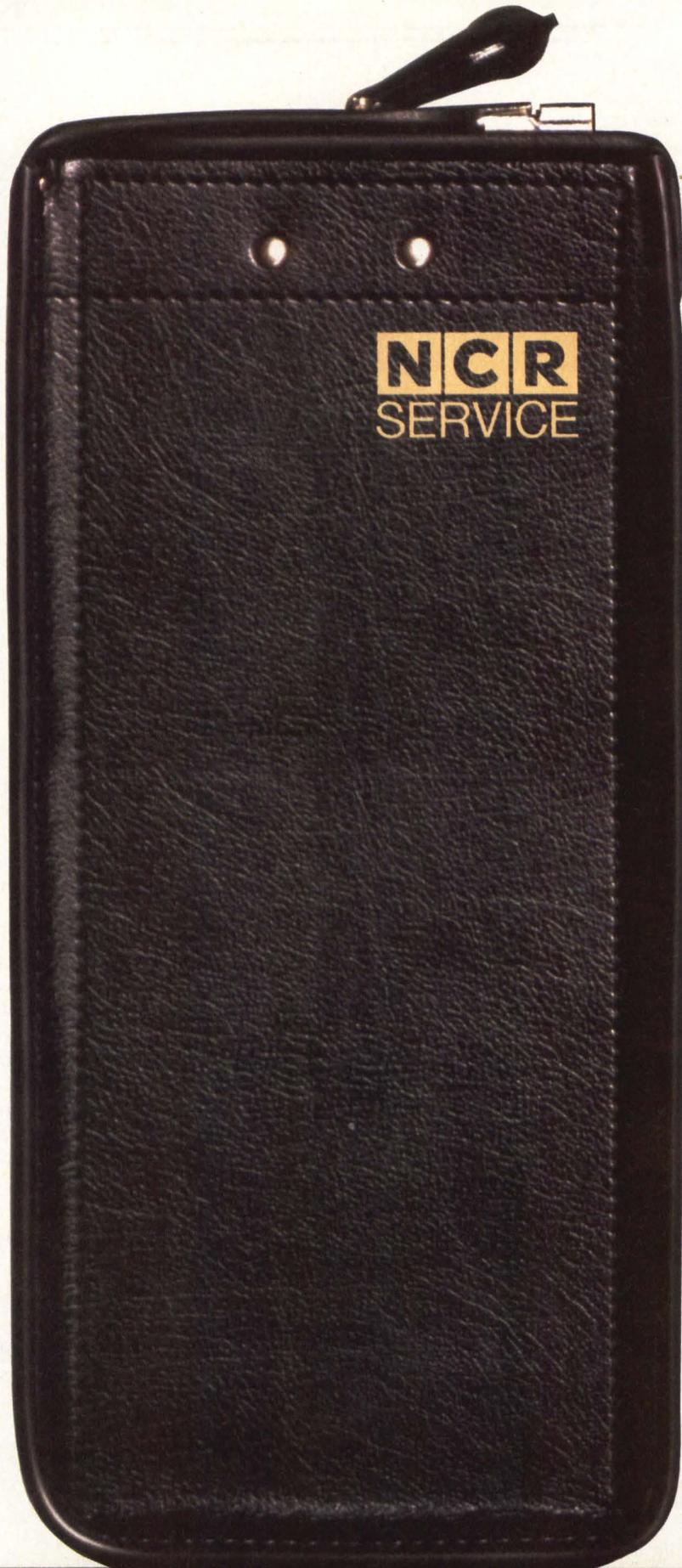
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**As optical disks move closer to commercial reality, long-term shifts can be expected in data-storage architectures.**

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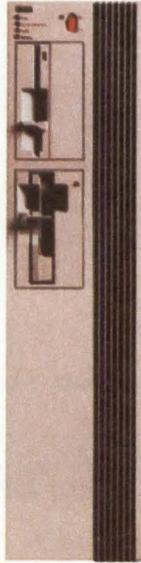


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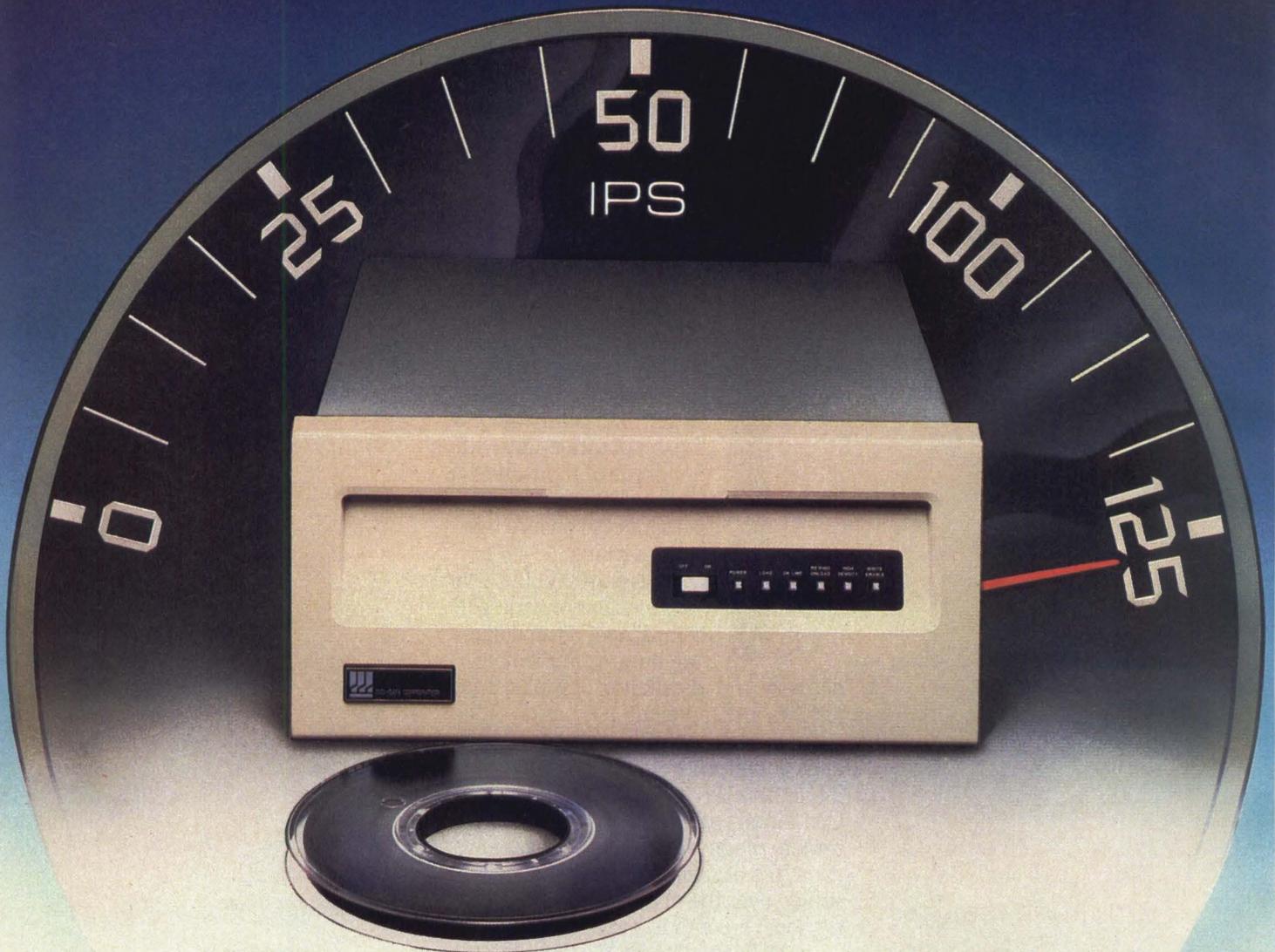
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# VERTICAL MARKET INTEGRATOR

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## AUTOMATION DEMANDS SYSTEM-WIDE PLANNING

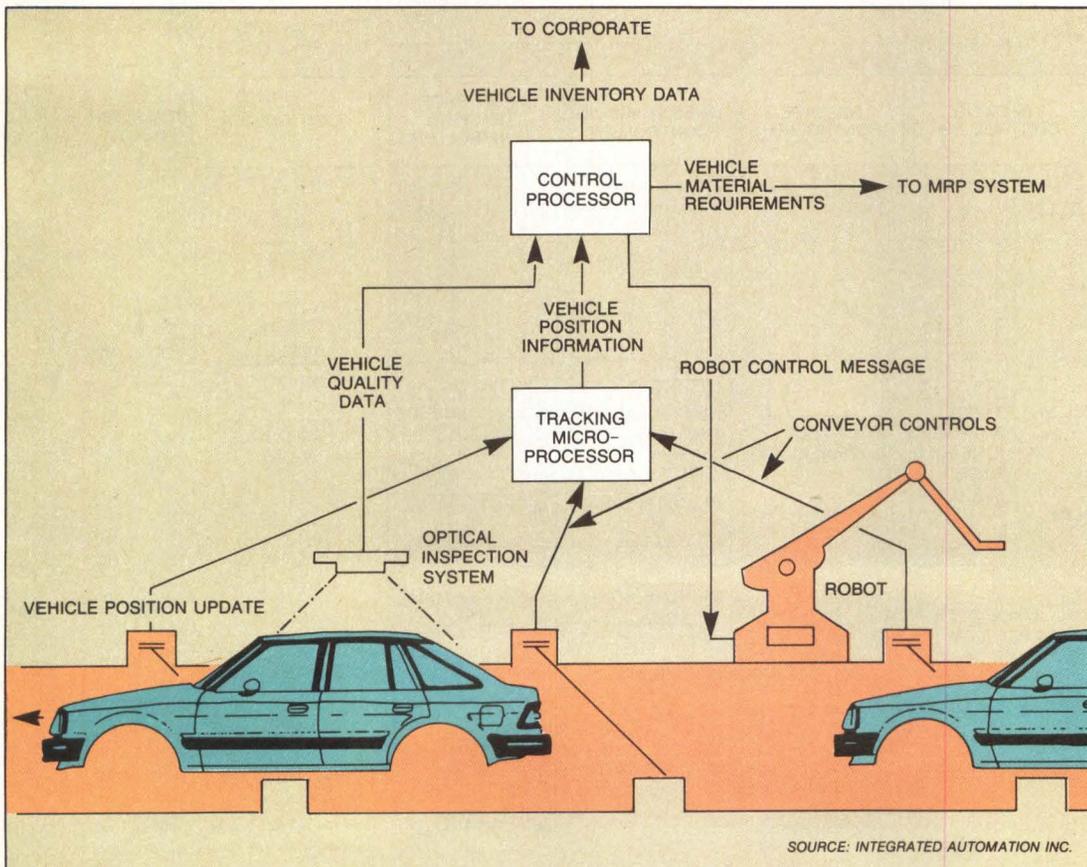
Implementing factory automation mandates close coordination between corporate and production departments

**Torben Moller** and **Leonard Bertain**  
Integrated Automation Inc.

Worldwide competition in markets that the United States once controlled has driven major U.S. companies to plan "factory-of-the-future" automation schemes aimed at decreasing manu-

facturing costs and increasing productivity. To implement such systems, however, manufacturers must evaluate sales order flow, investigate materials requirements, explore manufacturing process flow and integrate automation into corporate-wide data-processing systems.

The first step toward an effective factory auto-



**In a typical plant,** local controllers drive mechanical devices to control various machines. Information from sensors and other operator-controlled inputs helps control the process. The system stores this information and generates reports to management for analysis and transmission to other host computers.

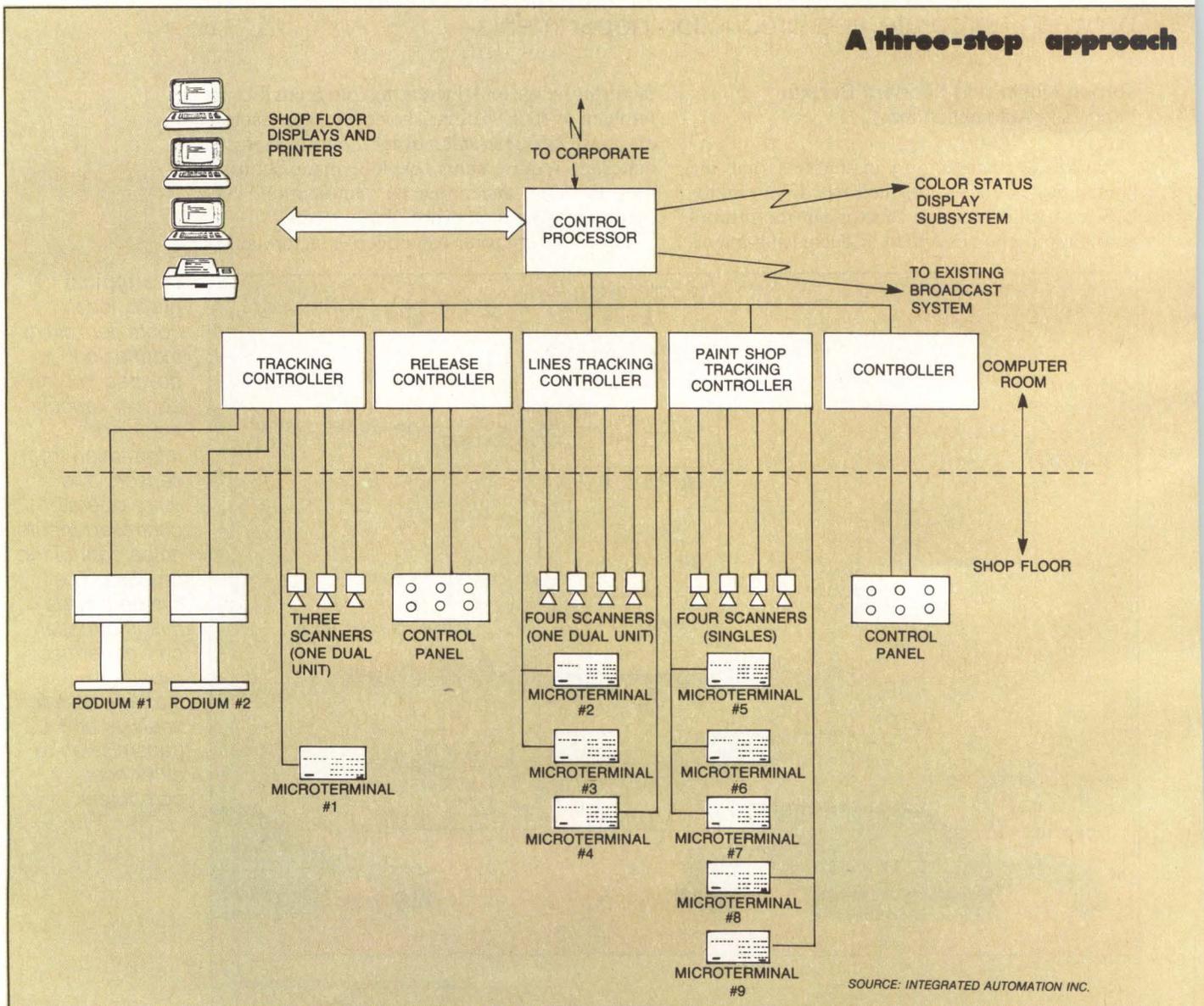
# VERTICAL MARKET INTEGRATOR

mation strategy requires manufacturers to integrate computer power in the corporate management information system (MIS) department with real-time automation on the factory floor. Because sensitive information is usually stored in the MIS department, factory scheduling and database interfaces must fit smoothly with installed MIS equipment. Companies often use an area host computer to coordinate plant operations, including controlling production lines, robots and numerically controlled machines. Factory machines typically have embedded microcontrollers for real-time control, data acquisition and inspection.

After a company's corporate managers decide

to examine their factory's policies and procedures, they might turn to a system integrator such as Integrated Automation (IA) Inc., Berkeley, Calif., that can solve their company's automation problems. IA tailors factory systems to users' needs. Using a three-phased approach consisting of system definition, detailed system design and system implementation, IA helps companies set up an automated factory (see "A three-step approach automates the factory," below). Automated systems can provide quality control, strategic planning, vendor assessment and product inventory tracking.

IA begins by analyzing a company's resources and operation, defining how the company will



work in the future and determining how the employees will interact with the automation.

## Bar-code reader identifies faults

A primary facet of factory automation involves parts tracking. Automating parts tracking calls for the integration of machine-readable identification codes using standard bar codes and bar-code scanning equipment with the user's installed identification and control systems. However, some operations requiring parts identification cannot use standard bar codes. Such operations include labels for merchandise with partially imperfect or skewed codes printed on metal and for merchandise with codes impressed

as part of a product's molding. In these cases, a reader and code system employing visual and ultrasonic scanners provides the information for detecting and classifying faults.

The visual-inspection system uses a camera scanner that reads bar codes one line at a time. This scanning technique enables the system to react to the information contained in one line of pixels or to build an image area by counting a software-determined number of pixel lines. The camera builds an image of a label, and software determines the label's orientation and reads the coded information. The camera, which has a built-in light source, can detect imprinted edges, codes printed on shiny and non-reflective mate-

## automates the factory

### Arvis Neal

Integrated Automation Inc.

Integrated Automation (IA) Inc. approaches the implementation of a complex automated system in three steps: system definition, detailed system design and system implementation. The three phases help estimate precise project costs because each estimate is made just before each phase of the project is to begin. The three-step approach also aids overall project planning because every phase includes a detailed analysis of the preferred approach for the next phase. The approach benefits users by offering low risk, flexible funds allocation, tight project control and low overall costs.

**System definition**, the most important of the three phases, begins by precisely delineating the process to be automated and the existing process and compiles a customer "wish list." Given the system requirements and the preferred system concept, the IA project team details and categorizes the basic functions that the proposed system must perform to meet the requirements. This determines the size or performance required of the individual units that make up the system. The team also analyzes the interaction among functions to determine the type of equipment

**A materials/product information flowchart for an automotive assembly plant tracks materials through manufacturing. At each stage, scanners record the assembly identification numbers of each subassembly and the progress of each finished and partially finished assembly. The host computer stores and manipulates this information.**

that should be used for each function.

Next, the team proposes a functional system design to the user. If the design meets the anticipated needs, the team evaluates the available technologies to identify which would be the most applicable for each function. This evaluation process analyzes commercially available labels, scanners, input devices, conveyors, material-handling equipment, microcontrollers, data-processing equipment and communication devices. After considering such factors as cost, performance, reliability, maintenance and plant architecture, the team proposes a conceptual design and recommends a technological approach.

In the final part of system definition, the team examines and predicts the time and costs requirements of the next stage in automation.

**Detailed system design**, the next step, begins with a product and data flowchart that tracks where and how products move through manufacturing and how and when product information is transmitted to local process controllers and remote data processors. The project team decides which commercial systems will be used and which functions will require customized systems. The team also details system software flowcharts, develops the necessary software and orders the hardware.

**System implementation**, the final phase, involves the actual installation of the system.

---

**Arvis Neal** is vice president of the process automation division of Integrated Automation Inc., Berkeley, Calif. Previously, he was a supervisor at EOCOM Corp. Neal attended California State University, Long Beach, Calif.

# VERTICAL MARKET INTEGRATOR

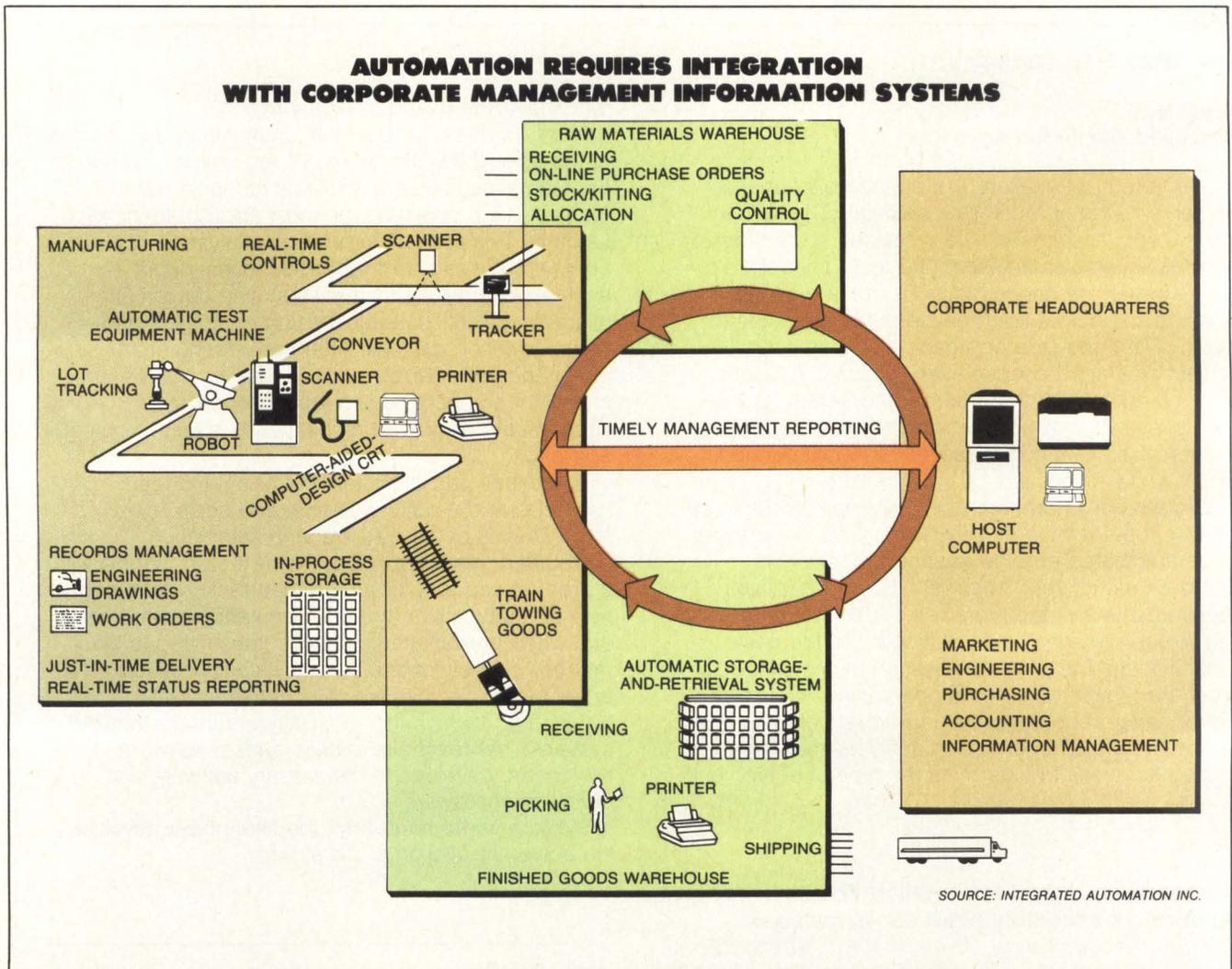
rials and raised dots molded into rubber.

For more general-purpose applications, inspection systems can track moving webs of textiles, paper or metals. The camera monitors the width of the high-speed moving web by counting pixels. It reacts instantly to a width that varies from user-defined parameters. The system also looks for tears in the web by processing a predetermined number of clocked scan lines, which define an area on the moving web. In addition, the camera checks for variations in a material's brightness or reflectivity as criteria for fault detection and uses backlighting to determine the thickness of a translucent web.

In a similar manner, ultrasonic inspection sys-

tems detect differences in the transmission or reflection of ultrasound. This difference signals the presence of air gaps in a bond or adhesive or the presence of irregularities in a homogeneous material.

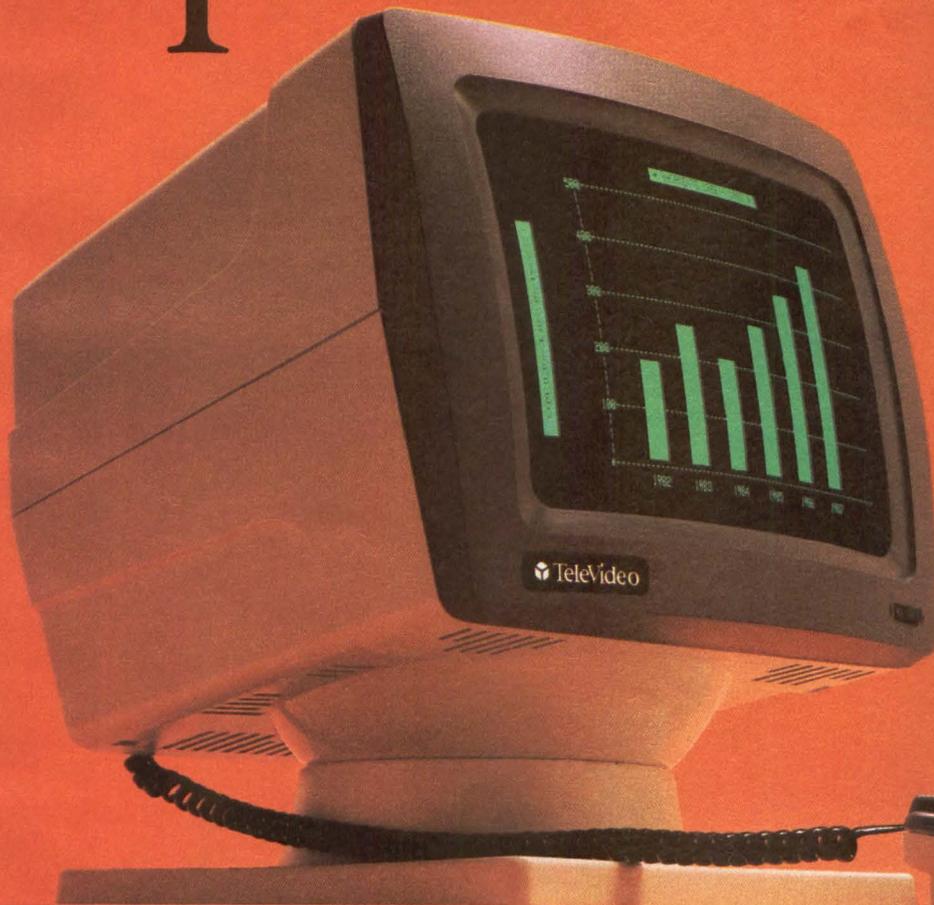
With visual and ultrasonic scanning systems, the user can specify how the system should define a fault. Relevant data that can be used as fault criteria include area definition, pixel count, gray-scale thresholds and averaging. The user can also specify that the system compare data samples to find images with actual faults. The resulting system would then scan actual faults, extract relevant parameters and build them into a recognition system.



In the "factory of the future," factory scheduling and database interfaces will fit smoothly with installed MIS equipment. Companies often use an area host computer to coordinate plant operations, including controlling production lines, robots and numerically

controlled machines. Driven by information generated from the raw materials warehouse, manufacturing facility and finished goods warehouse, the central corporate computer can provide a daily log of company-wide activity.

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CIRCLE NO. 48 ON INQUIRY CARD

After specifying how the system should define faults, the user can determine how the system should classify, or react to, detected faults. For example, the user could specify that the system react by generating feedback to an operator, who would then adjust a valve on the production line. Another way the system could react to a detected fault would be to sound an alarm signaling life-threatening conditions.

## Shop-floor control tracks motion

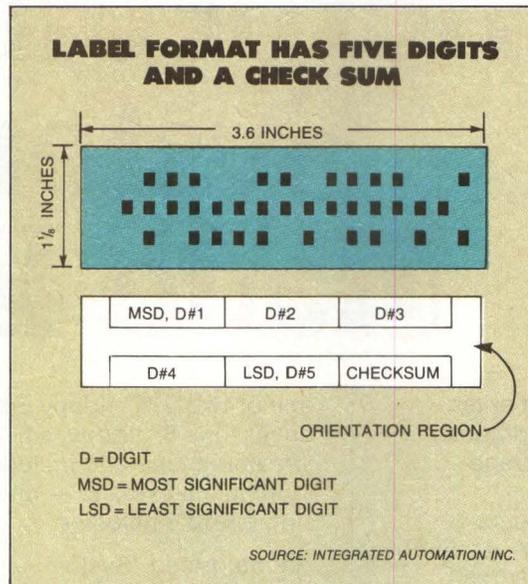
To demonstrate the feasibility of factory automation, IA is installing an integrated shop-floor-control system in an automobile assembly plant. The system will feature inventory control and "just-in-time" delivery, which means that the system will closely monitor inventory so that the company does not need to keep a large stock on hand. This lowers inventory costs by shortening product lead times and allowing the user to avoid ordering too many of a particular item. The shop-floor system also will allow corporate management to access the shop-floor database. The company will eventually install quality-control equipment, parts/materials-tracking systems and an interface to the company's MRP system.

The analysis of the automobile plant concentrated on tracking the movement of vehicles through the plant. Based on this analysis, IA developed scheduling algorithms to insert vehicles into assembly in a predetermined order.

During operation, the automobile plant's shop-floor-control system gathers undifferentiated car bodies into a scheduling area. Once they are gathered, the system determines the options to be added to each car and the order of adding the options, based on the time and materials required for each option. As the car bodies leave the scheduling area, the shop-floor module assigns them a machine-readable code by which the system tracks the bodies' progress.

The system also assigns a set of operations to the machine-readable code of each car. The module then moves the car bodies to a holding area. There it schedules them for painting and other operations. After leaving the holding area, the cars move to the assembly line. Scanners read the code as the cars travel along the assembly line. The decoded data tells robots or operators to perform certain assembly tasks, to remove a car from sequence for special operations or to pass the car along the line.

The computer system can handle exceptions for different options. For example, if the system sends cars A, B and C to the assembly line and designates car A to receive an air conditioner, car A would at some point leave the scheduled



**A bar-code reader uses line-by-line scanning to build an image of a label. The label includes a five-digit code, a checksum digit and an orientation region that enables the scanner to recognize the label's position.**

sequence on the assembly line. Scanners would monitor the car's movement, and a terminal would record work done. After installation of the air conditioner, the car would re-enter the line in a different sequence. Using tracking algorithms, the computer system would update the sequence of events.

In other instances, however, the user can decrease the number of code scanners because the system knows in advance the sequence of events and how to correct mistakes that might occur. For instance, the system could schedule cars A, B and C to be painted in a sequence that could not be interrupted. But, if a painting robot improperly obscures the code on B, the next scanner might read B's code as "A" (unknown) or "C." To correct this mistake, the system recognizes and treats the unknown code as B or signals the shop floor to re-mark car B.

At some points on the assembly line, a process is not associated with a particular car. In this case, the computer system uses "item presence detectors" to ensure that the sequence of car bodies has remained intact. By knowing where and when each operation is to occur, the system ensures that each workstation receives a sufficient supply of parts and materials to continue operating.

Because a holdup can cause delays throughout the plant, the shop-floor-control system includes a broadcast system that sends instructions over the data network. □

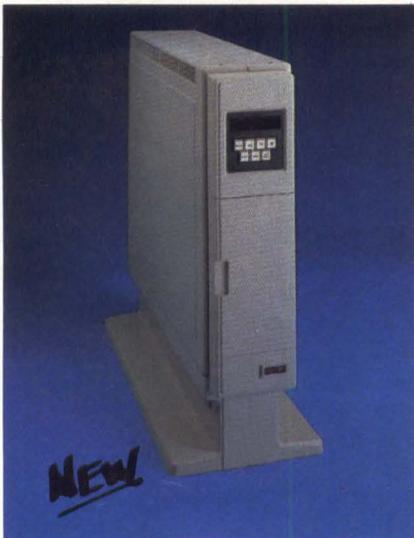
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**Torben Moller** is a senior scientist at Integrated Automation (IA) Inc., Alameda, Calif. **Leonard Bertain** is a marketing manager at IA.

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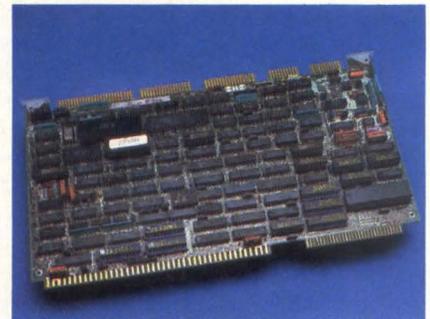


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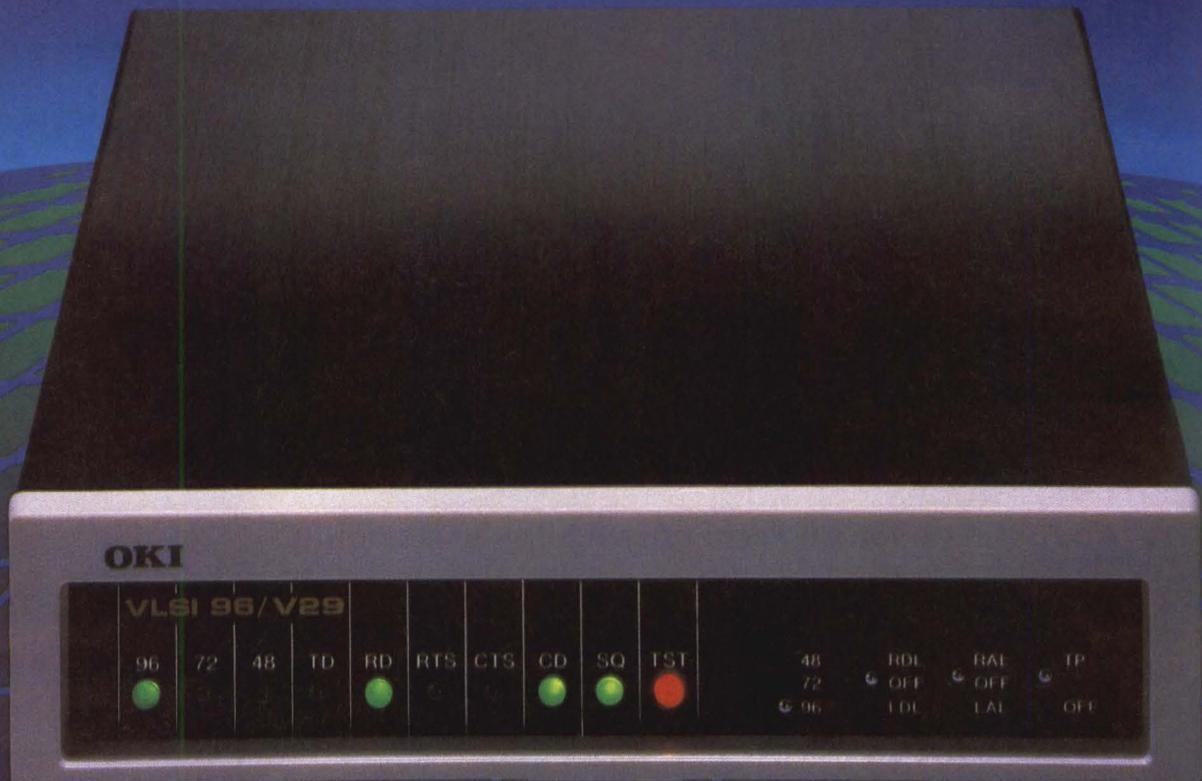
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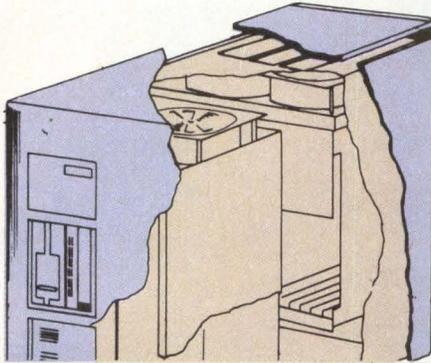
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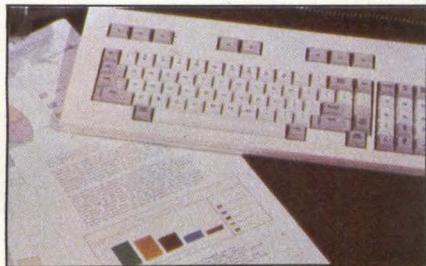
# FEATURE HIGHLIGHTS



p. 85 . . . . . *Braving the elements*

## **SUPERMICROS: SUPERMICRO BRAVES HARSH ENVIRONMENTS . . . . . 85**

It takes a rugged machine to withstand the rough handling, contaminants and shocks of harsh environments such as factory floors. One example is Charles River's new Universe 2400, a full 32-bit, UNIX-compatible supermicro that sports the 32-bit VMEbus.



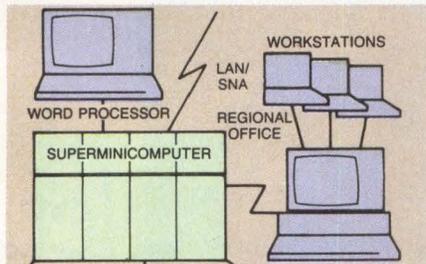
p. 95 . . . . . *Offering new routes*

## **MINICOMPUTER SOFTWARE: INTEGRATED SOFTWARE SPURS MINI MARKET . . . . . 95**

"Personal-computer imperialism" isn't about to vanquish the role of minicomputers in office automation. Minicomputer manufacturers and software development companies are rising to the personal-computer challenge with integrated OA software schemes and new machines to take advantage of them. Major players with recent introductions include DEC, DG, HP, IBM and Wang, as well as a score of independent software companies.

## **MINICOMPUTER HARDWARE: SUPERMINIS SHAPE UP AS DEPARTMENTAL CPUs . . . . . 109**

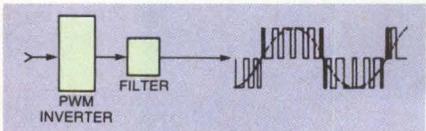
Superminicomputers can form the backbone of distributed data processing environments. These departmental CPUs are being called on to handle everything from database management to document image and capture, and each of the major manufacturers has recently introduced enhanced machines to handle the various tasks.



p. 109 . . . . . *Minis fight back*

## **UNINTERRUPTIBLE POWER SYSTEMS: UPSes WIN CONVERTS DESPITE OBSTACLES . . . . . 119**

High-voltage spikes, surges, sags, brownouts and blackouts can cause a lot more stress than can signing a check for an uninterruptible power system. To make things easier, new UPSes are cheaper, smaller and quieter. Our feature roundup also includes a comprehensive listing of UPS vendors and their products (p 131).



p. 119 . . . . . *UPSes prevent sags*



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CIRCLE NO. 52 ON INQUIRY CARD

# SUPERMICRO BRAVES HARSH ENVIRONMENTS

Universe 2400 rolls up its sleeves with full 32-bit data and address paths on a VMEbus, up to 64 ports and a rugged shell

**Jim Isaak**

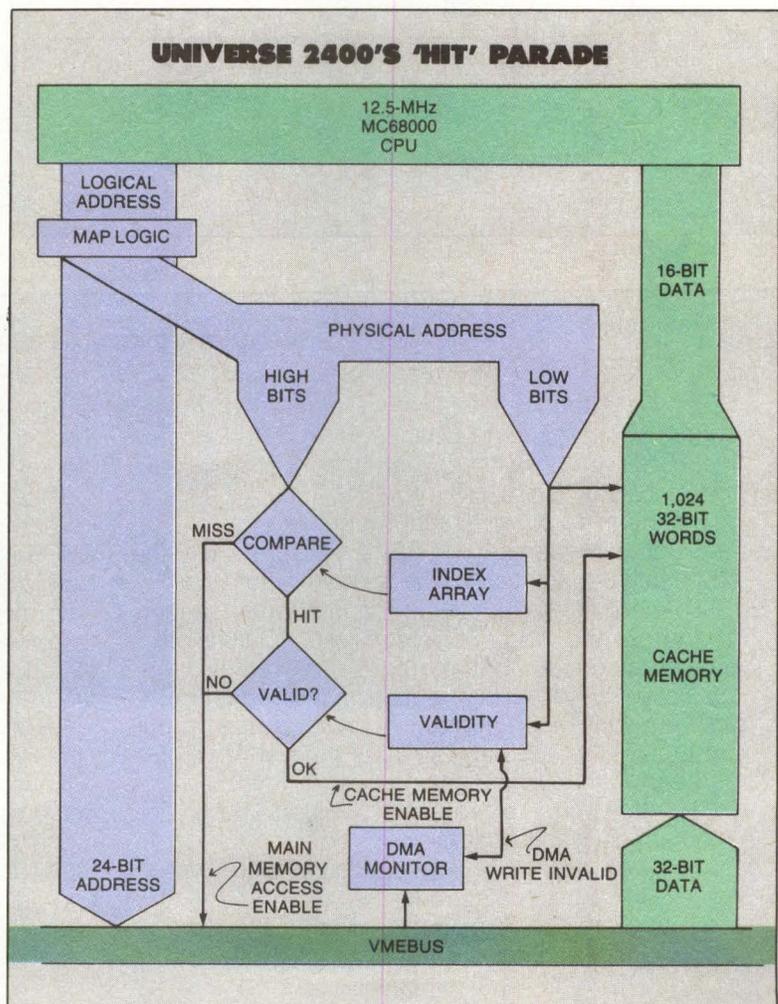
Charles River Data Systems Inc.

The harsh environment—factory floor, vehicle or remote location—is new to the supermicro-computer, yet this is the territory it's lately been expected to inhabit. The Universe 2400, made by Charles River Data Systems Inc. (CRDS), Framingham, Mass., is designed for such working conditions. Its hardware, software and packaging advances allow it to operate from 0 to 40 degrees Celsius ambient temperature, it is resistant to moisture and particulate matter, and it is unlikely to disconnect, withstanding routine vibration and rough handling.

The Universe 2400 is based on a 12.5-MHz Motorola Inc. MC68000 microprocessor, a 4K-byte cache memory, a MC68000-based peripheral controller and multiple I/O processors, also MC68000-based. It uses the 32-bit VMEbus and supports two operating systems: UN/System V, which is CRDS' implementation of UNIX System V, and UNOS, CRDS' UNIX-compatible, real-time operating system.

The Universe 2400 is built around the VMEbus in an effort to enhance the machine's struc-

**The Universe 2400's cache** connects the 32-bit VMEbus to the 16-bit data-pin structure of the MC68000 microprocessor. Cache "hits" are detected by indexing high-order with low-order address bits and a comparison to the high-order bits of the address register.

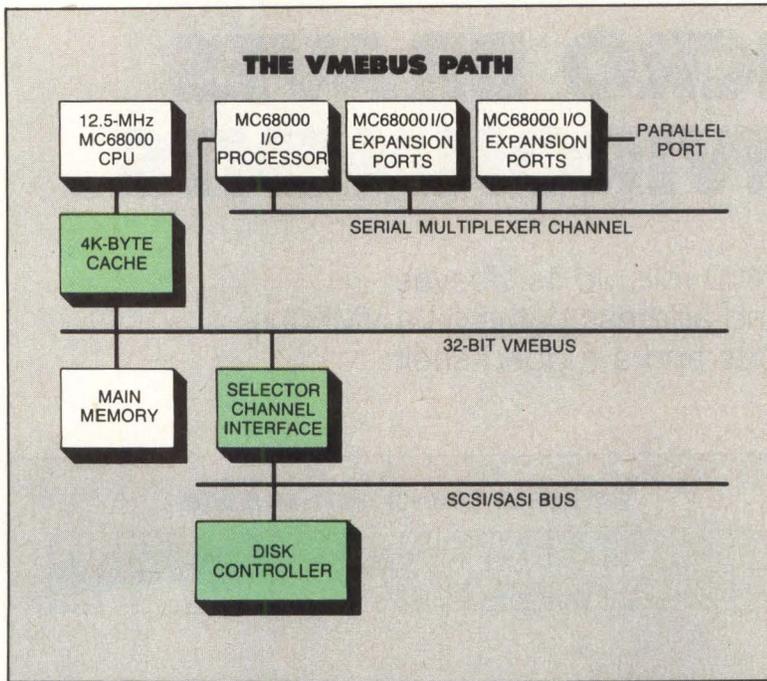


ture and operational capabilities. The characteristics of the VMEbus are well-known in the industry, and CRDS' choice was made easier by the company's extensive experience in using a 32-bit data path. (Its existing products are based on the VMEbus predecessor, the VERSAbus.) The VMEbus' reliability has led to its wide-

spread use since 1982 and to proven, published standards.

Printed-circuit-board integrity also affects reliability. The VMEbus specifications call for end panels of metal that can be screw-mounted to the back of the chassis. These reduce the effects of bouncing and vibration, which can loosen boards. VME specifications also call for the use of DIN-standard connectors, which eliminate corrosion.

The form factor also affects the ease of configuring the system. While the VMEbus' double-Eurocard format (233.3 mm by 160 mm) has its drawbacks (see "Why ride the VME bus?" below), it nonetheless encourages the allocation of single-purpose functions to each card; because 12 VMEbus cards fit in the compact package, system designers can tune the configuration to specific needs. That is an important consideration in tuning process-control and monitoring configurations because a single VME card failure affects relatively few processes and the faulty card can be easily isolated and replaced. It also



**A 32-bit VMEbus** interfaces the main processor, memory and I/O processors. The selector channel interface connects burst-mode or block-transfer devices on the SCSI/SASI bus.

### Why ride the VMEbus?

For the introduction of the Universe 2400 supermicrocomputers, Charles River Data Systems Inc. (CRDS) has switched from the VERSAbus to the VMEbus.

A number of considerations went into the decision to implement the 32-bit VMEbus. First, the OEM-sales orientation of the system is such that CRDS cannot produce all of the interfaces needed to address the range of potential applications. To provide access to the interfaces, for example, CRDS had to select a standard, non-proprietary bus. The Universe 2400 family allows a user to pull out the CPU boards and replace them with other processors. CRDS expects to do this with the MC68020 when it is available in volume, but another supplier's boards could be used to upgrade as well. In any case, the VMEbus allows for freedom of reconfiguration.

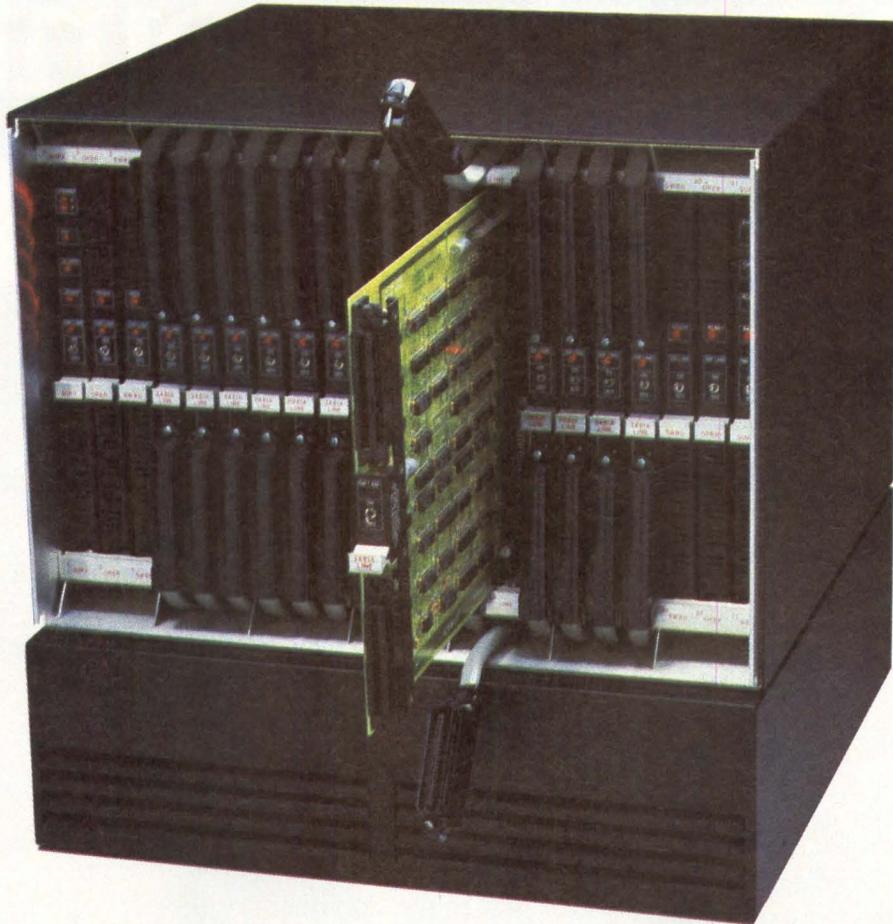
Second, the Universe 2400 is aimed at light industrial environments; the environmentally secure,

airtight seals of the VMEbus DIN connectors—and the boards that screw into the chassis—suit that market.

Third, a bus must be more than simply non-proprietary—it must be widely accepted. CRDS says that it has carefully compared VMEbus, NuBus, Futurebus and Multibus II and has determined that the VMEbus is five years ahead of the others, based on its track record. Also, its electrical compatibility with the VERSAbus makes the transition easier.

CRDS believes the 32-bit bus standard is a horse race between VMEbus and Multibus II. Both will eventually have IEEE support and a number of implementations. According to the company, it is highly desirable to implement the bus that provides the widest selection of devices. This provides competitive pricing for volume items (such as added RAM) and the ability to get the specific capabilities a user needs in an interface.

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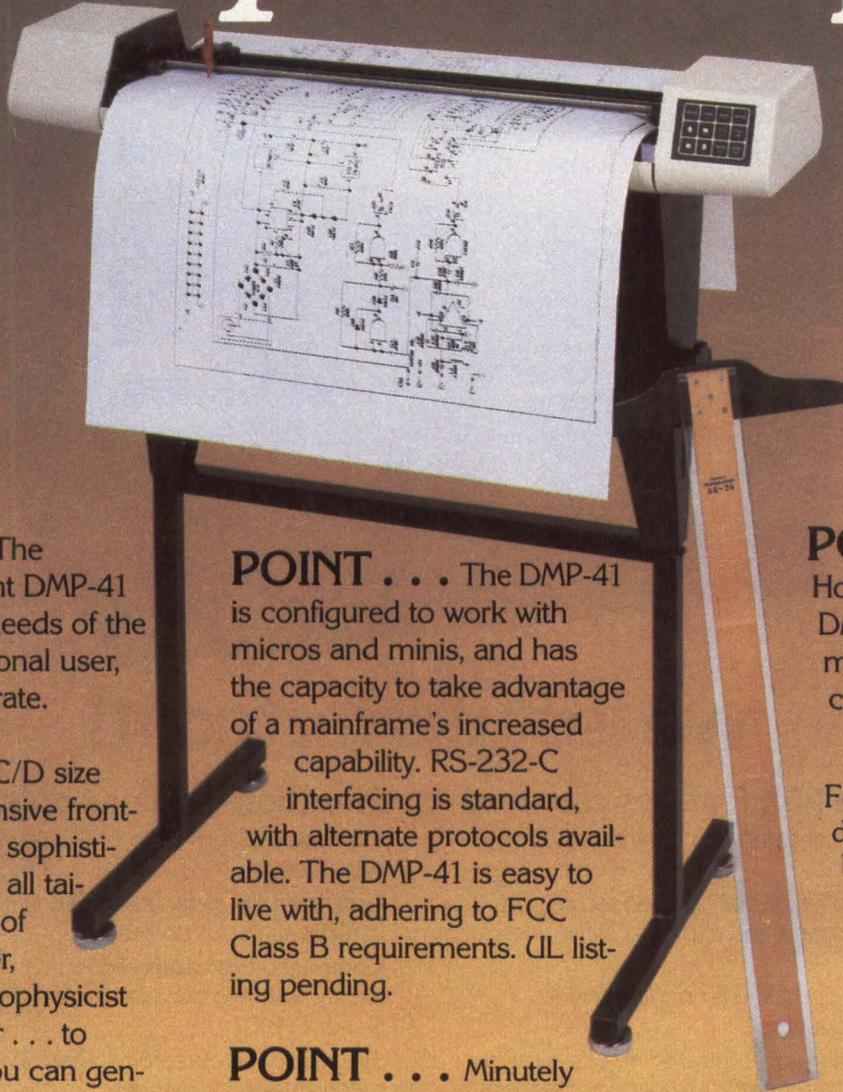
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## SUPERMICROS

means there is space for seven or eight expansion interfaces, depending on the amount of memory in the system.

Finally, the popularity of the VMEbus indicates that it has become a de facto standard among 32-bit supermicroprocessors in industrial applications. This consideration far outweighed the advantage of the familiar VERSAbus form factor and the risk of trying other buses.

### A choice of operating systems

CRDS provides two operating systems, both compatible with UNIX System V and the /usr/group 1984 standard. UN/System V enables users to write application software with the full set of UNIX development tools and run it under UNOS, a run-time, real-time operating system that handles application programs written under UN/System V and any 1984 /usr/group standard application software.

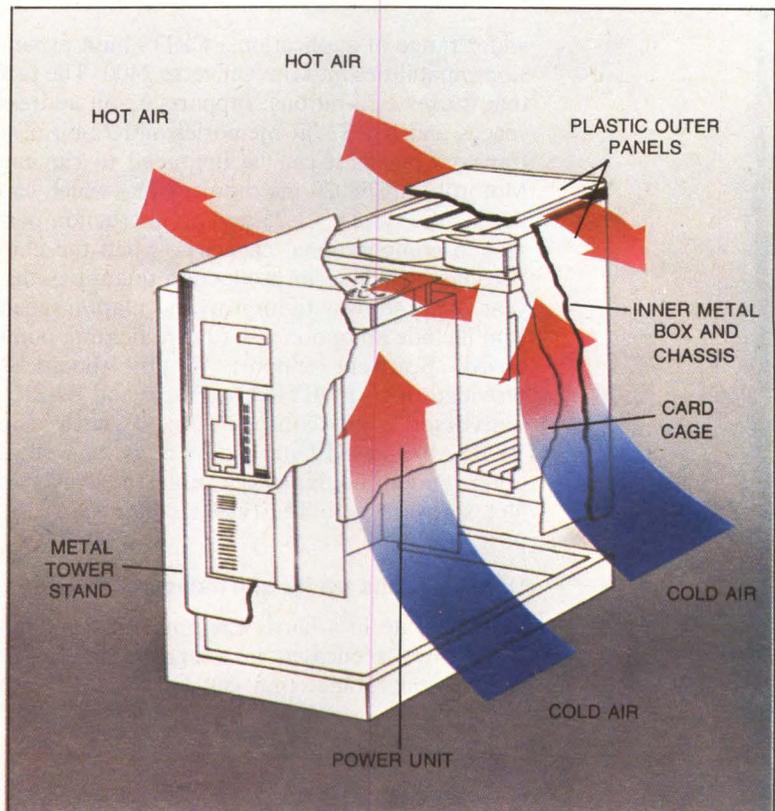
Because CRDS has been oriented to real-time systems from the company's inception, the Universe 2400 incorporates a number of features that enhance performance. These performance features include:

- **Interprocess synchronization**, which allows a system to wait for multiple inputs and maintains a history of them so they cannot be lost
- **Shared data facilities**, which allows two processes to share a memory area and thus communicate at the highest speed possible
- **Priority scheduling**, which allows a user to process tasks in the priority required to meet performance goals
- **Real-time-oriented device driver interfaces**, which allow a user to develop or modify device drivers without system source code.

Other UN/System V features affect data integrity and reliability. Record and file locking prevents the accessing of a file when a person or process is modifying it. Bit-map file allocation prevents duplicate entries from being made and reduces disk-access time by supporting contiguous file allocation. Exception-processing control enables subroutines to identify and handle abnormal conditions in place of the operating system. Bad-block handling automatically maps around a bad section of a disk.

To operate industrially, a computer system needs software that supports real-time operation, assures data integrity and makes the system easy to use. The latest revision of UNOS, released at the same time as the Universe 2400, incorporates such features.

Automatic start-up, during which UNOS automatically configures the system, identifies the peripheral devices on the system, initializes the drivers for them and enters the multitask appli-



*When the Universe 2400 is mounted on its tower stand, its fans draw cool air into the box through filtered vents near the floor. Air is drawn directly over the power supply, through the card cage and out and through the slots near the top of the outer case.*

cation-program environment.

An automatic-recovery capability determines whether the Universe 2400 has been shut down abnormally and verifies and validates the disk's integrity. That allows applications to reinitialize through the user or control environment. The Universe 2400 recalibrates itself, runs diagnostics and restarts itself without user intervention.

Contiguous files increase performance beyond most UNIX files by speeding disk access of files. To increase the speed and assure integrity, files can be written directly to a disk, bypassing the disk cache. This is essential for assuring that data logging and transaction updates are completed under application control.

Important features of real-time applications include UNOS' event-count synchronization, the elimination of processor wait states and the creation of a 256-level priority scheduler that provides precise application control of processor allocation.

To permit a single basic-level system to span a

wider range of applications, CRDS built expansion capabilities into the Universe 2400. The fact that it uses a 32-bit bus, supports 32-bit address spaces and has 32-bit memories and 32-bit disk transfers means it can be upgraded to run the Motorola MC68020 microprocessor—which can double the system's 1.25-million-instruction-per-second computational capacity—when the chip becomes available in production quantities this year. Another way to improve calculation speed is to include an optional hardware floating-point board. Software support for the board is provided in C, FORTRAN, Pascal and BASIC. Universe 2400 can be mixed with the VERSAbus-based Universe 68 units, as well as other vendors' equipment, by using the Universe-Net software with IEEE 802.3 hardware support.

**Universe rolls up its shirt-sleeves**

To operate in a harsh environment, the Universe 2400 is encased in a structurally folded sheet-metal cabinet that can be mounted in a

tower configuration, in a standard 19-inch rack, in a National Electrical Manufacturers Association standard enclosure, on a wall or on a desktop. The power supply meets Federal Communications Commission, Canadian Standards Association and Verband Deutscher Electroniker specifications.

When mounted on its tower stand, the Universe 2400 is impervious to damage from spills because its top surface is curved and liquids move along a conduit until driven away from the machine by air from the side vents. The tower lifts the 2400 above the floor for both improved airflow and protection from wet or damp floors and dirt.

Because of the unit's dimensions—17 by 12½ by 21 inches—its center of gravity is low enough to eliminate the need for wide-splayed feet on the tower mount. All cables are attached at the rear of the unit and a key control panel in front holds a "locked on/locked reset" and a status display. Locked reset effectively disables the system even with the power on, providing system security while still complying with the industrial requirement that factory-floor equipment be easily switched off in case of emergency.

The box accommodates four half-height 5¼-inch devices in combinations of Winchester disks, floppy disks or streaming tape units.

The case is cooled by three two-speed fans that circulate air from bottom to top. The power supply has its own fan to improve overall unit cooling and is isolated in a chimney atop the tower. Air is drawn through filters to remove airborne particles.

In a cool office, the Universe 2400's fans can be set on a quiet, low, 55-cubic-feet-per-minute setting. In a warmer environment, users can switch the unit to the higher setting and it will operate in ambient temperatures that reach 40 degrees Celsius (104 degrees Fahrenheit), making this supermicrocomputer a sensible choice for harsh environments. □

**Spec summary**

- **Model:** Universe 2400
- **Manufacturer:** Charles River Data Systems Inc., 983 Concord St., Framingham, Mass., 01701, (617) 626-1000
- **Price:** \$9,955 in single-unit quantities; volume discounts available; 90 days ARO
- **Processor:** 12.5-MHz Motorola Inc. MC68000
- **Cache:** 4K-byte, 45-nsec static RAM
- **Addressing:** 24-bit, 10M-byte maximum physical memory
- **Bus standard:** VMEbus, 12-slot, full 32-bit data and address path; more than 40M-bit-per-second (bps) maximum bandwidth; 12M- to 19M-bps sequential block transfer to memory
- **Memory management:** eight-segment user/eight-segment system address translation and protection
- **Chassis slots:** 12 (seven unoccupied)
- **Selector channel:** small computer systems interface (SCSI), MC68000-based
- **Expandability:** Serial ports, four (one with modem) to 64; parallel ports; zero to seven; RAM, 512K bytes (parity) to 10M bytes (parity or error correction code)
- **Disk:** 20M- or 35M-byte to 360M-byte; access time, 80 msec for 20M, 38 msec for 25M; 300K-byte peak transfer for each
- **Backup:** 45M-byte ¼-inch streaming tape
- **Interchange:** 320K-byte to 1.2M-byte floppy disk

**Jim Isaak** is director of product planning at Charles River Data Systems Inc., Framingham, Mass., and chairman of the IEEE committee (P1003) on UNIX standards. He has worked in marketing management and system engineering at Data General Corp., Westboro, Mass., and has a master's degree in electrical engineering from Stanford University, Stanford, Calif.

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

# Introducing Human Designed Systems' HDS200 Display Terminal Family



## EASY ON YOUR EYES

Ended December 31, 1984 1983

Statement Data:

Revenues \$145,200 \$104,558

Income 14,003 10,266

arnings per common share:

132-col. characters actual size

Large, high-density characters make the HDS200 terminal the easiest to work with, even if you work with terminals all day. Our 15" monitor has more viewing area (62% more than competitive screens) so you can work comfortably.

## EASY ON YOUR SPACE

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## EASY ON YOUR BUDGET

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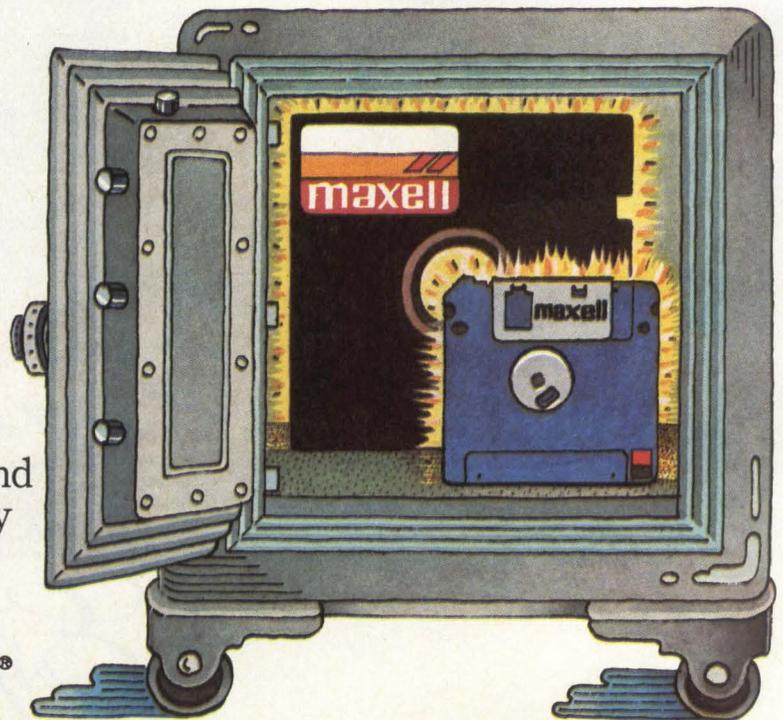
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# INTEGRATED SOFTWARE SPURS MINI MARKET

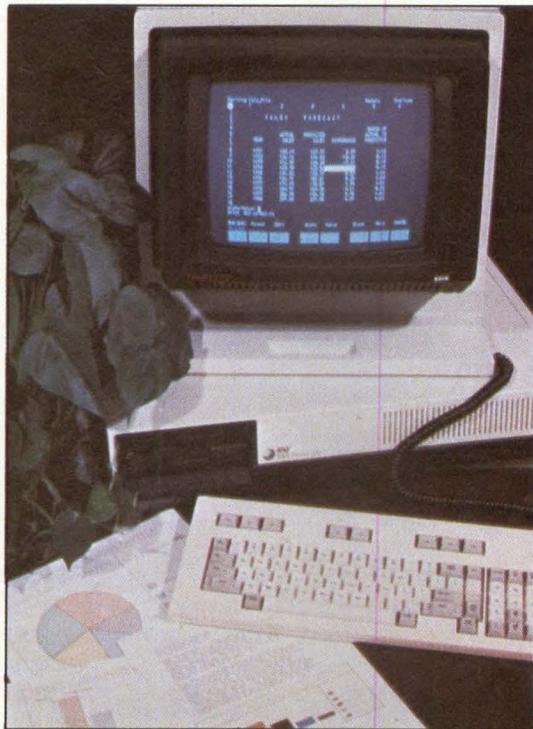
New software packages for minicomputers offer an alternate route to office automation

**Michael Tucker**, Associate Editor

System integrators are still debating whether office-automation projects are best tackled with multiuser minicomputers or local area networks of microcomputers. Now "personal computer imperialism" is creating a new generation of integrated office-automation software that could weight the balance in favor of multiuser systems. Personal computer integrated products upgraded for minicomputers, and new multiuser system products inspired by them, are combining user friendliness with cross-vendor links to make minicomputers accessible to individual managers.

"The excitement has gone back to the larger vendors and their minicomputers," says Kathleen Carey, senior associate editor of market research company Datapro Research Corp., Delran, N.J. While a year ago some observers speculated that minicomputers couldn't compete with user-friendly desktop machines on the office-automation front, today IBM Corp., Wang Laboratories Inc., Digital Equipment Corp., Hewlett-Packard Co. and Data General Corp. have all brought out integrated office-automation packages for minicomputers.

Software development companies, meanwhile, are taking advantage of their experience with personal computers and the emerging UNIX market to enter the minicomputer area in a big way. Companies introducing new or modified integrated software for minicomputers in the last few months include Cognetic Systems Inc., Handle Technologies Inc., Access Technology Inc., Applix Inc., Quadratron Systems Inc., Century Business Technologies, UniPress Soft-



**Handle Technologies** offers a broad software package that gives UNIX-based minicomputers an integrated word-processor, list manager, spreadsheet (shown), business graphics generator and spelling checker.

ware Inc. and Inspiration Systems.

Analysts explain the sudden flowering of a supposedly dying minicomputer software industry as a natural reaction to microcomputers. "Personal computers fueled a real drive for integration at the departmental level," says Peter Lowber, senior market analyst with the Yankee Group, Boston, "and the mini-computer vendors are well-positioned to take advantage."

**Perhaps the most interesting aspect of Wang Office is that it can be purchased in pieces.**

Lowber dismisses the idea that microcomputers alone can achieve office automation. "On the departmental level, you need a processor big enough to act as a file server and as a gateway to the outside world."

Datapro's Carey agrees: "I don't think the LAN question is as important as it was once. All of a sudden the big vendors—DEC, Wang, IBM, everybody—are doing amazing things with their minicomputers. Their workstations are getting smaller and friendlier. They're integrating voice and [other] new communications methods into their systems, and they're opening up communications to multiple hardware vendors."

As the ranking heavyweight in any market even remotely related to minicomputers, IBM offers Professional Office System (PROFS) for a variety of its machines running on the VM/SP operating system. In some ways the primary example of integrated software for minicomputers, PROFS combines a word processor with electronic mail and "personal computer-like administrative functions" (specifically, a calendar that automatically reminds the user of upcoming events). It also incorporates a search facility so that users can retrieve electronic mail or other documents from their individual files by author, date, subject, addressee or key word.

Users access PROFS from terminals or workstations and tailor its main menu to fit their needs by defining the sequence and wording of

selections. IBM has also recently brought out PROFS/PC2, software that allows the IBM PC to act as a workstation in a PROFS network or even to perform selected PROFS functions, such as e-mail, on its own.

Wang, Lowell, Mass., offers Wang Office for its VS series of computers. Wang Office gives users electronic mail, an electronic calendar and a file-management system. The file manager allows users to store and retrieve documents, messages and—with optional software and hardware—even pictures. Users can also invest in an optional word processor, a database manager, a spreadsheet and a graphics facility.

An unusual aspect of Wang Office is that it can be purchased in pieces. For the newcomer to computing who's thinking, "safe and sane," an entry-level package, subtitled VSOOffice/1, offers e-mail and the calendar alone well within the newcomer's speed limits. For users in need of a bit more horsepower under the hood, VSOOffice/2 throws in a file manager. For the grand prix crowd, VSOOffice/3 provides such features as revisable menus and spelling checkers.

Last December, DEC of Maynard, Mass., introduced a new version of its integrated office system, All-in-1. In its original incarnation, All-in-1 met with mixed reviews. The latest version is expected to satisfy old critics and to throw in some new wrinkles at the same time.

All-in-1 offers an electronic-mail system, a

### **INFO meets office automation**

Many integrated office-automation packages showing up on minicomputers grew out of the microcomputer software industry. But traditional data processing has its innovators too.

For example, Henco Software Inc., Waltham, Mass., has for several years marketed products for the power-players in computing—financial and accounting departments, corporate record keepers, programmers and so forth. The company's INFO, an integrated database manager, data-entry system and English-like developmental language, boasts some 2,000 installations worldwide.

With each release, INFO has gained another user-friendly, personal-computer-like characteristic. Now, in addition to its data-processing strengths, INFO can offer optional word processors, decision-support modeling programs, graphics managers, document managers, software developers' tool kits and dozens of third-party application programs.

Henco has also done much to make INFO accessible to and from other software packages. As

of last February, Data General Corp. revealed that it would associate INFO with its own Comprehensive Electronic Office (CEO). The company named Henco the first Data General Authorized Software Vendor, and DG's customers will soon be able to buy a "super CEO" that includes INFO as an option.

At almost the same time, Henco announced a scaled-down version of INFO for the IBM Corp. PC with hard disk. Microcomputer "imperialism," with personal computer products climbing into the minicomputer world, may just have met a competitor pushing down from above.

At the moment, INFO runs on Digital Equipment Corp.'s VAX and System 20, and Harris Corp., Honeywell Inc., IBM and Prime Computer Inc. minicomputers. Henco also admits to eyeing AT&T Information Systems' and UNIX's markets. Notes Bruce Rudy, Henco's manager of international marketing, "When the UNIX market starts to shake down, then maybe we'll be seeing an entry. AT&T is a bit new at the business, but heck, they're not bad for a several-billion-dollar start-up."



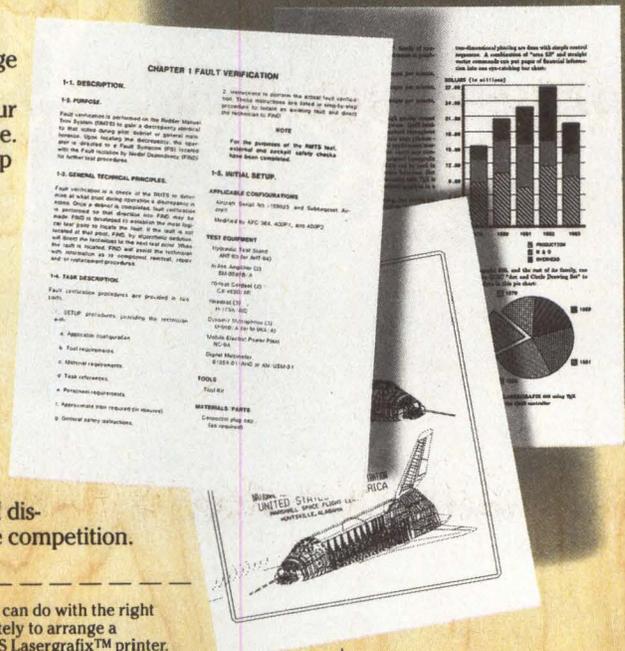
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**CIRCLE NO. 59 ON INQUIRY CARD**

word processor, a networking software package, a calendar and a file manager. Third-party software can be incorporated as selections on the main menu, and, as something of a first, DEC also announced that voice-mail and messaging options would be available this spring. With DECTalk Mail Access, users will be able to receive or answer voice mail from any standard touch-tone phone. They'll also be able to receive at least some text messages the same way. DECTalk is a text-to-speech converter and a separate product in its own right. With it as part of All-in-1, users can simply phone their offices and have the system read selected files aloud.

HP, Cupertino, Calif., has an integrated package known as HP Desk Manager. Running on the HP 3000 minicomputer, it too includes a "basic" word processor that is somewhat limited, e-mail, electronic filing and a calendar. What makes HP Desk Manager stand out is a host of options that can be plugged into the product to meet the needs of specific vertical markets. Report generators, business graphics software, a list manager, specialized word processors and more can be had, depending on the buyers' wants and the depth of their pockets.

**Data General promotes CEO**

The biggest and most ambitious integrated package currently offered by a major minicomputer vendor may be Comprehensive Electronic Office (CEO) from DG, Westboro, Mass. It includes a word processor, e-mail and electronic filing. There's also an integral decision-support package that includes a spreadsheet and a small database manager.

CEO makes a serious commitment to crossing vendor frontiers. DG claims users can employ CEO with Wang word processors, Northern Telecom Inc. Displayphones, IBM PCs acting as workstations, third-party software and virtually everything else that can be reached over X.25 and Systems Network Architecture networks.

Other minicomputer vendors are certain to get involved. It's been widely rumored, for example, that in the near future AT&T Technologies, New York, will introduce an integrated office-automation product to be called Office Management Systems. However, at press time AT&T representatives would neither confirm nor deny the rumor.

"As far as the market goes, third-party suppliers are going to have a tough row to hoe trying to compete with the major minicomputer vendors," notes Datapro's Carey. Yet, independent software developers are hanging in there all the same. In fact, they have some significant advantages over their larger competitors—such as

Schedules for Tuesday 4-Dec-1984			
WILLIAMS		DAVIS	
Time	Description	Time	Description
8:30a		8:30a	
8:45a		8:45a	
9:00a	#STAFF MEETING	9:00a	#Staff Meeting
9:15a	***	9:15a	***
9:30a	***	9:30a	***
9:45a	***	9:45a	***
10:00a		10:00a	
10:15a	#REVIEW CORPORATE STANCE	10:15a	#Review Corporate Stance
10:30a	***	10:30a	***
10:45a	***	10:45a	***
11:00a		11:00a	
11:15a		11:15a	
11:30a		11:30a	#Budget
11:45a	Luncheon	11:45a	***
12:00p	***	12:00p	
12:15p	***	12:15p	
12:30p	***	12:30p	
12:45p		12:45p	

years of experience bringing user-friendly software to the desktop computers of managers. Many independents already successfully market integrated packages for personal computers that can easily be upgraded to minicomputers or that can serve as the inspiration for larger products.

Also, the gradual spread of a standard AT&T System V UNIX operating system has given developers an ever-broader spectrum of machines on which to run their products. Indeed, all the packages covered in this article come in at least one flavor of UNIX.

And, finally, while the major players are just now experimenting with establishing links to other vendors, the independents have for some time made these links a way of life.

**Higgins to the rescue**

The classic example of a sophisticated microcomputer product may be Cognetic's Higgins. Originally meant for the IBM PC market, Higgins is a combined calendar, personal directory, "things-to-do" list, calculator, personal filing system, scratch pad, expense-report generator and clock.

Few observers are surprised that Higgins proves popular with personal computer users. What did startle many of them was that Cognetic, Portland, Ore., introduced a LAN version of the product last December and started talking about a minicomputer version for some time soon.

"We see the office of the near future to be [one of] personal computers linked with LANs, and then those LANs driven by very strong engines—minicomputers," explains Howard Case, Cognetic's vice president of marketing. "So, we decided to develop a product that could start at the bottom with the micros and work up."

**DEC's All-in-1** offers a personal calendar as well as an electronic-mail system, word processing, networking software and a file manager. Voice mail should be available soon.

Case says that, as "a resident of those mini-computer engines," Higgins is expected to be available sometime in late 1985.

**Users get a Handle on things**

Handle Technologies Inc., Tahoe City, Calif., meanwhile, already ships a more conventional, though broader, package. "We've taken an approach that I think is rather unusual," notes David Wertzberger, Handle's executive vice president. "You can buy the integrated package, or you can buy the individual modules that make it up, depending on what you need and can afford."

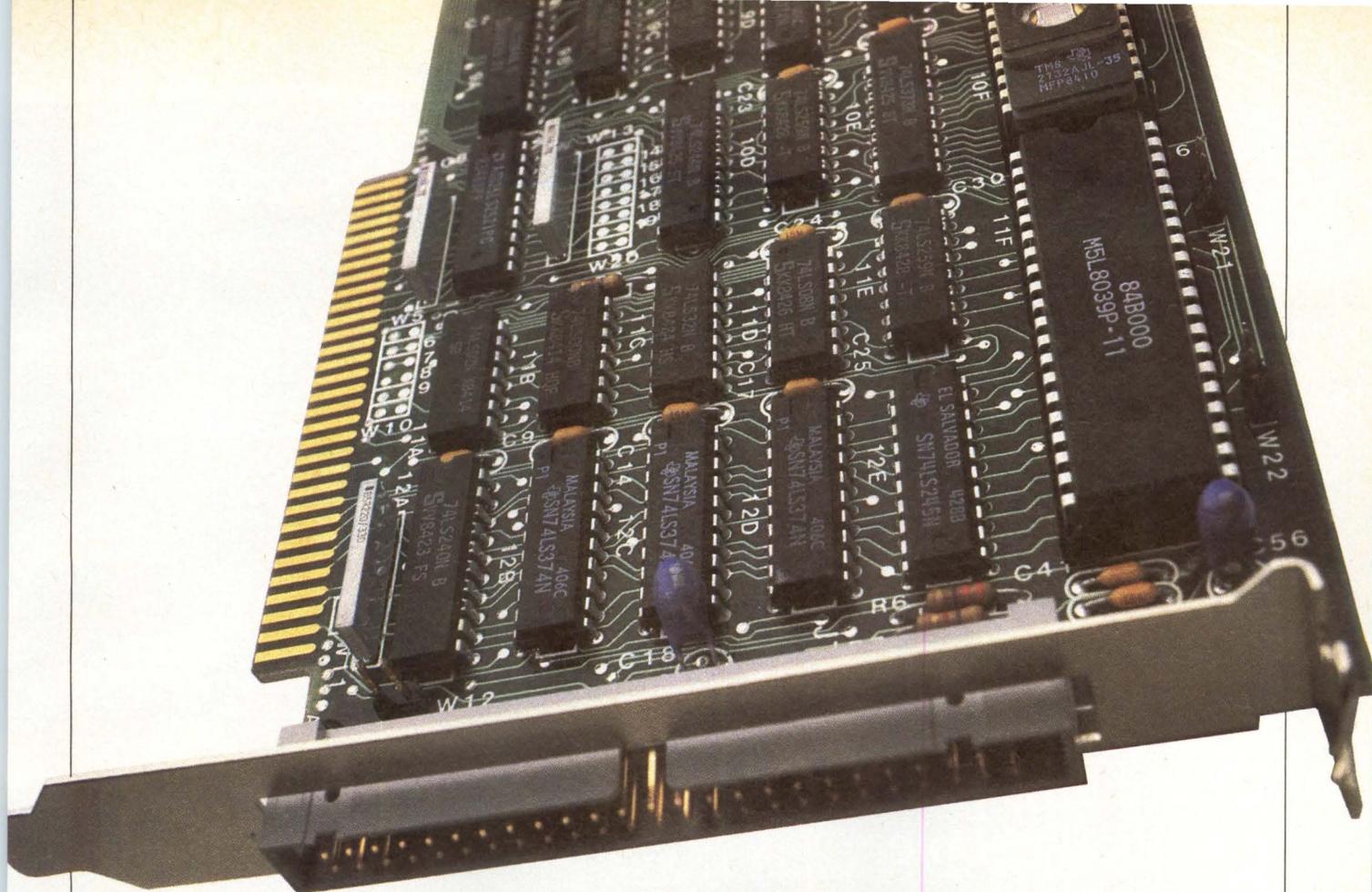
Handle modules include a word processor, a list manager, a business graphics application, a spreadsheet and a spelling checker.

The product also maintains extensive cross-

vendor links. A format-converting module known as Handle Access allows files to be exchanged with other programs. Handle has also heavily advertised the open architecture of its products, which lets OEMs and value-added resellers customize the software for vertical markets.

For more specialized financial applications, meanwhile, Access Technology Inc., South Natick, Mass., has recently offered its 20/20, a combined spreadsheet, graphics package, database manager and project scheduler that runs on both UNIX-based and several proprietary systems. What could make 20/20 particularly attractive for managers is its strong data-import capability, a built-in library of financial and statistical functions (such as a depreciation calculator) and a talent for "what-if" modeling.

<b>REPRESENTATIVE INTEGRATED PACKAGES FROM INDEPENDENT VENDORS</b>										
Company	Product	Product functions							Price (\$) (basic system)	Notes
		Data management	Spreadsheet	Graphics	Word processing	Communications	Administrative software	Systems		
<b>Access Technology Inc.</b> 6 Pleasant St. S. Natick, Mass. 01760 Circle 393	20/20	•	•	•				• IBM VM/CMS machines, DEC VAX, Prime PRIMOS machines, Data General MV series, AT&T UNIX	9,700	financial package
<b>Applix Inc.</b> 302 Turnpike Road Southboro, Mass. 01772 Circle 394	Alis	personal database	•	•	• electronic mail			• UNIX System V machines	1,350 per user	
<b>Century Business Technologies</b> 114 Center Ave. Pacheco, Calif. 94553 Circle 395	Officeware		•	•	• electronic mail, terminal emulation			• UNIX System V machines		includes form generator
<b>Cognetic Systems Inc.</b> 1800 S.W. First Ave. Suite 180 Portland, Ore. 97201 Circle 396	Higgins	personal files	expense report		• electronic mail			• UNIX System V machines	395	administrative software
<b>Handle Corp.</b> 140 Mackinaw Road P.O. Box 7018 Tahoe City, Calif. 95730 Circle 397	Handle	list processor	•	•	• electronic memos			UNIX System V machines		strongly modular design
<b>Inspiration Systems Inc.</b> Production Plaza Sewickley, Penn. 15143 Circle 398	Prevail	•	•	•	• electronic mail, file transfer			• UNIX System V machines	4,125	includes applications development language
<b>Quadratron Systems Inc.</b> 15760 Ventura Blvd. Suite 1032 Encino, Calif. 91436 Circle 399	Q-Office	optional	optional	optional	• electronic mail			• UNIX System V machines and others	4,600 per copy	installed on over 50 different machines
<b>Unipress Software Inc.</b> 2025 Lincoln Hwy. Edison, N.J. 08817 Circle 400	Uniplex II	•	•		• electronic mail			• UNIX System V machines	495-695, depending on configuration	includes print spooler, screen builder



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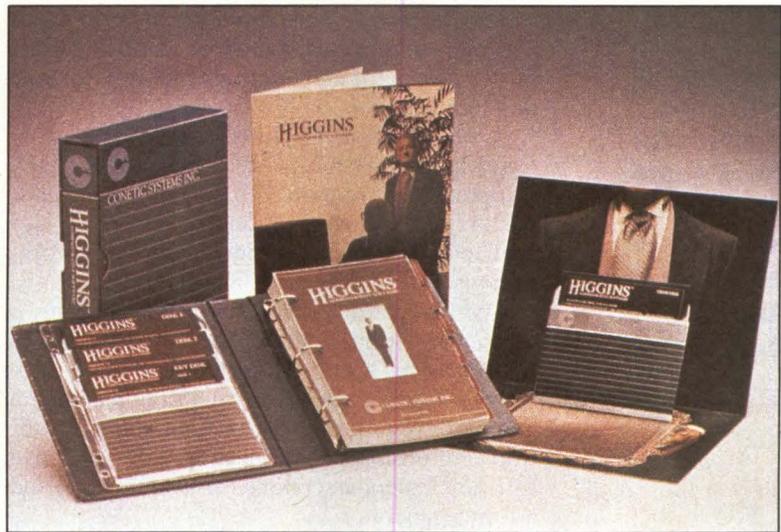
## MINICOMPUTER SOFTWARE

The 20/20 package has proved so popular with business users that Yates Ventures, Palo Alto, Calif., software analyst D.E. Followwill predicts that "it will probably become one of the premier business application packages running under UNIX."

### Through the looking glass

Applix, Westboro, Mass., has been marketing a UNIX-based package known as Alis exclusively through OEMs since last November. Alis contains, among other things, a word processor, a graphics editor, a spreadsheet, a personal database and an electronic-mail facility. Users can share information, and Alis can keep tabs on which files are being swapped by whom. And because the product is meant for OEMs, Applix has worked hard to install cross-vendor links. "We like to think," says John Butler, Applix's vice president of marketing, "that the strategic advantage of this product is in its ability to deliver a single office system across a broad range of hardware."

One ambitious product is Q-Office from Quadratron, Encino, Calif. Q-Office integrates a



The classic example of a sophisticated microcomputer product may be Cognetic Systems' Higgins, which was originally meant for the IBM PC. Cognetic personifies the versatile product as "Higgins the Butler."

### REPRESENTATIVE INTEGRATED PACKAGES FROM MINICOMPUTER VENDORS

Company	Product	Product functions						Systems	Price (\$) (basic system)	Notes
		Data management	Spreadsheet	Graphics	Word processing	Communications	Administrative software			
<b>Data General Corp.</b> 4400 Computer Drive Westboro, Mass. 01581 Circle 388	CEO	electronic files	•		•	electronic mail	•	Eclipse series	5,660	strong multivendor links
<b>Digital Equipment Corp.</b> 129 Parker St. Maynard, Mass. 01754 Circle 389	All-in-1	electronic files			•	electronic mail	•	VAX 11/725, VAX 11/730, VAX 11/750, VAX 8600	7,500	voice mail
<b>Hewlett-Packard Co.</b> Information Systems Group 19055 Prune Ridge Ave. Cupertino, Calif. 95014 Circle 390	HPDesk-Manager	electronic files		basic		electronic mail		HP3000	12,000	can be part of a much larger integrated office system
<b>Honeywell Inc.</b> Honeywell Plaza Minneapolis, Minn. 55408 Circle 391	Office Automation Systems	electronic files	•		•	electronic mail	•	Honeywell minicomputers	1,065	
<b>IBM Corp.</b> 1133 Westchester Ave. White Plains, N.Y. 10604 Circle 392	PROFS	electronic files			•	electronic mail	•	IBM System/ 370,43XX, 303X, 308X, 3031, 3081, 4321, 4331	4,000 initial fee, 600 monthly thereafter	
<b>Prime Computer Inc.</b> Prime Park Natick, Mass. 01760 Circle 380	Office Automation System	electronic files			•	electronic mail	•	Prime 50 series	7,000 initial fee	
<b>Wang Laboratories Inc.</b> One Industrial Ave. Lowell, Mass. Circle 381	Wang Office	electronic files				electronic mail	•	Wang VS series	6,000	

**Independent software developers have some significant advantages over their larger competitors.**

word processor, an electronic calendar, a menu manager, an electronic note pad, a phone directory, a calculator and a forms generator into one tidy bundle.

As of press time, Q-Office was available on no fewer than 52 systems. At last January's UNIX /usr/group convention, Uniforum, in Dallas, Quadratron announced that Q-Office is also available for digital voice telephone workstations.

Another package available for some time is Officeware from Century Business Technologies, Pacheco, Calif. It includes a word processor, a spreadsheet-like financial planner, a graphics generator, terminal-emulation software, an electronic-mail facility, administrative software (calendars, phone lists and the like) and a forms generator.

UniPress, Edison, N.J., calls the Uniplex II integrated package "the first available integrated office-automation software package for UNIX-based computer systems." UniPress is itself a remarketer and Uniplex II is actually a product of Redwood International, St. Albans, England.

It has been selling briskly in Europe for three years.

In both its American and European incarnations, Uniplex II features a word processor, a spreadsheet, a database, a forms and menu generator and, surprisingly in view of UNIX's inherent print spooler, it includes a print-spooling facility.

**Will Inspiration prevail?**

One potentially strong integrated package introduced in January is Prevail from Inspiration Systems Inc., Sewickly, Pa. Prevail merges office-automation software (a word processor, a spreadsheet and a communications program) with a hefty report-generating database and a Pascal-like application-development language named ADL.

In effect, Inspiration is trying to achieve the industry's long-standing dream of a hybrid programming environment equally useful to programmers and managers. Prevail's personal-computer-like modules are supposed to meet the needs of inexperienced users, whereas the database and the ADL language are meant to inspire the power-players in traditional data-processing environments.

The real proof of the product will have to await Prevail's first shipments, expected this year. However, beta-site users have been enthusiastic, and Inspiration staff members are already talking about incorporating hundreds of applications from both in-house and third-party sources.

Meanwhile, what could be the ultimate in minicomputer software integration may have begun at Uniforum last January. In a surprise announcement, Relational Database Systems Inc. (RDS), Palo Alto, Calif., revealed that it would share some of its source code with several software houses, language developers and UNIX-porting outfits. "As a result," the company claims, "system developers can get a hook into the back end of RDS' database management systems....Any product—spreadsheet, accounting package or project manager—that contains a 'hook' can deal with the [RDS] database easily and directly. No intermediate data-interchange files are needed."

In other words, if the remainder of the industry goes along with RDS, it may soon be possible for system integrators literally to pick and choose among various software modules and bundle them as tightly as if they'd been meant for one another. □

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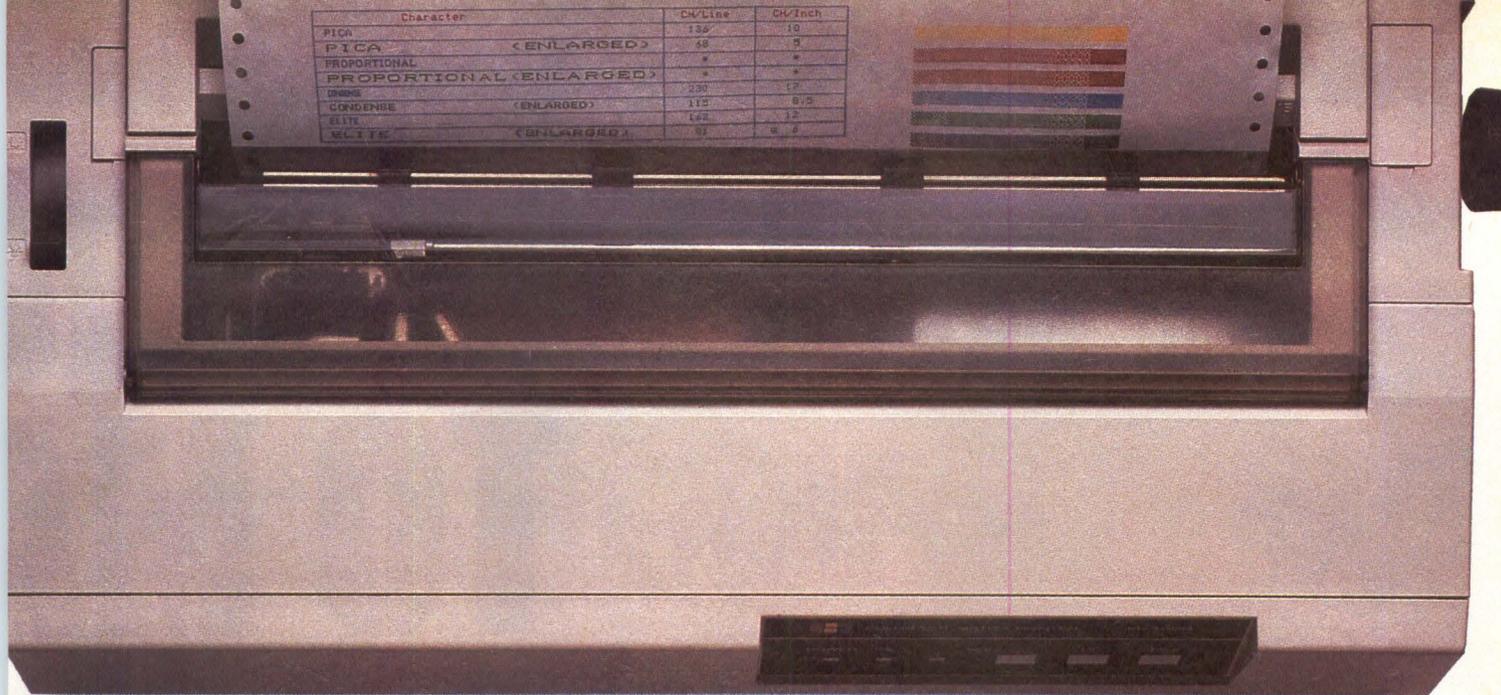
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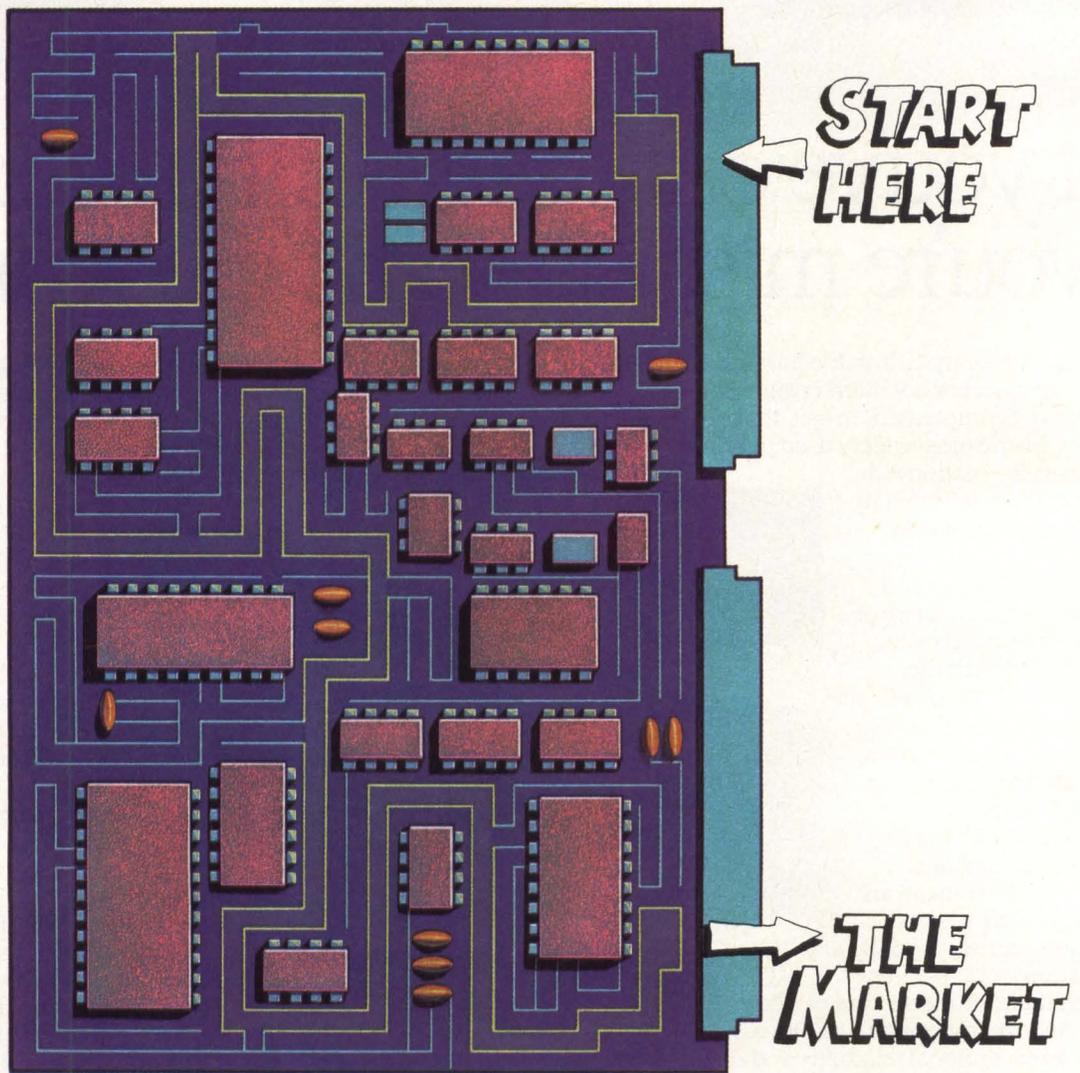
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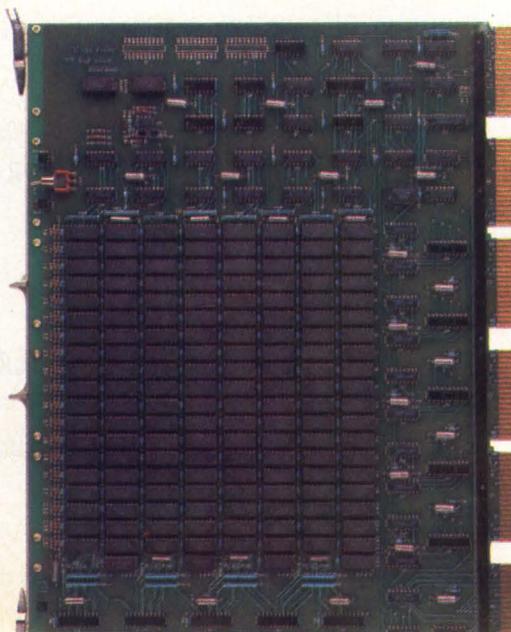
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# SUPERMINIS SHAPE UP AS DEPARTMENTAL CPUs

Functional enhancements and competitive price/performance characteristics lead major minicomputer vendors into battle

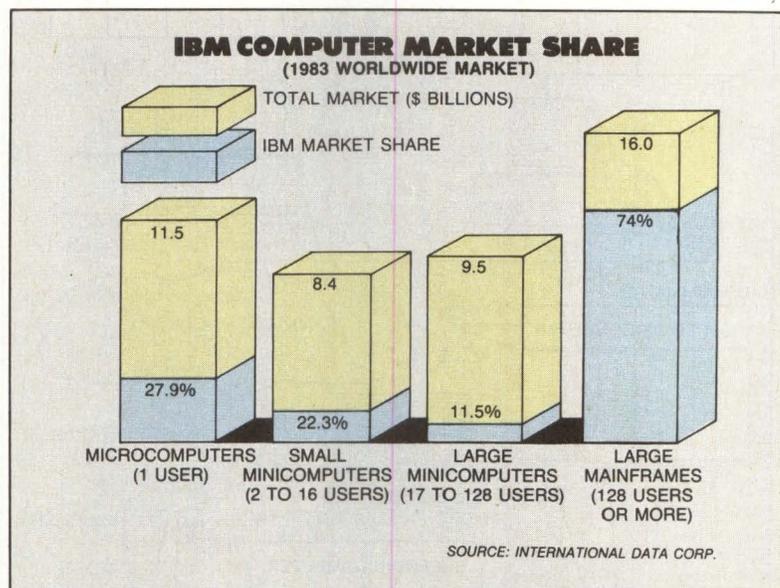
Lynn Haber, Associate Editor

Distributed data processing, an idea of the 1970s, never materialized, primarily because good networking did not exist. But, today, with the de facto standardization of Ethernet and the availability of superminicomputer hardware and software at price/performance levels that are sometimes more cost-effective than microcomputer-to-mainframe links, distributed data processing is a reality.

To witness this change, note the vociferous marketing efforts and flurry of product announcements by major minicomputer vendors, such as Digital Equipment Corp., Data General Corp., Wang Laboratories Inc., Prime Computer Inc. and Hewlett-Packard Co. These companies offer integrated office solutions based on the superminicomputer as a departmental CPU. Even IBM Corp., the granddaddy of centralized data processing, is touting the System/36 as the cornerstone of its departmental strategy.

As the departmental CPU, some of the functions that the superminicomputer must perform include database management and control, networking and communications, workstation support, report generation and more advanced services such as document image capture and processing.

Combined with a proliferation of desktop machines, an increase in the amount of data produced and a growing need to share that information with co-workers, minicomputer companies are looking to satisfy a bottom-to-top drive toward office integration.

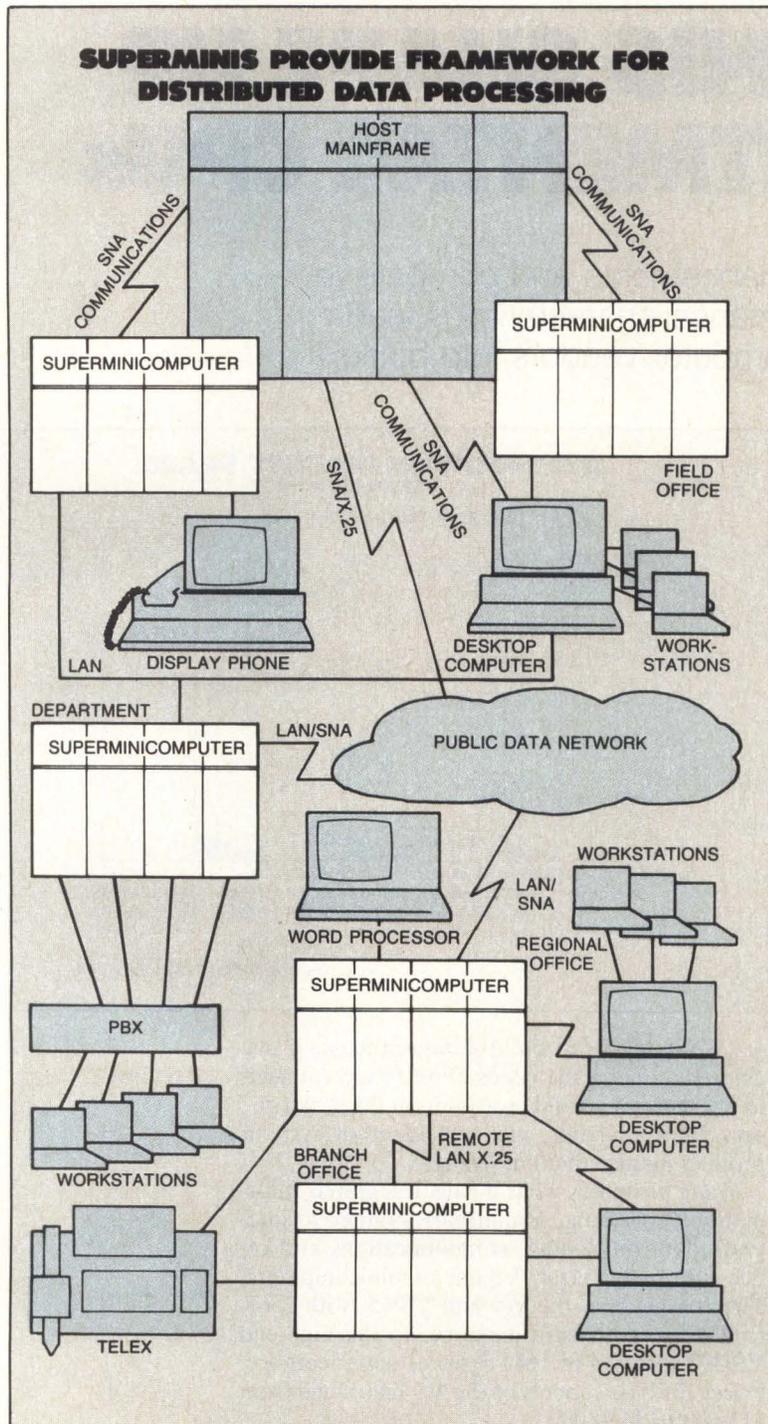


"We're trying to build a data-processing machine that meets the needs of users and connects to every terminal and processor on the desktop," says John Thibault, vice president of systems product management at Wang.

Wang promotes what it calls Integrated Information Processing, a multipart strategy to integrate data processing, communications and office automation via its VS line of minicomputers. They range from the low-end VS/15, with 256K to 2M bytes of main memory, to the high-end VS/300 with 4M to 16M bytes of main memory. Prices for base models of the VS line range from \$13,500 to \$170,000.

“The function of the superminicomputer at the departmental level is to support personal computers in one of a number of activities, providing power, flexibility and software sup-

**Superminicomputers are becoming increasingly popular as the “middlemen” in distributed data networks.**



port,” says William C. Rosser, vice president of the Gartner Group Inc., a research and consulting company in Stamford, Conn.

As the processing power of the superminicomputer matures, evidenced by recent product introductions such as DEC’s VAX/8600—reportedly capable of processing 4.4 million instructions per second (MIPS)—an evolutionary change in commercial data-processing environments results.

**A three-tier office environment**

In a three-tier business structure, the low end is occupied by the personal computer, the middle tier, by the superminicomputer and the upper level, by the mainframe, or host, computer.

Compared to some of the first attempts to satisfy the user’s need to process and share information, which included micro-to-mainframe links and microcomputer-based clusters, the superminicomputer as the departmental CPU can be a better dollar-per-job-provided solution. According to Rosser, the cost per MIPS for superminicomputers ranges from \$70,000 to \$120,000, compared with mainframe computing (based on an IBM 3080-family machine) at \$210,000 per MIPS.

Major superminicomputer manufacturers have identified and are going after the middle tier. According to market research company International Data Corp., Framingham, Mass., IBM, which claims 74 percent of the mainframe market, 27.9 percent of the personal computer market, 11.5 percent of the large minicomputer market and 22.3 percent of the small minicomputer market, has largely ignored data processing at the departmental level. What many of these minicomputer companies offer that IBM currently does not, is a smooth migration path across their product lines.

“This is a big area of opportunity,” says Rosser. According to the industry consultant, if the number of personal computers reaches 50 percent of the white-collar work force, as predicted, and the three-tier approach to integration proves to be a good solution for data processing, then the number of superminicomputers shipped will escalate. “These companies recognize that they’ve got to get out there, even if the personal computer at the bottom is IBM and the host at the top is IBM,” he explains.

According to market research company Dataquest Inc., San Jose, Calif., the number of superminicomputers shipped in 1989 is expected to exceed 199,000 units, compared with 15,500 in 1983. The dollar value for superminicomputer shipments is expected to exceed \$19 billion by

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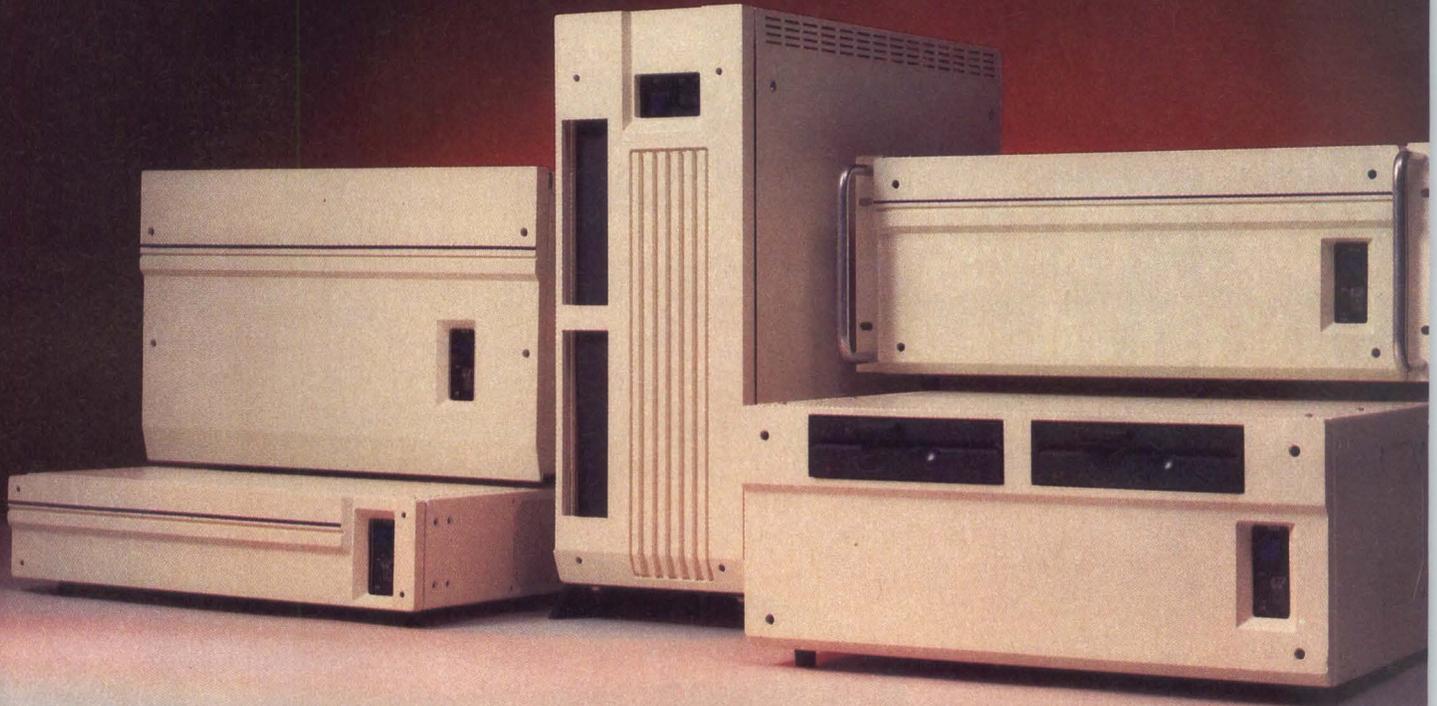


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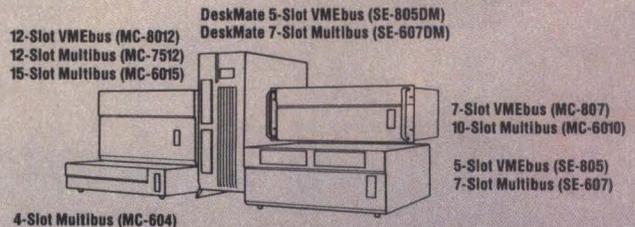
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## MINICOMPUTER HARDWARE

1989, compared with \$3.65 billion in 1983.

Recognizing the inevitability of a multivendor environment, minicomputer manufacturers are committing to product compatibility for IBM 3270 emulation (between mainframe, minicomputers and desktops), X.25 (to the public-switched networks), Ethernet protocols, the Navy Document Exchange (between multivendor desktops), IBM's Systems Network Architecture (allowing access to an IBM host), the Document Interchange Architecture/Document Content Architecture (DIA/DCA) and the UNIX operating system.

Many manufacturers will purchase from independent vendors, products and services that they cannot provide themselves. "Our philosophy on joint ventures and company alliances," says a Prime spokesman, "is that where we can add true benefit and have product uniqueness, we'll develop products internally, but it makes no sense to reinvent the wheel."

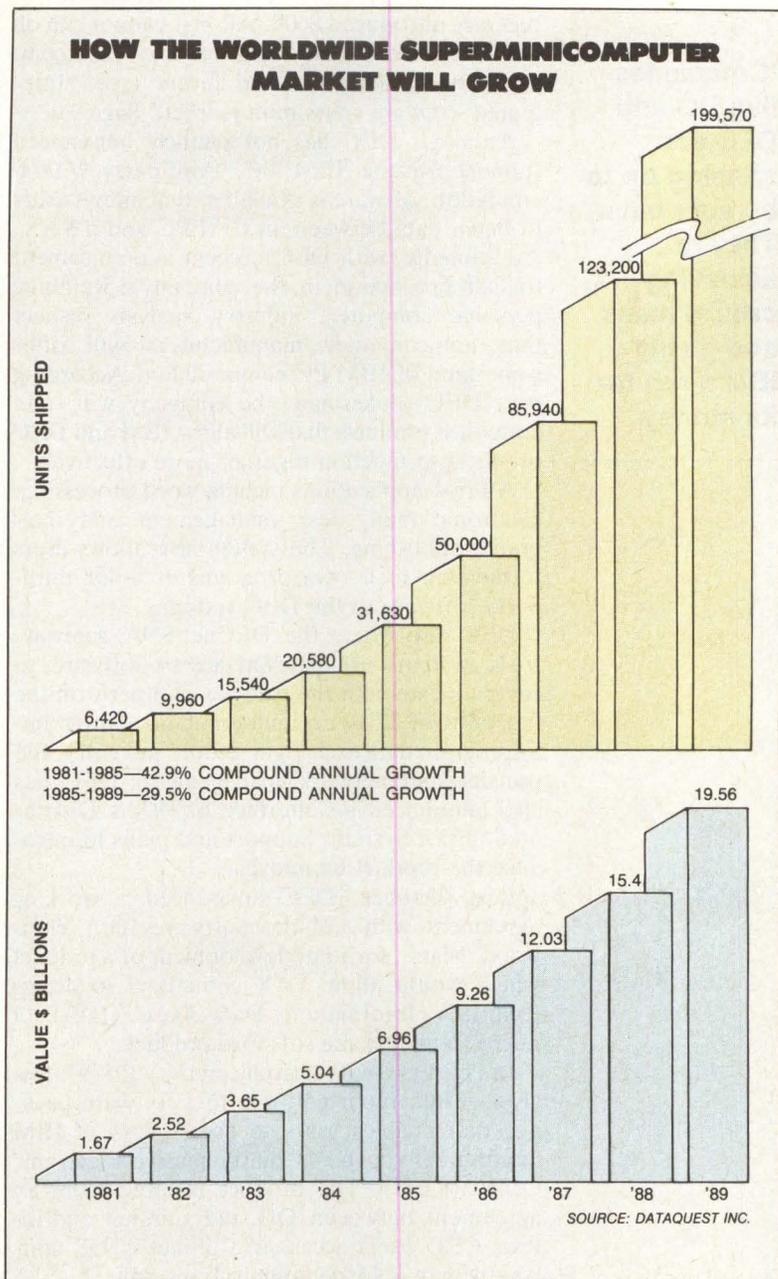
As products get more complex, development cycles become longer and product life cycles become shorter, manufacturers' research and development allocations must be wisely calculated. "The nature of the computer business is such that you see decreased product life, increased capital investment and decreased profit margins," says Brad Smith, associate director of research for the computer industry service at Dataquest. "The expectations of the past are no longer applicable."

### Integration is important

Currently, IBM's biggest disadvantage in approaching the middle tier is that the company offers multiple products that are incompatible (e.g., the Series 1, System/36, System/38, the 4300 and the 8100). In contrast, companies like DEC, DG and Wang offer users a single, consistent architecture that covers a wide performance range. A consistent operating system and user interface across products allows departments to swap machines or upgrade when necessary without the burden and expense of having to regenerate software.

"The user wants to have a machine that will be the appropriate investment to meet the requirements of different-sized departments," says Gartner's Rosser. "If you run out of gas using the IBM System/36, what do you do beyond that? Multiple [System/] 36s are an awkward approach to solving the departmental problem."

IBM does have powerful systems within discrete groups and offers good upgrades for systems within a family. A sign of the company's marketing strategy became evident last October when it announced Displaywrite 1, 2 and 3 for



the PC, Displaywrite/36 and intentions to offer Displaywrite/370—software that, according to IBM, offers complementary functions and common user interfaces to provide an integrated office-system network. IBM also offers Personal Service/PC, 36 and 370, which also provide office integration.

DEC's All-in-1 Office and Information System software offers the user a menu of applications that can be accessed from the company's terminals or personal computers. All-in-1 applications also run on VAXes, from the 11/725 to the

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**'Companies like DG and DEC are shaping up to be sure bets. They're achieving critical mass and giving IBM a run for its money.'**

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recently introduced 8600. All-in-1 cannot run on the MicroVax, but DEC plans to announce compatibility sometime in the future (see "Integrated software spurs mini market," Page 95).

Although DEC has not publicly announced support for the IBM PC, third-party VT100 emulation software is available that allows users to batch data between an IBM PC and a VAX. Additionally, with DEC's recent announcement to halt production of the company's Rainbow personal computer, industry analysts suspect that minicomputer manufacturers will offer some kind of IBM PC compatibility. According to a DEC spokesman, the company will soon announce products that will allow IBM and DEC products to function together more effectively.

All-in-1 applications include word processing, electronic mail, desk management and integrated publishing. The system also allows users to develop their own programs or tailor third-party software to the DEC system.

DEC also offers the DECnet/SNA gateway. VAX systems use gateway-access software to communicate with the gateway and perform the functions of 3270 terminal emulation, program-to-program data exchange, remote job entry, file transfer and network management. DEC has also announced an interface to IBM's Distributed Office Systems Support and plans to introduce the product by midyear.

Last October, DEC announced a working agreement with Cullinet Software Inc., Westwood, Mass., for joint development of a product which would allow VAX computers to access Cullinet's Information Data Base (IDB), a micro-to-mainframe software product.

In February, DG introduced the AOS/VS Decision Link, reportedly the first software package that enables users to access data in IBM mainframes via DG's Comprehensive Electronic Office (CEO). The product resulted from an agreement between DG and Cullinet and allows CEO users access to Cullinet's IDB software via an SNA communications link.

### **The key trends**

In terms of hardware competition, Dataquest's Smith expects the next shoot-out to occur shortly, when superminicomputer manufacturers take on IBM and the "BUNCH" (Burroughs Corp., Univac Corp., NCR Corp., Control Data Corp. and Honeywell Information Systems Inc.). "Companies like DG and DEC are shaping up to be sure bets," says Smith. "They're achieving critical mass and giving IBM a run for its money." Smith refers specifically to DEC's 8600 with its clustering capability, which he believes will "take DEC into the 1990s."

Last year's minicomputer trend was UNIX compatibility. This year's buzzwords are emitter-coupled logic (ECL), gate-array circuit technology, clustering and fault-tolerance.

Though more expensive than Schottky transistor-to-transistor logic or reduced-instruction-set-computer architecture, ECL reportedly offers more reliability and faster processing. Such vendors as DEC, Prime, DG, Gould Inc. and Harris Corp. have implemented ECL circuitry in their products.

Clustering allows users to add computers incrementally in a transparent manner. This arrangement provides multiple resources and greater reliability and speed. For example, the DEC VAXcluster, introduced in April 1983, is a network of loosely coupled processors and storage systems that appears to the user as a single accessible computer. In the VAX line, the 11/750, 11/780, 11/785 and the 8600 have cluster capabilities.

### **Fault-tolerant systems**

Although not synonymous, both cluster and fault-tolerant systems are high-priority concepts for many minicomputer manufacturers because of increased system reliability. Fault-tolerant architecture protects the computer system from failure either through hardware, redundant components or software that directs one processor to assume the work of a faulty processor. Fault-tolerant systems are most often used in applications that require on-line, real-time transaction processing, such as banking.

Traditional computer manufacturers have not built fault-tolerant machines because of incompatibility with their existing product line. In addition, uncertainty exists as to whether users can justify the cost of the fail-safe features of a fault-tolerant system.

Many long-standing minicomputer vendors are keeping a watchful eye on the fault-tolerant market and admit it is a technology that users will soon request. In February an agreement was announced that IBM would buy an unspecified number of fault-tolerant computers from Stratus Computer Inc., Marlborough, Mass.

Without public comment from IBM, the agreement has analysts predicting that the computer giant will build a machine based on the Stratus system and offer it to its large customers who are either considering—or demanding—the benefits of fault-tolerant technology. □

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

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# 250 Reasons Why You're Probably Using the Wrong Products to Clean Your Computer

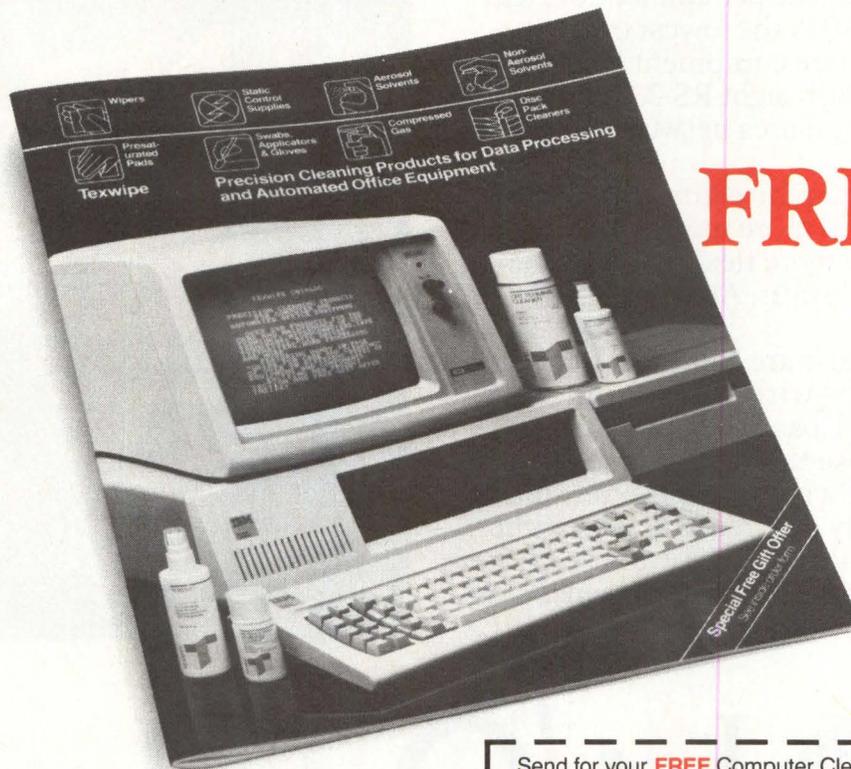
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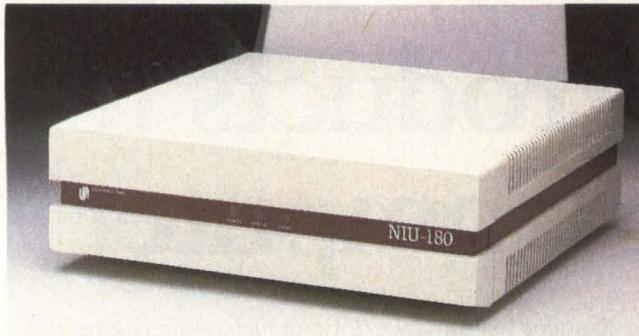
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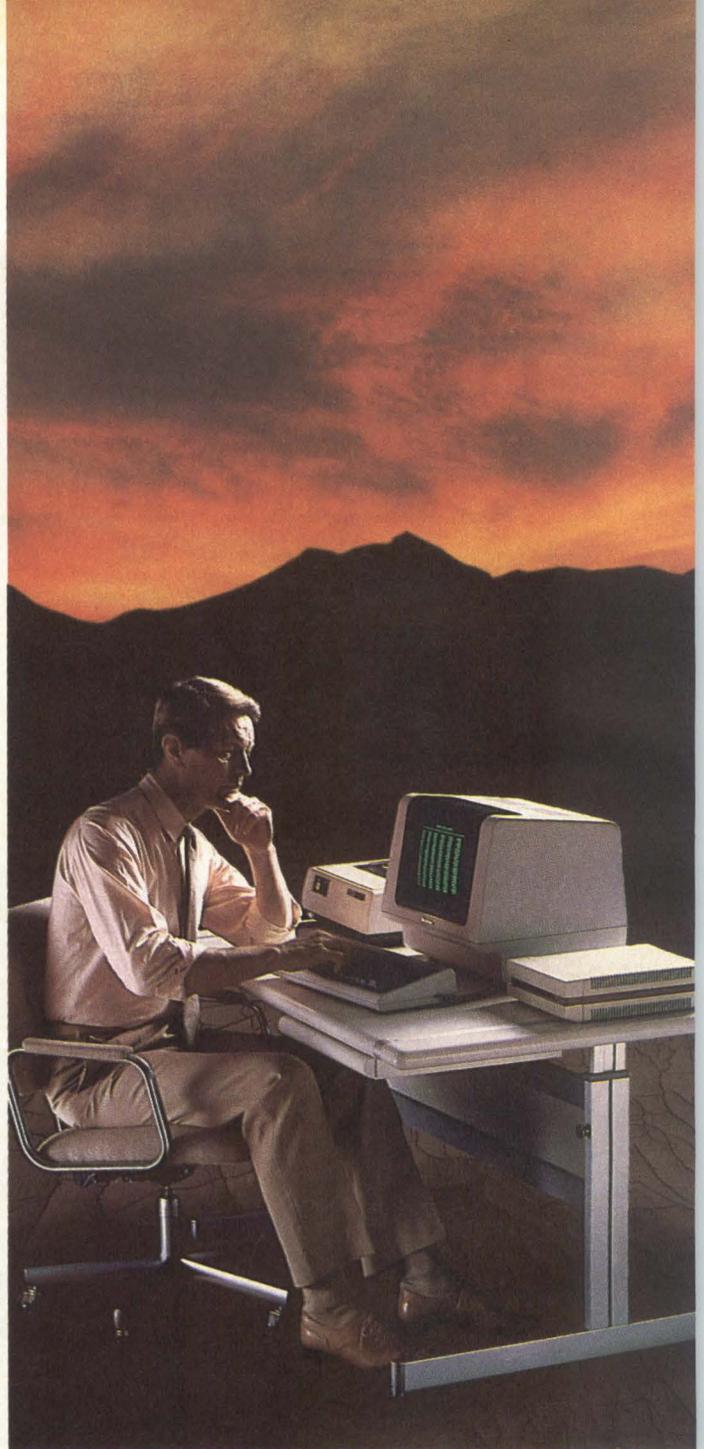
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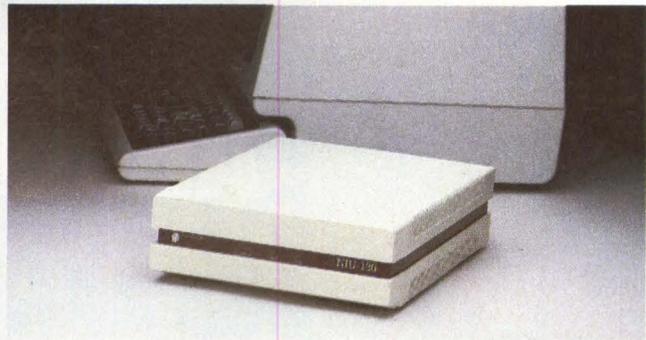
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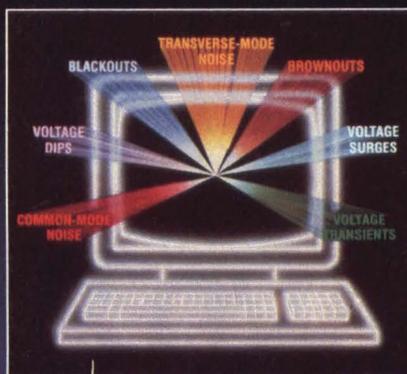


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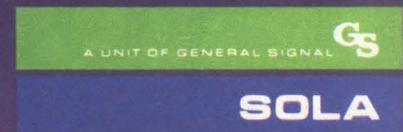
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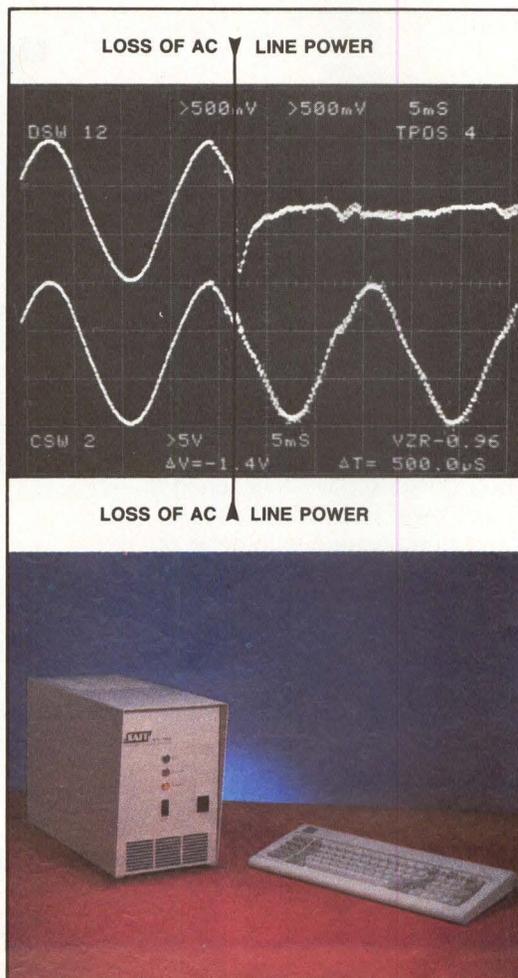
Surmounting price, size and noise barriers, uninterruptible power systems are increasingly protecting microcomputers from catastrophic data loss and equipment damage

**Jesse Victor**, Associate Editor

Uninterruptible power systems (UPSes) protect sensitive electronic equipment from high-voltage spikes, surges, sags, brownouts, blackouts and other power disturbances that can destroy data and damage equipment. Although widely used for mainframe computer systems and private branch exchanges, UPSes have been slow to penetrate minicomputer and microcomputer applications. System integrators and end users have been turned off by these units' reputation as expensive, bulky, noisy devices that sometimes require special rooms for battery storage. That attitude is now changing as a new generation of smaller, less expensive, lighter and quieter systems is bringing data and equipment protection to microcomputer and minicomputer systems. Debate continues, however, over response time and, in some cases, the square-wave outputs of the less expensive standby UPSes.

A score of manufacturers offer UPSes for less than \$1,500 that can sit on or beside a desk and have a noise rating more typical of a printer than of the "monsters" that formerly were the norm in power-protection equipment. For example, the Cuesta Systems Inc. \$695 Model 40012060 weighs just 20 pounds, measures 11 by 13 by 2 inches and provides protection for 400-VA computer systems. The standby unit transfers operations from the utility AC power line to internal battery power within 2 to 10 msec after a power failure.

For tougher requirements, Sola Electric offers



**Transferring from interrupted AC line power** (shown in top trace) to backup battery power in less than 0.5 msec, SAFT America's 1K-VA SPS-1000 standby power system produces a voltage-regulated and current-limited sine-wave output (bottom trace) to support the load when a power failure occurs.

compact standby units with 400- to 1.2K-VA ratings as well as more expensive on-line units over a 750- to 1.2K-VA range. The 15-by-7-by-18½-inch SPS 800 A, for example, switches in 4 to 10 msec when the line voltage drops by 15 percent and provides power from its internal, sealed lead-acid battery for 12 minutes at full load and 30 minutes at half load. The \$983 800-VA unit, in contrast to many standby UPSes, which produce a square-wave output, furnishes a sine wave with less than 5 percent total harmonic distortion (THD). The new Mini-UPS line of 400- or 750-VA on-line devices protect against overvoltages and undervoltages, line transients and noise. They supply sine-wave output regulated to within ±3 percent of nominal through variations from +10 percent to -15 percent.

Despite the obvious benefits of these and higher VA-rating UPSes, system integrators and end users have been reluctant to use them. A recent survey by Frost & Sullivan Inc., New York, estimates that fewer than 3 percent of microcomputer and minicomputer systems are

protected by UPSes.

Cost has been a major barrier to widespread UPS usage. Until now, UPSes have been too expensive, contends Tony Materna, single-phase UPS program manager at Emerson Electric Co. "We had to get the price down [for our models] to a threshold below which a buyer could justify that kind of cost. A typical 10K-VA minicomputer system with disk drive and a printer or two represents a capital investment of \$35,000 to \$50,000. Historically, a 10K-VA UPS would cost \$20,000 to \$22,000—about 30 percent to 40 percent of the capital cost of the equipment. A lot of people still think of it that way."

"Many users aren't aware that such products exist," maintains Kevin J. McGowan, marketing manager, power conditioning/UPS, at Sola Electric. "OEMs and manufacturers are hesitant about telling a buyer of a \$3,000 computer that he has to go out and spend \$2,000 or so for a UPS."

However, "More and more system users are using UPSes every day," emphasizes Richard

System integrators' and end users' reluctance to use uninterruptible power systems (UPSes) may arise in part from skepticism concerning the frequency and severity of power-line disturbances. But power-disturbance studies show that blackouts and brownouts are not limited to New York's well-publicized problems and that voltage surges and sags do not occur only after severe thunderstorms.

A recent Frost & Sullivan Inc. survey of 4,500 U.S. users of business microcomputer and minicomputer systems shows an average of 5.7 spikes or transients, 4.2 overvoltage or undervoltage occurrences and 1.6 power outages a month. A landmark IBM Corp. study by George W. Allen and Donald Segall, "Monitoring of Computer Installations for Power Line Disturbances," rates oscillatory voltage disturbances due to network or load switching as the most frequently occurring U.S. power-line disturbance, with a frequency of 62.6 per month, followed by voltage spikes (50.7 per month) and undervoltages (14.4 per month).

August, not April, is "the cruelest month" for power users. Power outages, Allen and Segall note, happen at an average rate of once a month during February, April and June but peak in August at 1.5 occurrences. Only January is free of reported outages (but not of voltage dips). A total of 42 percent of the undervoltages—and the most severe—occurred during normal business hours, with 28 percent happening between 5 p.m. and 1 a.m. But operating a computer at night does not offer

### Lightning—and power disturbances—

protection: 30 percent of undervoltages occurred between 1 and 9 a.m.

"There is a tremendous variation in the disturbances recorded at the different locations," Allen and Segall conclude. "In general, city locations with their underground distribution systems and networks have relatively few severe undervoltages or outages, but have a substantially higher number of oscillatory disturbances."

Another study, the AT&T Bell Laboratories report, "The Quality of U.S. Commercial AC Power," by M. Goldstein and P. D. Speranza, finds similarly widespread, but fewer, power disturbances. Findings

#### TYPES OF AC POWER LINE DISTURBANCES

(monitored at data-processing sites over 16 months at 29 locations)  
(Allen/Segall study)

Type	Number of occurrences
Oscillatory, switching	2,831
High frequency (spikes)	1,676
Undervoltages	1,569
Overvoltages	103
Power outages	65
<b>Total</b>	<b>6,244</b>

SOURCE: IBM CORP.

Morris, product manager at Hitran Corp. "When the data-processing manager analyzes power outages and realizes that every time the computer goes down the company loses \$10,000 to \$15,000 worth of time and money, he will think it's well worth it to spend the money for a UPS."

Lost data, however, is not the only consequence of power disturbances. Scrambled data is also a powerful incentive for UPS purchases, notes Charles Weddington, vice president of sales and marketing at Control Technology Inc. "A typical end user is someday going to find the directory on his 10M-byte hard disk scrambled," he says. Weddington creates an even more frightening scenario: "If your data is scrambled and you don't know it is, you can get bad data and make business decisions based on it."

Paradoxically, the decentralization of computer power through desktop systems has hindered awareness of a need for UPSes, Materna suggests. In the minicomputer and mainframe world, he points out, a professional data pro-

cessing manager is responsible for data and aware of the problems that can develop. "Now the DP manager is really Fred, the head of accounting, even though he doesn't think of himself as DP manager," Materna stresses. But as department managers begin to realize how much it costs the company each time they lose data, sales of UPSes will rise, Materna contends.

Stewart Roberts, marketing manager at General Power Systems Inc., notes that many computer users buy UPSes after the damage is done. "Whenever there has been a severe blackout in any part of the country," he observes, "the next day we get many phone calls regarding our equipment." Frost & Sullivan reports that 58 percent of business microcomputer and mini-computer users surveyed bought power-conditioning equipment after they had experienced problems, as compared with only 42 percent who purchased the devices along with their computers. But that attitude may be changing: Users ranked UPSes at the top of the list of planned power-protection equipment purchases last year,

**strike more than once**

from 24 U.S. Bell System sites indicate that low-voltage conditions—sags plus power failures—account for 92.7 percent of reported power disturbances. Based on monitored data, the study predicts 50 percent of Bell System sites would have fewer than four power failures (one cycle or more) a year, two impulses greater than 200V peak and 25 sags (96V or less).

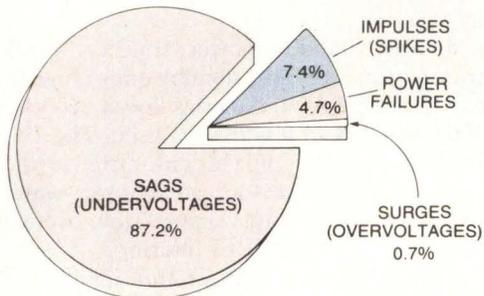
Surprisingly, more sags than impulses are recorded during electrical storms, according to the study. Impulse-suppression equipment in the

power-distribution system, Goldstein and Speranza point out, protects by momentarily shorting the power line, producing sags. Although 50 percent of the sags are probably caused by external weather conditions, the other half are produced by transient-causing loads, such as compressor motors, or by system faults, which cause circuit breakers to trip. The generally lower incidence of power disturbances in the Bell System study than in some others might be due to the possibility that the Bell System has "made a greater effort to ensure dependable power than the average micro/minicomputer user," Frost & Sullivan suggests.

A U.S. Department of Commerce study observes: "Regardless of the location of a computer site in the country, the number of high-speed fluctuations in utility line voltages is virtually constant. In some cases, average daily fluctuation rates range from five to 10 dips or surges greater than equipment-design limits."

Nothing in these studies suggests that the quality or reliability of U.S. electrical power will improve over the next few years. To the contrary, "the indicated continuing decline in power quality," due in part to an increasingly complex distribution system, Frost & Sullivan predicts, can only "increase the utilization of uninterruptible alternate sources." Ironically, electric utilities, Frost & Sullivan notes, are a "major user of power-conditioning and/or UPS equipment. Some utilities have UPS equipment for every computer."

**AC POWER LINE DISTURBANCES AT BELL SYSTEM SITES**  
(GOLDSTEIN/SPERANZA STUDY)



SOURCE: AT&T BELL LABS

Frost & Sullivan says.

System integrators and end users specifying UPSes are finding that today's devices have much more to offer than just reduced size and cost. Increasingly sophisticated features and capabilities are making it easier to integrate UPSes and tailor them to a specific application. Consider some key points of these backup power systems:

- **Programmable-output waveform.** RTE Deltec Corp.'s 7000 Series on-line UPSes allow system integrators to adjust the output waveform for applications requiring more power at various points on the wave other than the leading or trailing edge.
- **Fast transient response and low output impedance,** such as in General Power Systems' on-line units. "The faster you can regulate [the output]," explains Jim Edman, director of engineering and program management, "the less the output voltage will dip and hence be modulated by events at the load. Turning on a disk drive with a stalled motor produces a large transient load. With low output impedance and a fast regulator, your output will not deviate much from the mean when that happens."
- **Slow slew rate with adjustable frequency synchronization,** such as in Elgar Corp.'s 10K-VA UPS 103-3B and 15K-VA UPS 153-3B

and the RTE Deltec 6000 Series. These features help eliminate damage to disk drives from abrupt frequency shifts, claims Deltec's Dick Mason, manager of distributor sales. The inverter in the Deltec units can thus be set to phase lock to the bypass input line over a range of  $\pm 0.5$ , 1 or 1.5 Hz. Slow slew-rate capability aids in matching phase with an external engine generator when the generator is used to extend a UPS' backup time.

- **Low noise.** Although not a major consideration when UPSes were relegated to separate rooms, the hum generated by backup power systems could be a problem for the smaller units now moving into office environments next to the computers they support. Many UPSes, however, now have noise levels comparable to office printers. Low-noise units include Clary Corp.'s UPSjr 750- to 2.5K-VA on-line units, which are rated at less than 55 dB(a) at 5 feet, and Computer Power Inc.'s Defender 400 VA UPSes with 40 dB(a) maximum noise at 6 feet. The Clary UPSes use ultra-isolating magnetic techniques and linear bipolar transistors instead of silicon-controlled rectifiers (SCRs) to cut common- and transverse-mode noise, emphasizes general manager James Rohleen.

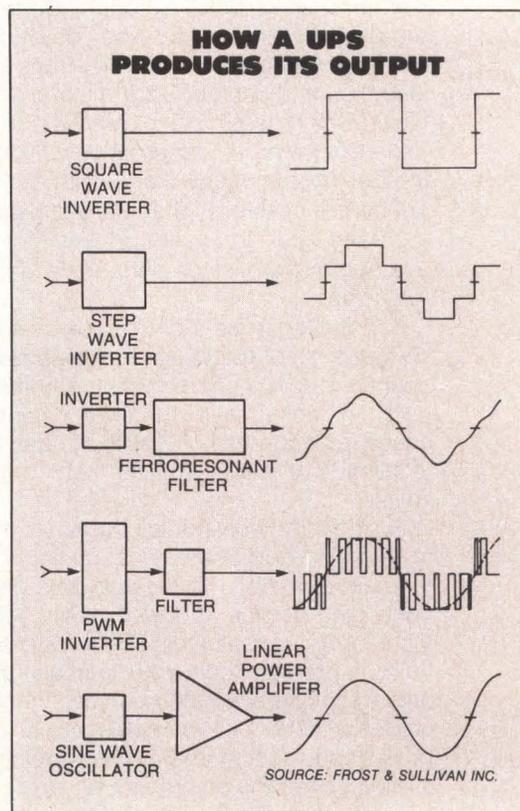
- **Redundant circuits.** International Power Machines Corp.'s Endless Power (EP) UPSes employ redundant power transistors mounted on plug-in boards. A failure on one of the cards will not affect inverter output, according to the company. The 32K- to 80K-VA units have a mean time between failure of 5.6 years.

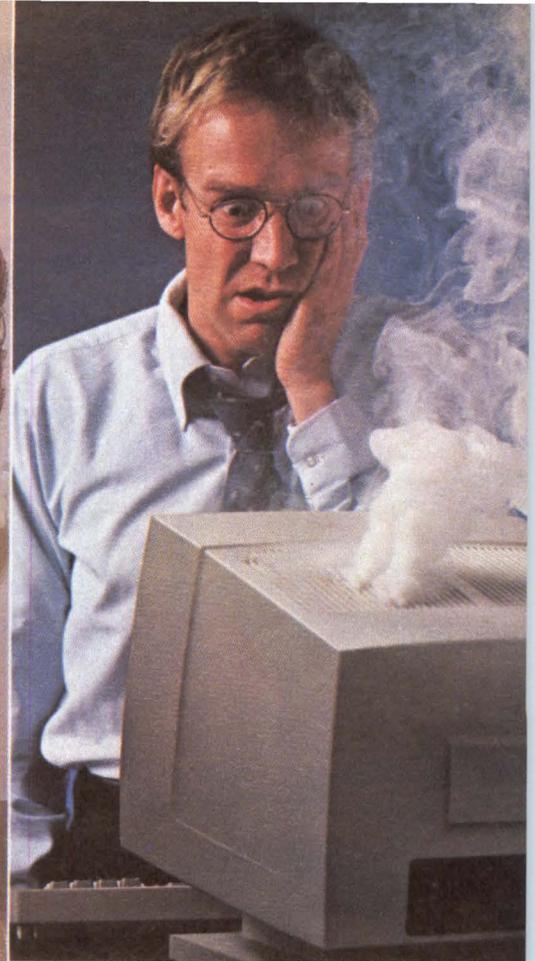
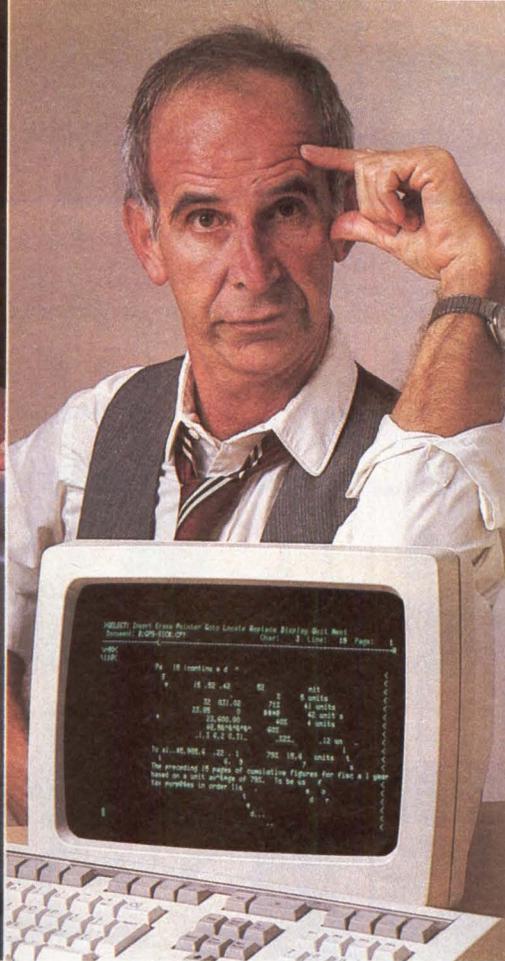
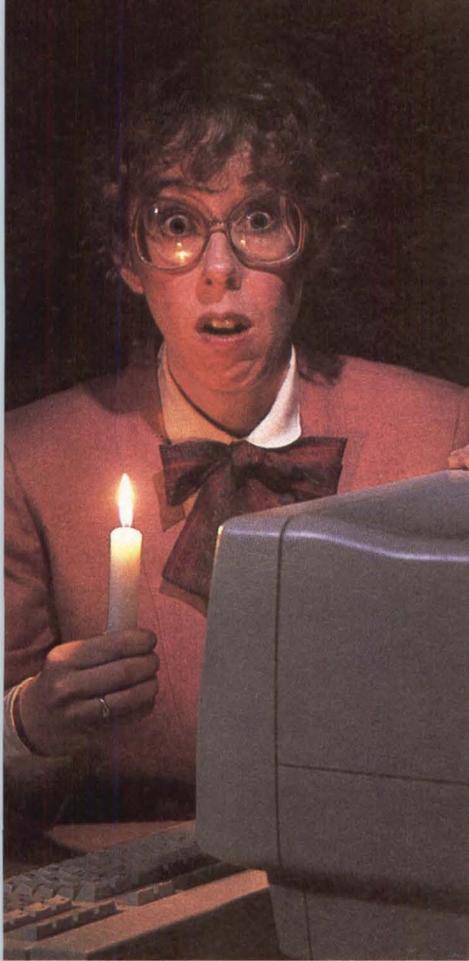
- **Tight output regulation.** Although 5 percent regulation is the norm and 3 percent not uncommon, Behlman Engineering Corp.'s 100-VA to 18K-VA UPSes employ linear power amplifiers in their inverters to achieve low electromagnetic interference (EMI) and radio-frequency interference (RFI) and 1 percent line- and load-voltage regulation. The units handle load power factors from zero to one, leading or lagging, without output degradation, the company says.

- **Fast standby power transfer.** Although transfer times of most standby units range from 4 to 12 msec, SAFT America Inc.'s 1K-VA SPS-1000 switches in less than 1 msec. The 19-by-8-by-13-inch unit is line-synchronized to the AC power line, produces a regulated sine-wave output and furnishes surge suppression, overcurrent protection and EMI/RFI filtering.

The SPS-1000's transfer time and sine-wave output are at the heart of the controversy surrounding standby UPSes. How quickly must standby units switch from interrupted AC line power to backup battery power to ensure unin-

**Inverter design determines** the type of output a UPS generates. Square-wave, or rectangular, outputs are common in lower-cost standby systems. Pulse-width modulation (PWM) outputs closely approximate the true sine-wave output of linear-power amplifier designs.





**A.** Once you're in the dark?

**B.** During a total memory loss?

**C.** After the smoke clears?

# When is the right time to buy a UPS?

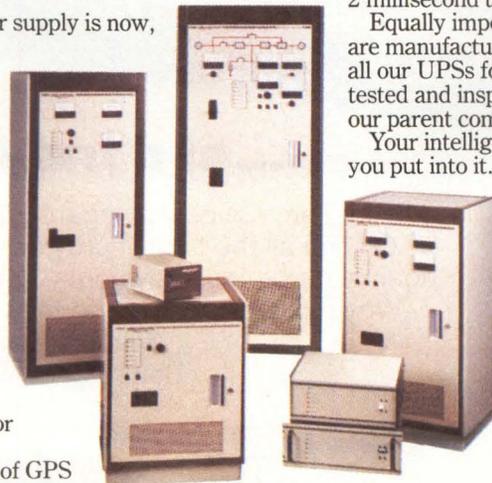
## **D. None of the above.**

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

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

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errupted computer operation? Can the square-wave outputs of many standby UPSes damage disk drive systems?

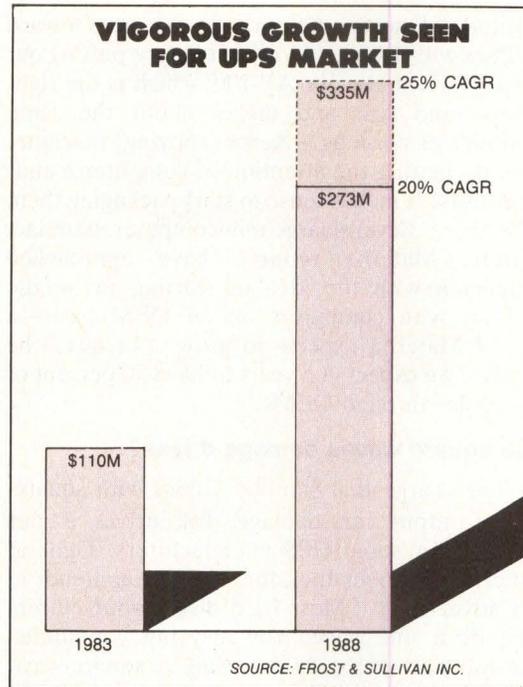
Not unsurprisingly, manufacturers that offer on-line systems tend to be negative about standby UPSes. Hitran's Morris comes down solidly in favor of on-line devices: "When that most critical period of time happens—a power failure—a switchover time is involved [with standby devices]. At this critical time, you really want to be there [with power]. A standby unit may or may not be fast enough." Sola's McGowan however, stresses that users should not forsake standby UPSes' advantages, such as lower cost and smaller size, solely on the basis of their transfer time. The important question, in McGowan's view, is whether the equipment supported by the power source will tolerate the transfer time.

Other analysts agree that the crucial question for or against a standby UPS is the adequacy of its transfer time. General Power's Edman argues that because on-line units tend to cost about 45 percent more than standby systems, there is no real need to spend the money on an on-line system, provided the computer can tolerate the milliseconds' interruption in power the transfer involves.

"We did a lot of testing and decided to develop a 2-msec switching time for our standby UPSes," Edman says. "There are some small computers that can't tolerate the 5 msec to 10 msec, which seem to be standard in the UPS market. Some computers, if their power is interrupted for, say, beyond 3 msec, sense this as a power failure, or their logic systems give up and they lose memory or just don't function properly."

Some computers can't even tolerate a 4-msec delay, points out Stanley A. Smith Jr., sales manager at Computer Power Inc. "It depends on the personal computer's power supply. In many cases microcomputers and minis with hard disks have a tough time handling a 4- to 6-msec transfer time. But it's very hard to generalize."

Control Technology's Weddington acknowledges that the company's 5-msec UPS had a problem in switching fast enough to support the IBM Corp. PC/XT microcomputer. "Fifty percent of the time it didn't switch fast enough," he explains. "The IBM [XT computer] had a defective power supply. Thousands of XTs do. They are supposed to send a 'power-not-good' signal to the CPU after a power outage of about 23 msec. But many of them are out of spec and give a power-outage signal at 2 or 3 msec." Weddington adds: "The only equipment we have ever encountered switchover time complaints



**Spurred by strong sales of smaller (less than 10K-VA) UPSes for burgeoning microcomputer and minicomputer applications, the UPS market will expand at a 20 percent to 25 percent compound annual growth rate (CAGR) through 1988.**

with is the IBM PC/XT. And every one of those, as far as we could determine, had a defective power supply."

Control Technology's new B Series UPSes, Weddington says, switch at less than 4 msec, typically in 2 msec, with "no reported problems with switchover time." A \$95 "zero-switch" option is available for the B Series, Weddington adds, that enables it to transfer in about 400 to 500  $\mu$ sec.

Materna notes that Emerson wanted to demonstrate both the effectiveness and the necessity of their UPSes, as well as the need for UPSes in general. They planned to do this by setting up a demonstration in which one minicomputer would be plugged directly into a wall outlet, the other into a UPS—and the plug pulled on both of them. The minicomputer manufacturer reacted rather strongly to this proposed power-interruption test, Materna reports. "They said, 'You want us to do what? Pull the plug while the machine is running? We can't let you do that. It would damage the hardware and blow the SCRs.'"

"We've been afraid for some time that a computer manufacturer like IBM would get into the UPS business," Materna observes. "But they don't want to because it would be perceived by the customer as a liability to say their machine doesn't work on normal utility power unless you buy this piece of equipment [a UPS], so they never bring it up."

Materna thinks, however, that the standoff

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**American UPS companies that underestimate the Japanese do so at their own risk, one expert warns.**

---

attitude of most computer manufacturers toward UPSes will change. "Now that we are putting out small UPSes like our AP-100, which is the right shape and cost and makes about the same amount of noise as a Xerox [copying] machine, we are getting the attention of computer manufacturers. It makes sense to start packaging them together." Several large minicomputer manufacturers, Materna reports, have approached Emerson with the idea of starting to bundle UPSes with computers on an OEM basis—a trend Materna expects to grow. "In fact," he adds, "we expect in 5 years to have 50 percent of our sales through OEMs."

#### **Do square waves damage drives?**

The charge that standby UPSes with square-wave output can damage disk drives is put forward by some UPS manufacturers. General Interface Systems Inc., for example, contends in its advertising: "Most hard disk manufacturers require a sine wave. You may put your units' warranty in jeopardy by using a square-wave unit...because disk drive motors get their timing from the peak of the sine wave....The lack of a peak or square-wave units can allow excessive energy, e.g., heat, through a drive motor, causing motor failure." Sola's McGowan agrees in principle: "A square-wave output is detrimental to various pieces of equipment, among them disk drives and anything that has motors."

Control Technology's Weddington, however, is skeptical of a sweeping claim that all square-wave outputs damage disk drives. "As a generality, it is highly inaccurate," he says. Weddington holds that any UPS output, sine wave or rectangular, that is not well-regulated can cause damage. The company's RBS-AC square-wave-output standby UPSes avoid potential problems, he says, with 1 percent output regulation (no load to full load) and a harmonic-limited rectangular waveform.

A rectangular waveform has more area under it compared with a sine wave and thus delivers more current, Weddington explains. "With some UPSes you may over-drive because you are not adjusting your root-mean-square [rms] power. We use a pulse-width-modulated output, so we put out the same rms power level as a sine wave." A Fourier analysis of any square wave, Weddington says, "will show that the top part, which looks flat, contains a lot of harmonics. Some can be high in frequency and fairly high in peak voltage. We damp out the harmonics. There is no chance that our product could damage anybody's hardware."

Although the debate over square-wave output continues, many standby UPS manufacturers,

including Topaz Inc., Sola Electric, Computer Power and SAFT America, have opted for sine-wave output.

Topaz's compact Powermaker, 400- to 1K-VA Micro UPS, for example, produces a sine wave with 5 percent maximum THD and furnishes backup times to 35 minutes at full load and 75 minutes at half load. Another compact system, Sola Electric's 400- or 800-VA Standby Power Source provides 3 percent regulation. Its sealed, lead-acid battery affords 12 minutes of reserve at full load, 30 minutes at half load.

Most industry observers see a bright future for standby UPSes, despite the controversy surrounding some of their operating characteristics. Weddington points out that standby units are typically half the size of on-line devices, sell for one-third to one-half their price and can easily be moved. And in today's office environment, where space is at a premium, standby systems' relatively small size assumes added importance.

Future UPSes, standby or on-line, says Computer Power's Smith, will follow standby units' lead in adapting to decentralized microcomputers in tomorrow's office environments. "Instead of having a mainframe with one large UPS, there may be 15 or 30 micros, each with its own UPS."

Further major UPS size reductions, though, Smith says, will depend on advances in battery technology. "The number and size of its batteries control the size of a UPS. But power technology has not basically changed for a hundred years. Change will be slow."

UPS prices will drop over the next few years, Emerson's Materna forecasts, as volume production reduces manufacturing costs. "This year you will see a 30 percent reduction in cost per KVA over last year," he stresses.

Although American UPS manufacturers have had little to worry about from foreign competition, Materna expects the battle for market share to heat up as overseas companies enter the arena. "There is a fair amount of foreign competition that's about to enter the field," he warns. "Up to now, the domestic market has been fairly safe. But the Japanese, the French and, possibly, the West Germans are starting to make a showing. Last year, there were only two Japanese companies to worry about. Now there are five."

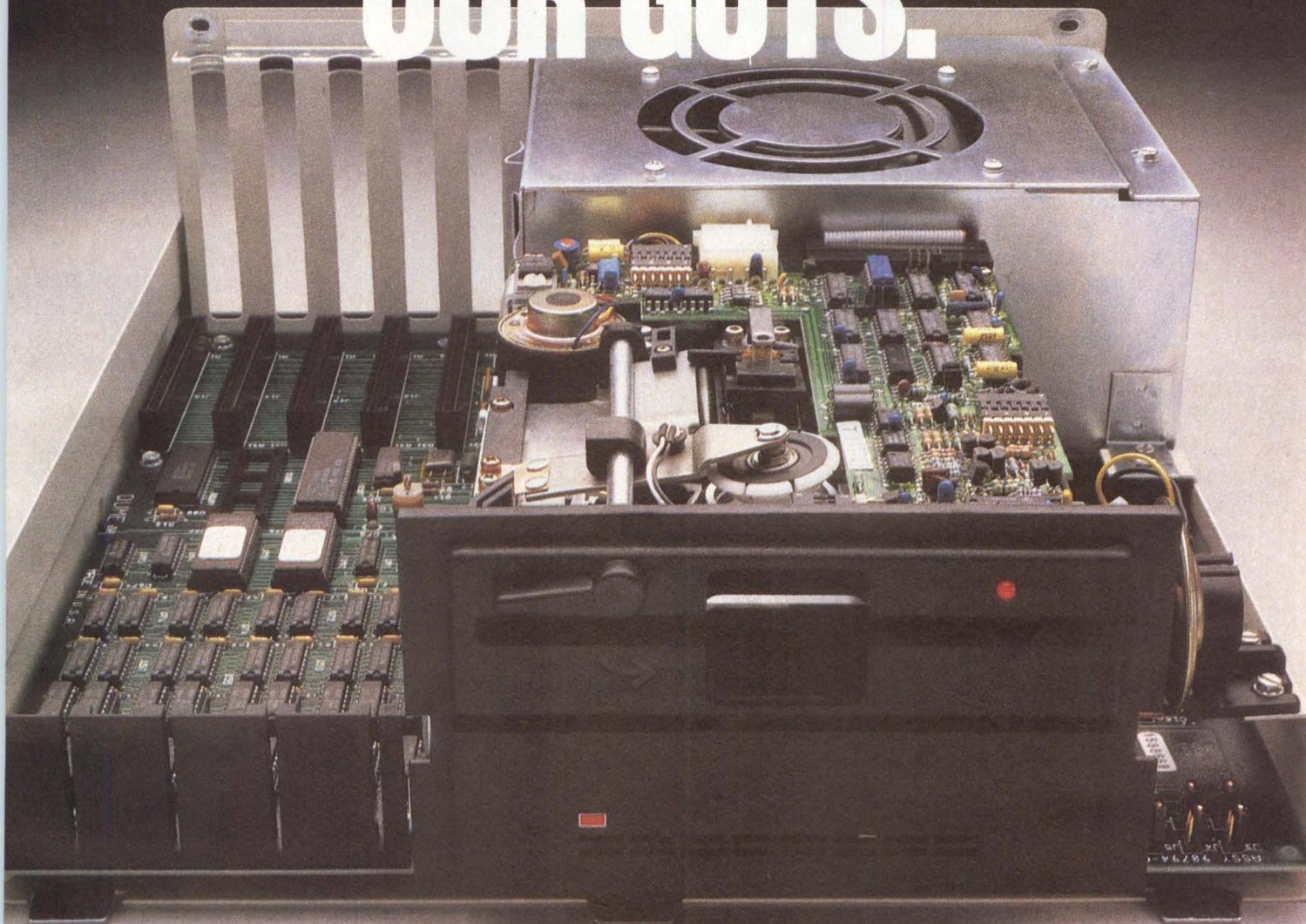
American UPS companies that underestimate the Japanese do so at their own risk, Materna cautions. "Everyone else who has ignored them," he says, "has ended up unemployed." □

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**Interest Quotient (Circle One)**  
**High 465 Medium 466 Low 467**

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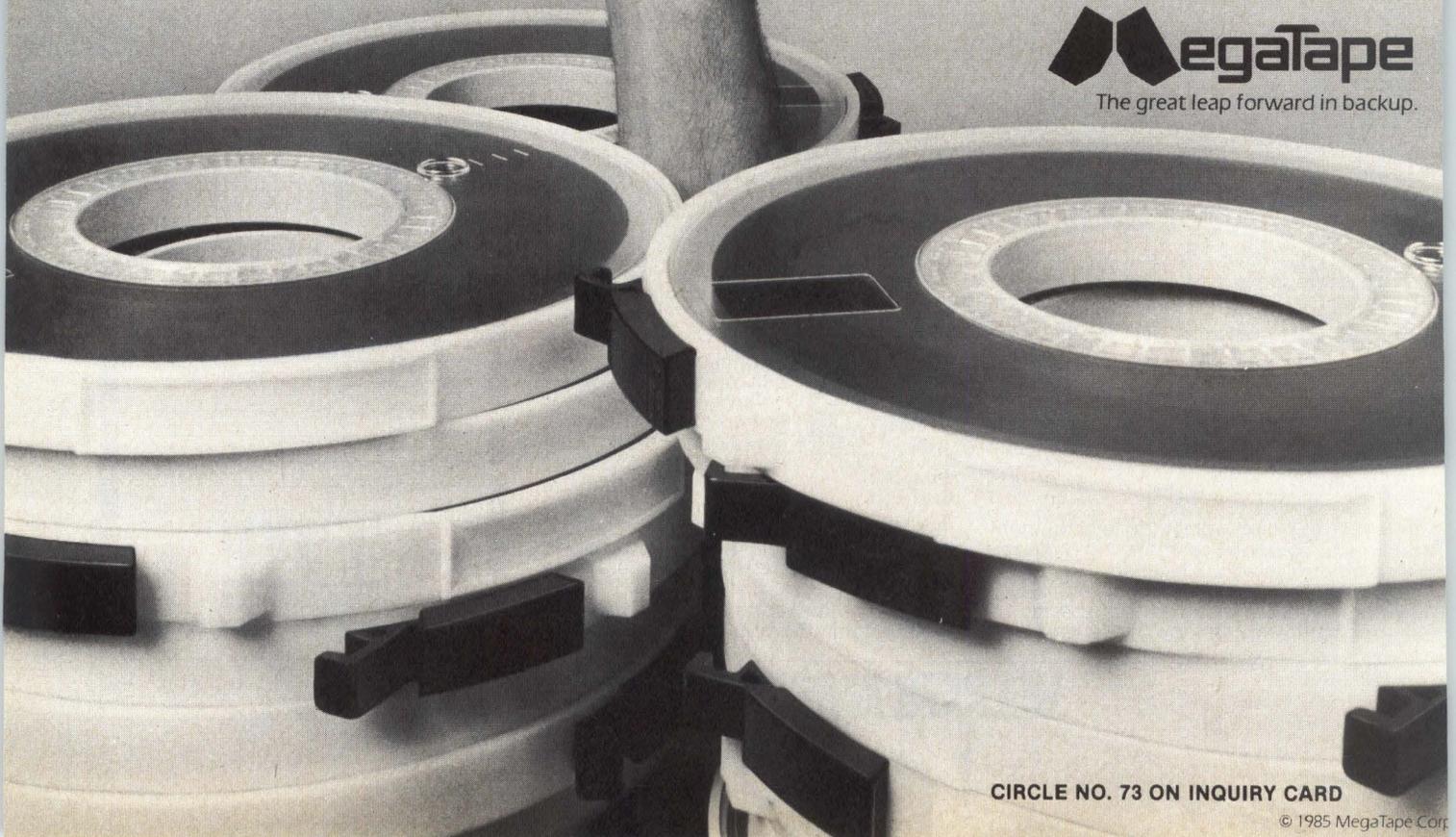


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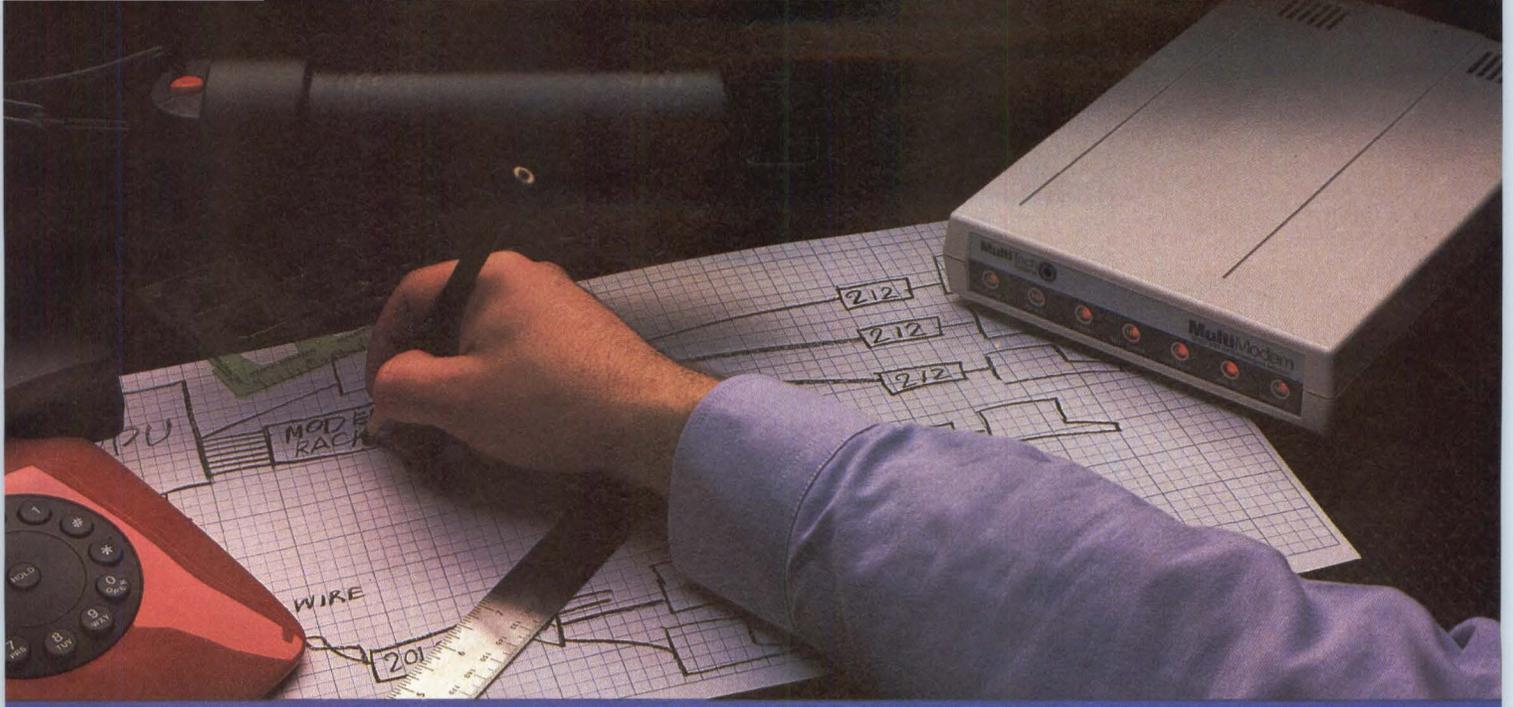
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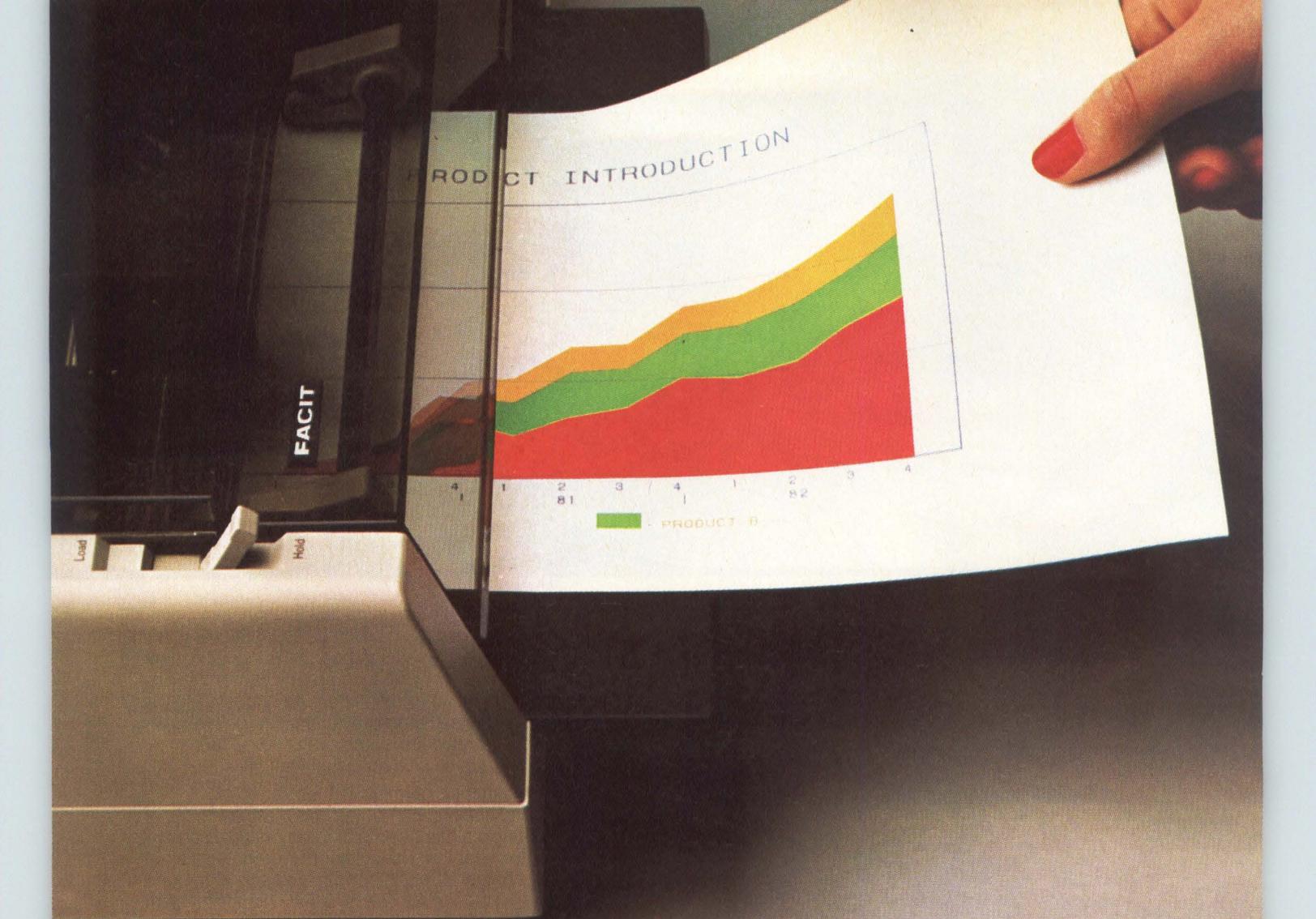
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## PRODUCT INTRODUCTION

PRODUCT B

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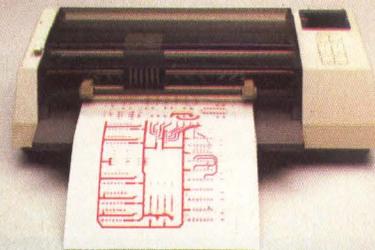
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# UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD/inches)	Weight (lbs.)	Price (\$)
<b>ABACUS CONTROLS INC.</b>									
80 Readington Road Somerville, N.J. 08876 (201) 526-6010 Circle 382	639-4	on-line solid state	30	120, 208	111	4 wire + GND	63 x 48 x 30 (cabinet)	2,260	
	914-4/10	on-line solid state	10	120, 208	35	2 wire + GND 4 wire + GND	44 x 30 x 61 (cabinet)	1,620	
	918-4	on-line solid state	1.6	120, 208	5	4 wire + GND	19 x 20 x 33 (rack)	255	
	919-4	on-line solid state	10	120, 208	35	2 wire + GND 4 wire + GND	55 x 30 x 61 (cabinet)	1,470	
	923-4	on-line solid state	2	120	21	2 wire + GND	19 x 20 x 30 (rack)	310	
	938-4	on-line solid state	3	120, 208	10	4 wire + GND	22 x 30 x 61 (cabinet)	420	
	963-4	on-line solid state	6	120	63	2 wire + GND	22 x 30 x 70 (cabinet)	1,075	
	968-4	on-line solid state	6	120, 208	21	4 wire + GND	22 x 30 x 79 (cabinet)	925	
	978-4	on-line solid state	7.5	120, 208	26	4 wire + GND	44 x 30 x 61 (cabinet)	1,130	
	983-4	on-line solid state	8	120, 208	28	2 wire + GND 4 wire + GND	44 x 30 x 61 (cabinet)	1,120	
	6158-4	on-line solid state	15	120, 208	55	4 wire + GND	63 x 22 x 30 (cabinet)	1,110	
<b>ATLAS ENERGY SYSTEMS</b>									
16872 Milliken Ave. Irvine, Calif 92714 (714) 863-0900 Circle 415	RP66010	on-line rotary motor	10	208, 408		3 wire + GND 4 wire + GND			
	RP66020	on-line rotary motor	20	208, 480		3 wire + GND 4 wire + GND			
	RP66030		30	208, 480		3 wire + GND 4 wire + GND			
	RP66050	on-line rotary motor	50	208, 480		3 wire + GND 4 wire + GND			
	RP66080	on-line rotary motor	80	208, 480		4 wire + GND			
	RP66100	on-line rotary motor	100	208, 480		4 wire + GND			
<b>BEAVER ELECTRONIC LABORATORY</b>									
P.O. Box 202 Kingston, Mass. 02364 (617) 585-5666 Circle 416	BBU-912	on-line direct current	.1	115, 230	6		5.25 x 19 x 19 (rack)	28	1,395
<b>BEHLMAN ENGINEERING CORP.</b>									
1142 Mark Ave. Carpinteria, Calif. 93013 (805) 684-8311 Circle 417	UPS-Single Phase	on-line solid state	1-7.5	90, 115, 120, 208, 220, 480, 600	2-125	2 wire + GND			1,750
	UPS-Three Phase	on-line solid state	3-20	90, 115, 120, 208, 220, 480, 600	17-110	3 wire + GND 4 wire + GND			9,925
<b>BEST POWER TECHNOLOGY INC.</b>									
P.O. Box 280 Necedah, Wisc. 54646 (800) 356-5794 Circle 383	F1-5	on-line solid state	1	120		2 wire + GND	30 x 23.25 x 18 (cabinet)	270	3,500
	F2-5	on-line solid state	2	120		2 wire + GND	30 x 23.25 x 18 (cabinet)	290	4,300
	F3-5	on-line solid state	3	120, 208, 240		2 wire + GND	30 x 23.25 x 18 (cabinet)	330	5,100
	F5-5	on-line solid state	5	208, 240		2 wire + GND	50.5 x 23.25 x 18 (cabinet)	420	7,950

## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD inches)	Weight (lbs.)	Price (\$)
	F7.5-5	on-line solid state	7.5	208, 240		2 wire + GND	50.5 x 23.25 x 18 (cabinet)	520	10,300
	F10-5	on-line solid state	10	208, 240		2 wire + GND	50.5 x 20.25 x 18 (cabinet)	590	12,875
	F15-5	on-line solid state	15	208, 240		2 wire + GND	50.5 x 47 x 18 (cabinet)	860	15,500
	Micro-250	on-line solid state	.25	120		2 wire + GND	17 x 8.75 x 20 (cabinet)	90	945
	Micro-500	on-line solid state	.5	120		2 wire + GND	17 x 8.75 x 20 (cabinet)	100	1,345
	OP1000	standby (response time: 8 msec)	1	120		2 wire + GND	9.5 x 23.25 x 12 (cabinet)	136	2,625
	OP2000	standby (response time: 8 msec)	2	120		2 wire + GND	9.5 x 23.25 x 12 (cabinet)	160	3,225
	OP5000	standby (response time: 8 msec)	5	208, 240		2 wire + GND	30 x 23.25 x 12 (cabinet)	260	5,100
	OP7500	standby (response time: 8 msec)	7.5	208, 240		2 wire + GND	30 x 23.25 x 18 (cabinet)	285	6,200
	OP10000	standby (response time: 8 msec)	10	208, 240		2 wire + GND	30 x 23.25 x 18 (cabinet)	340	7,750

### CLARY CORP.

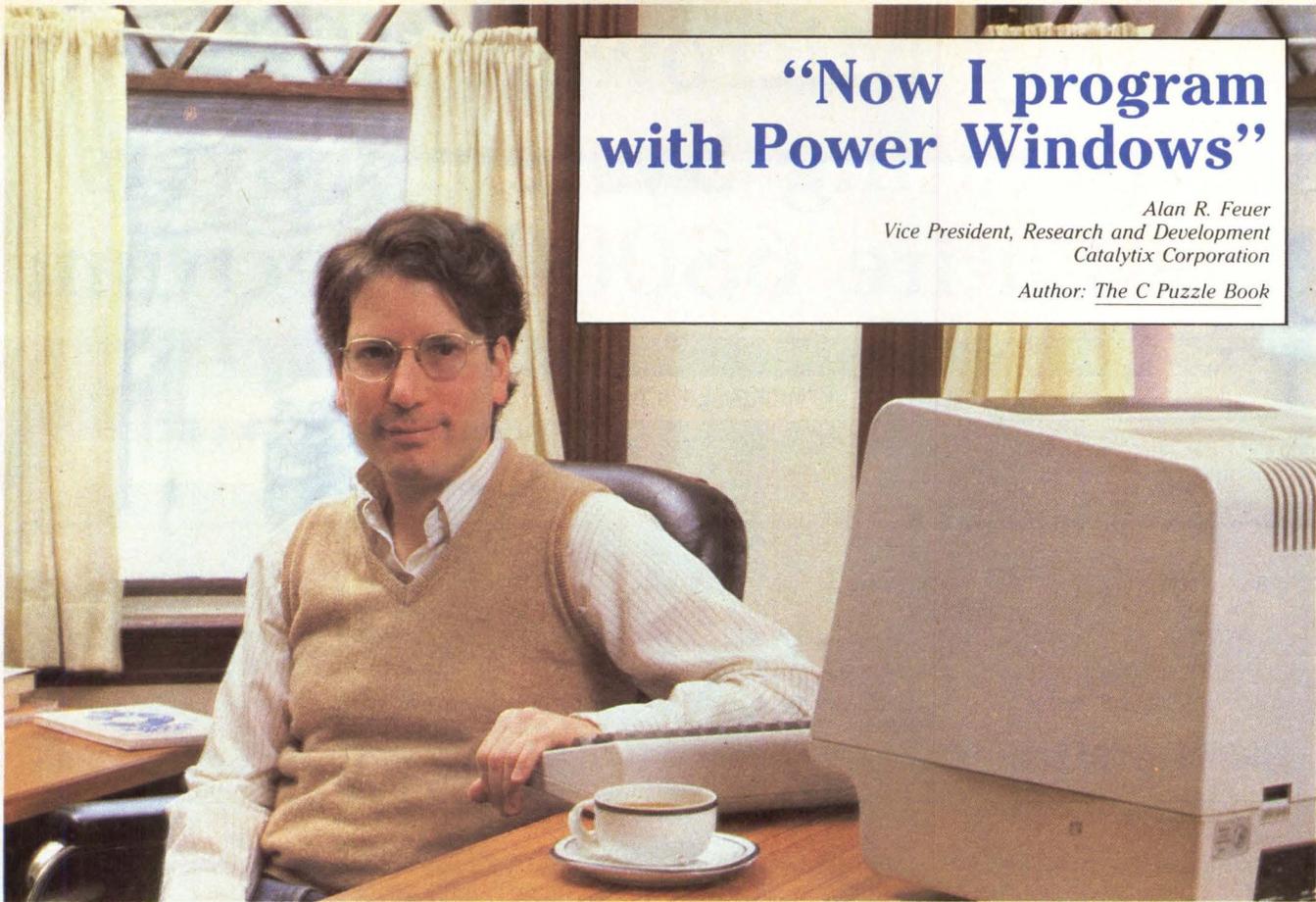
320 W. Clary Ave.  
San Gabriel, Calif. 91776  
(818) 287-6111  
**Circle 418**

UPSjr UPS1-750VA-1M-SBS	on-line solid state	.750	115	21	2 wire + GND	33.5 x 17.375 x 20 (cabinet)	340	3,995
UPSjr UPS1-1.25K-1M-SBS	on-line solid state	1.25	115	25	2 wire + GND	33.5 x 17.375 x 20 (cabinet)	340	4,395
UPSjr UPS1-2.5K-1M-SBS	on-line solid state	2.5	115	46	2 wire + GND	33.5 x 17.375 x 20 (cabinet)	490	6,495
UPS1-750VA-1A-SBS	on-line solid state	.750	115	21	2 wire + GND	17.5 x 19 x 21 (rack) 39.5 x 25.5 x 26 (cabinet)	281-309	3,450-4,300
UPS1-1.25K-1A-SBS	on-line solid state	1.25	115	25	2 wire + GND	17.5 x 19 x 21 (rack) 39.5 x 25.5 x 26 (cabinet)	281-305	3,850-4,850
UPS1-2.5K-1A-SBS	on-line solid state	2.5	115	46	2 wire + GND	17.5 x 19 x 21 (rack) 39.5 x 25.5 x 26 (cabinet)	394-418	5,910-6,760
UPS1-3.75K-1A-SBS	on-line solid state	3.75	115	72	3 wire + GND	53.5 x 25.5 x 26 (cabinet)	700	9,895
UPS1-5K-1A-SBS	on-line solid state	5	115	81	3 wire + GND	53.5 x 25.5 x 26 (cabinet)	760	10,495
UPS1-7.5K-1-SBS	solid state	7.5	115, 230			72 x 55 x 27	1,400	16,700
UPS1-10K-1-SBS	on-line solid state	10	115, 230	89	3 wire + GND	72 x 55 x 27 (cabinet)	1,500	17,490
UPS3-10K-1	on-line solid state	10	120, 208	48	4 wire + GND	72 x 55 x 27 (cabinet)	1,700	20,900
UPS3-15K-1	on-line solid state	15	120, 208	63	4 wire + GND	72 x 55 x 27 (cabinet)	1,800	24,080
UPS3-30K-1	on-line solid state	30	120, 208		4 wire + GND	72 x 68 x 27	2,400	32,000
UPS3/1-10K-SBS	on-line solid state	10	120, 208	89	4 wire + GND	72 x 55 x 27 (cabinet)	1,500	18,850

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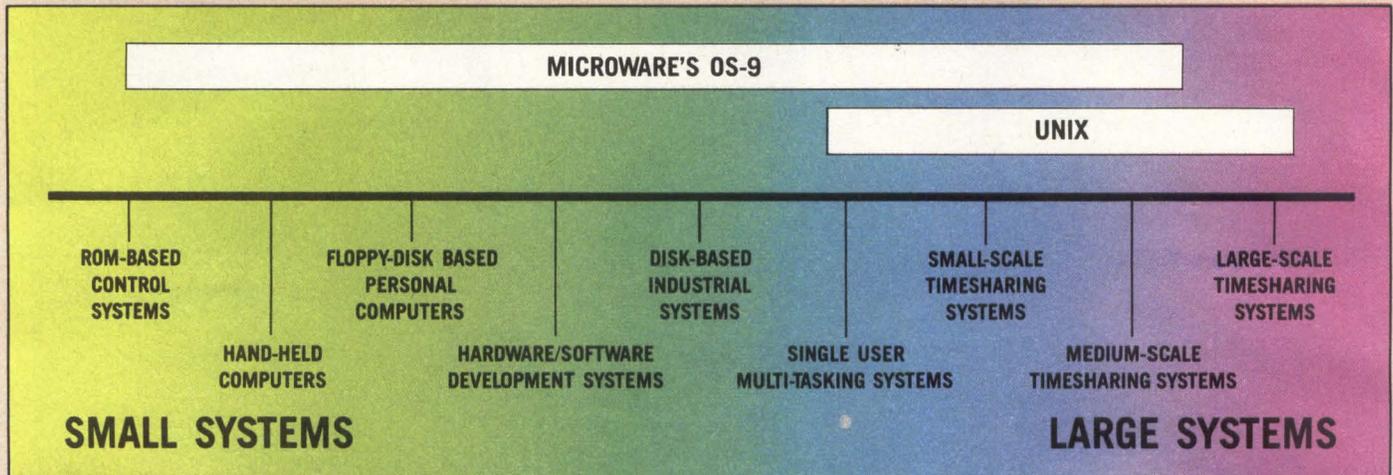
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### Key OS-9 Features At A Glance

- Compact (16K) ROMable executive written in assembly language
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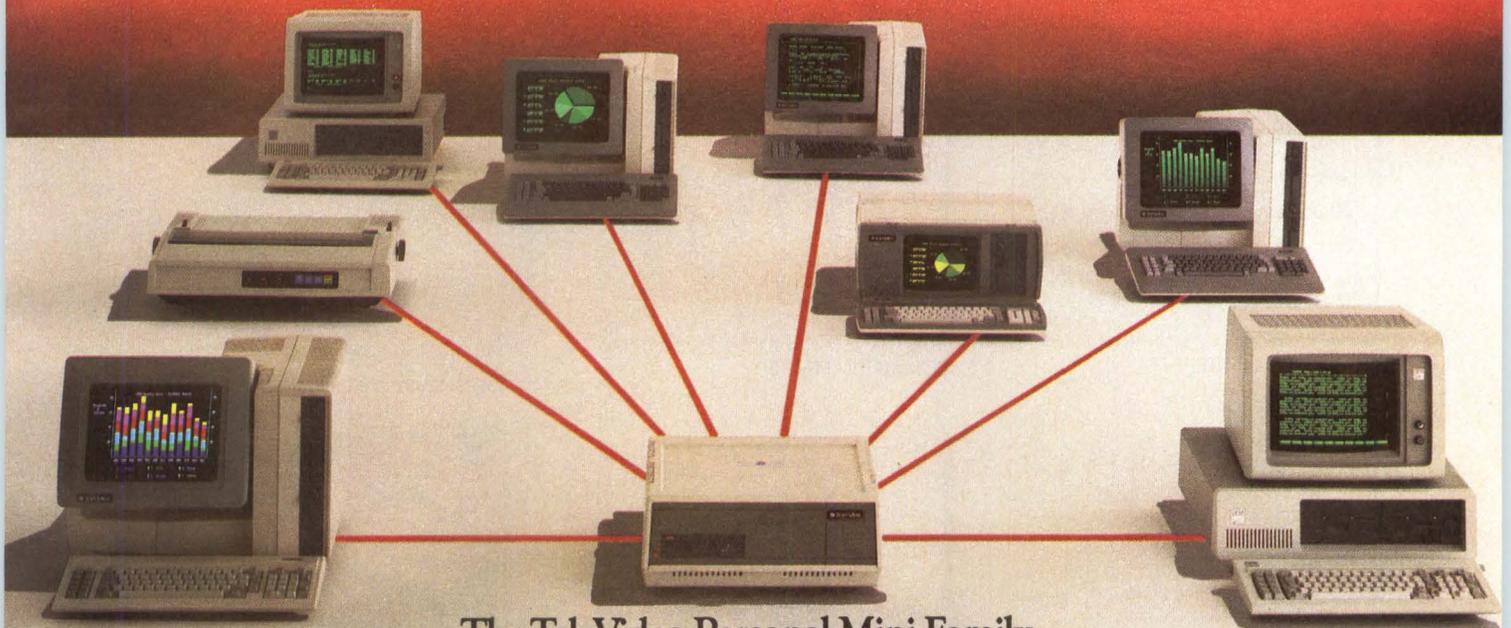
## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD inches)	Weight (lbs.)	Price (\$)
<b>COMPUTER POWER INC.</b>									
124 W. Main St. High Bridge, N.J. 08829 (201) 638-8000 Circle 419	Computersave	on-line solid state	.5-1	120	9-17	2 wire + GND 3 wire + GND	11.5 x 12.5 x 29 (cabinet)	160	1,650- 1,975
	Defender	standby (response time: 4 msec)	.4-1.2	120, 220, 230, 240		2 wire + GND 3 wire + GND	7 x 19 x 20 (rack) 7 x 16.75 x 20 (cabinet)	80-114	690- 1,195
	FTUPS	on-line solid state	.7-10	115, 120, 208, 220, 230, 240, 277, 440, 480	5-110	2 wire + GND 3 wire + GND 4 wire + GND	48.5 x 39 x 18, 60.5 x 39 x 18, 68.5 x 39 x 24 (cabinet)		4,265- 13,420
	IPS	standby (response time: 4 msec)	.5-25	115, 120, 208, 220, 230, 240, 277, 440, 480	10-130	2 wire + GND 3 wire + GND 4 wire + GND	36.5 x 39 x 10, 48.5 x 39 x 10, 68.5 x 39 x 18, 68.5 x 39 x 24 (cabinet)		2,680- 19,500
	Series-36	on-line solid state	.5-1.5	120		2 wire + GND 3 wire + GND	32 x 32 x 11 (cabinet)	280-345	1,690- 3,500
	UPS	on-line solid-state	.5-25	115, 120, 208, 220, 230, 240, 277, 440, 480	10-130	2 wire + GND 3 wire + GND 4 wire + GND	48.5 x 39 x 10, 60.5 x 35 x 18, 68.5 x 39 x 24 (cabinet)	415- 8,150	3,685- 26,310
<b>COMPUTER POWER PRODUCTS</b>									
227 E. Compton Blvd. Gardena, Calif. 90248 (213) 277-6937 Circle 420	MRU	rotary motor	12-62	208, 220, 480, 600		3 wire + GND 4 wire + GND			
	SRU	rotary motor	75- 500	208, 220, 480, 600		3 wire + GND 4 wire + GND			
<b>CONTROL TECHNOLOGY INC.</b>									
8200 N. Classen Blvd., Suite 104 Oklahoma City, Okla. 73114 (405) 840-3163 Circle 421	RBS-AC 300	standby (response time: 3 msec)	.3	115, 120, 208, 220	3.13/1	2 wire + GND	5.37 x 13.75 x 11.4 (cabinet)	31	549
	RBS-AC 500	standby (response time: 3 msec)	.5	115, 120, 208, 220	4.79	2 wire + GND	5.37 x 13.75 x 11.4 (cabinet)	41	695
	RBS-AC 600	standby (response time: 3 msec)	.6	115, 120, 208, 220	5.63	2 wire + GND	5.37 x 13.75 x 11.4 (cabinet)	41	795
	RBS-AC 1000	standby (response time: 3 msec)	1	115, 120, 208, 220	9	2 wire + GND	7.87 x 13.75 x 11.4 (cabinet)	59	995
<b>CUESTA SYSTEMS INC.</b>									
3340 Roberto Court San Luis Obispo, Calif. 93401 (805) 541-4160 Circle 422	20012060	standby (response time: 2-10 msec)	.2	115, 120	2.5	NEMA 5-15	4 x 6 x 9 (cabinet)	14	495
	20023050	standby (response time: 2-10 msec)	.2	220, 230, 240	1.5	NEMA 5-15	4 x 6 x 9 (cabinet)	14	595
	40012060	standby (response time: 2-10 msec)	.4	115, 120	5	NEMA 5-15	11 x 13 x 2 (cabinet)	20	695
	9012060	standby (response time: 2-10 msec)	.09	115, 120	1.5	NEMA 5-15	4 x 6 x 9 (cabinet)	9	350
	9023050	standby (response time: 2-10 msec)	.09	220, 230, 240	.8	NEMA 5-15	4 x 6 x 9 (cabinet)	9	395
<b>CYBERNEX INC.</b>									
7171 Industrial Park Blvd. Mentor, Ohio 44060 (216) 946-1783 Circle 423	12.5/1BB1	on-line solid state	12.5	208, 480		2 wire + GND	38 x 36.5 x 77 (cabinet)	1,500	
	15/1BB3	on-line solid state	15	208, 480		4 wire + GND	73.5 x 36.5 x 77 (cabinet)	1,600	
	18.75/1BB1	on-line solid state	18.75	208, 480		2 wire + GND	73.5 x 36.5 x 77 (cabinet)	2,000	

## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD inches)	Weight (lbs.)	Price (\$)
	30/1BB1	on-line solid state	30	208, 480		2 wire + GND	73.5 x 36.5 x 77 (cabinet)	2,400	
	30/2BB3	on-line solid state	30	208, 480		4 wire + GND	73.5 x 36.5 x 77 (cabinet)	2,000	
	50/2BB1	on-line solid state	50	208, 480		2 wire + GND	73.5 x 36.5 x 77 (cabinet)	3,200	
	50/2BB3	on-line solid state	50	208, 480		4 wire + GND	73.5 x 36.5 x 77 (cabinet)	3,200	
	75/3BB3	on-line solid state	75	208, 480		4 wire + GND	97 x 36.5 x 77 (cabinet)	4,800	
	100/3BB3	on-line solid state	100	208, 480		4 wire + GND	97 x 36.5 x 77 (cabinet)	5,200	
	120CV1-ST5	on-line solid state	1	120		2 wire + GND	32.5 x 32.25 x 23.51 (cabinet)	445	
	120CV2-ST5	on-line solid state	2	120		2 wire + GND	51.5 x 32.25 x 23.51 (cabinet)	897	
	120CV3-ST5	on-line solid state	3	120, 240		2 wire + GND	73.75 x 32.25 x 23.51 (cabinet)	1,290	
	120CV5-ST5	on-line solid state	5	208, 240		2 wire + GND	73.75 x 32.25 x 23.51 (cabinet)	1,436	
	120CV7.5-ST5	on-line solid state	7.5	208, 240		2 wire + GND	73.75 x 32.25 x 23.51 (cabinet)	1,800	
<b>DYMARC INDUSTRIES INC.</b>									
21 Governor's Court Baltimore, Md. 21207 (301) 298-9296 Circle 424	1350	standby (response time: 12 msec)	.350	120		2 wire + GND	6 x 10.75 x 12.63	32	
<b>DYNATECH COMPUTER POWER INC. (FORMERLY RKS INDUSTRIES)</b>									
4865 Scotts Valley Drive Scotts Valley, Calif. 95066 (800) 892-1342 Circle 425	DP 1350	standby (response time: 12 msec)	.35	120	4/1	2 wire + GND	6 x 10.75 x 12.62 (cabinet)	32	749
<b>ELGAR CORP.</b>									
9250 Brown Deer Road San Diego, Calif. 92121 (619) 450-0085 Circle 426	UPS 102-1B	on-line solid state	1	120	22	2 wire + GND	8.7 x 19 x 18 (rack)	100	3,300
	UPS 103-3B	on-line	10	120, 208, 440, 460, 480		3 wire + GND 4 wire + GND	78 x 41 x 31 (cabinet)	1,700	2,300
	UPS 153-3B	on-line solid state	15	120, 208, 277, 480		3 wire + GND	78 x 41 x 31 (cabinet)		26,000
	UPS 253-3B	on-line solid state	25	120, 208, 277, 480		3 wire + GND	78 x 55 x 31 (cabinet)		32,000
	UPS 302-1B	on-line solid state	3	120	60	2 wire + GND	14 x 19 x 20 (rack)	220	5,000
	SPR-350	standby (response time: 8 msec)	.35	120		2 wire + GND	5 x 10 x 14 (cabinet)	32	500
<b>EMERGENCY POWER ENGINEERING INC.</b>									
3580 Cadillac Ave. Costa Mesa, Calif. 92626 (714) 557-1636 Circle 427	System 50	on-line solid state	2-5	208, 380, 480		2 wire + GND 3 wire + GND	54 x 22 x 21 (cabinet)	500	8,000-14,000
	System 100	on-line solid state	6-20	208, 380, 480, 600		3 wire + GND 4 wire + GND	71 x 27 x 25 (cabinet)	1,000	14,000-27,000
	System 400	on-line solid state	10-25	208, 380, 480, 600		4 wire + GND	71 x 32 x 32 (cabinet)	1,600	23,000-32,000
<b>EMERSON ELECTRONIC CO. (INDUSTRIAL CONTROLS DIV.)</b>									
3300 S. Standard St. Santa Ana, Calif. 92702 (714) 545-5581 Circle 428	AP 160	on-line solid state	3	120, 240	25-50	2 wire + GND 3 wire + GND	52 x 25.6 x 18.7 (cabinet)	485	8,028
	AP 165	on-line solid state	5	120, 240	42-84	2 wire + GND 3 wire + GND	52 x 35 x 18.7 (cabinet)	730	10,086
	AP 175	on-line solid state	10	120, 240	84-168	2 wire + GND 3 wire + GND	52 x 35 x 18.7 (cabinet)	815	15,054

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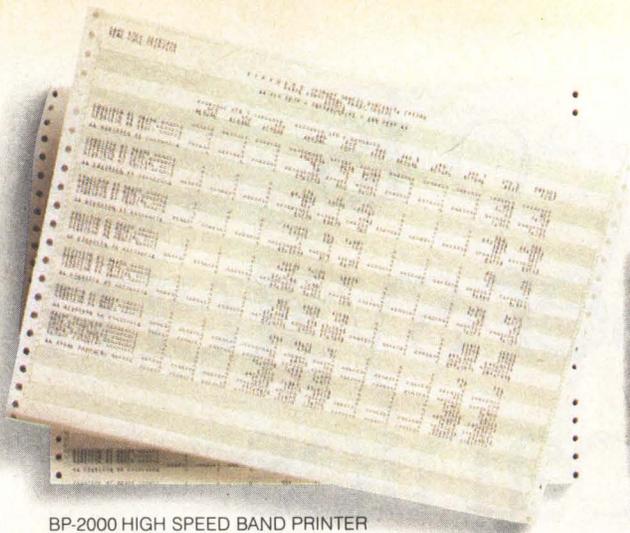
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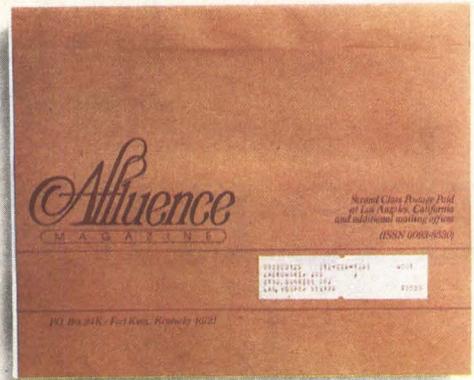
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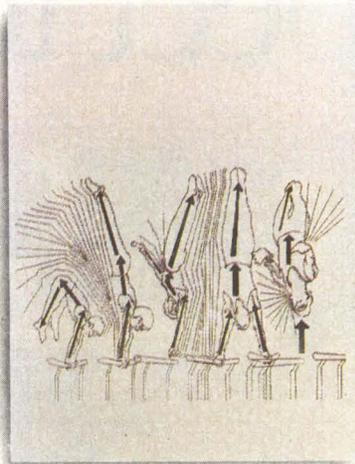
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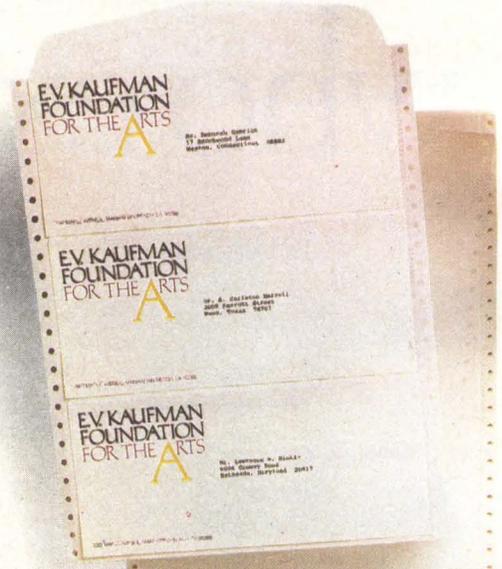
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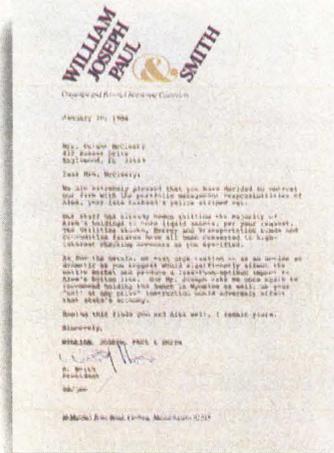
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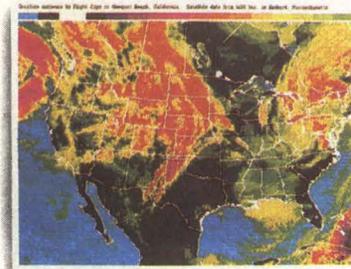
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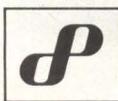
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## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD/inches)	Weight (lbs.)	Price (\$)
<b>EXIDE ELECTRONICS CORP.</b>									
3201 Spring Forest Road Raleigh, N.C. 27604 (919) 872-3020 <b>Circle 429</b>	Series 1000/1101	on-line solid state	1.5	120, 208, 240	7.5, 8.6, 15	2 wire + GND	34 x 17 x 25.6 (cabinet)	370	4,130
	Series 1000/1103	on-line solid state	3	120, 208, 240	14, 16, 28	2 wire + GND	34 x 17 x 25.6 (cabinet)	450	5,930
	Series 1000/1105	on-line solid state	5	120, 208, 240	23, 26, 46	2 wire + GND	34 x 34 x 25.6 (cabinet)	76	9,910
	Series 2000/2015	on-line solid state	18.75	208, 240, 480, 600	28, 63	3 wire + GND 4 wire + GND	72 x 77 x 30 (cabinet)	2,950	38,700
	Series 2000/2030	on-line solid state	37.5	208, 480, 600	53, 123	3 wire + GND 4 wire + GND	72 x 77 x 30 (cabinet)	4,100	49,400
	Series 2000/2045	on-line solid state	56.25	208, 480, 600	79, 181	3 wire + GND 4 wire + GND	72 x 77 x 30 (cabinet)	4,750	58,800
	Series 2000/2715	on-line solid state	18.75	208, 480, 600	28, 66	2 wire + GND 3 wire + GND	72 x 77 x 30 (cabinet)	2,950	31,100
	Series 2000/2730	on-line solid state	37.5	208, 480, 600	55, 127	2 wire + GND 3 wire + GND	72 x 77 x 30 (cabinet)	4,100	48,700
<b>GENERAL INTERFACE SYSTEMS INC.</b>									
12919 Alcosta Blvd. San Ramon, Calif. 94583 (415) 838-2683 <b>Circle 430</b>	SB 300	standby (response time: 4 msec)	.3	115	1	3 wire + GND	7 x 10.5 x 13.5 (cabinet)	37	600
	UPS 400	on-line solid state	.4	115	4	3 wire + GND	7 x 12 x 16 (cabinet)	69	1,095
	UPS 650	on-line solid state	.65	115	7	3 wire + GND	9 x 16 x 17 (cabinet)	110	1,595
<b>GENERAL POWER SYSTEMS</b>									
1400 N. Baxter Anaheim, Calif. 92806-1201 (714) 956-9321 <b>Circle 431</b>	GPS-0.1K126R	standby (response time: 2 msec)	.1	115, 230, 240	1/1	3 wire + GND	6 x 7 x 13 (cabinet)	19	495-545
	GPS-0.2K126R	standby (response time: 2 msec)	.2	115, 230, 240	1.9/1	3 wire + GND	6 x 7 x 13 (cabinet)	23	595-645
	GPS-0.3K126R	standby (response time: 2 msec)	.3	115, 230, 240	2.8/1	3 wire + GND	6 x 10 x 14.5 (cabinet)	35	695-745
	GPS-0.5K120-61	on-line solid state	.5	115, 120, 220	10/1	3 wire + GND	7 x 17 x 19 (rack) 7 x 17 x 19 (cabinet)	92	1,650-1,975
	GPS-0.5K126R	standby (response time: 2 msec)	.5	115, 230, 240	4.6/1	3 wire + GND	6 x 13 x 16 (cabinet)	50	895-945
	GPS-1K120-61	on-line solid state	1	115, 120, 208, 220, 230	20/1	3 wire + GND	20 x 16 x 24 (rack) 23 x 23 x 22 (cabinet)	270 (rack) 320 (cabinet)	3,045-3,145
	GPS-1K126R	standby (response time: 2 msec)	1	115, 230, 240	8.9/1	3 wire + GND	8 x 11 x 21 (cabinet)	100	1,295-1,395
	GPS-2K120-61	on-line solid state	2	115, 120, 208, 220, 230	42/1	3 wire + GND	18 x 16 x 27 (rack) 30 x 23 x 24 (cabinet)	292 (rack) 450 (cabinet)	4,600-4,750
	GPS-2K126R	standby (response time: 2 msec)	2	115, 230, 240	17.5/1	3 wire + GND	8 x 11.5 x 24 (cabinet)	125	1,995-2,095
	GPS-3K120-61	on-line solid state	3	115, 120, 208, 220, 230	62/1	3 wire + GND	44 x 23 x 25 (cabinet)	612	6,300-6,525
	GPS-5K120-61	on-line solid state	5	115, 120, 208, 220, 230	104/1	3 wire + GND	61 x 23 x 31 (cabinet)	800	11,500-11,750
	GPS-5K120-63	on-line solid state	5	115, 120, 208, 220, 230	26/3	4 wire + GND	61 x 23 x 31 (cabinet)	800	12,400-13,150

## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD inches)	Weight (lbs.)	Price (\$)
	GPS-10K120-61	on-line solid state	10	115, 120, 208, 220, 230, 240	97/1	4 wire + GND	61 x 23 x 30 (cabinet)	780	19,495-20,395
	GPS-10K120-63	on-line solid state	10	115, 120, 127, 208, 220, 230, 277	53/3	4 wire + GND	61 x 23 x 30 (cabinet)	780	21,495-22,195
	GPS-15K120-63	on-line solid state	15	120, 127, 277	80/3	4 wire + GND	69 x 28 x 31 (cabinet)	1,100	22,750
	GPS-20K120-63	on-line solid state	20	120, 127, 277	107/3	4 wire + GND	69 x 28 x 31 (cabinet)	1,300	28,570
	GPS-25K120-63	on-line solid state	25	120, 127, 277	134/3	4 wire + GND	69 x 28 x 31 (cabinet)	1,400	34,680
	GPS-35K120-63	on-line solid state	35	120, 127, 277	188/3	4 wire + GND	69 x 28 x 31 (cabinet)	1,730	39,200
<b>GTO ELECTRONICS INC.</b> 430 Ritt St. St. Peter, Minn. 56082 (507) 931-4137 Circle 432	PACS-250	on-line solid state	.25	115, 120	12	2 wire + GND	6 x 6 x 5 (cabinet)	15	
	PACS-1500	on-line solid state	1.5	115, 120	12	2 wire + GND	11 x 12 x 14 (cabinet)	53	
	PACS-2000	on-line solid state	2	115, 120	12	2 wire + GND	11 x 12 x 14 (cabinet)	70	
<b>HITRAN CORP.</b> Route 31 RD 5-65 Flemington, N.J. 08822 (201) 782-5525 Circle 433	BA0206-00	on-line solid state	1	120	20	2 wire + GND	52 x 38 x 24 (cabinet)	450	3,828
	BA0206-03	on-line solid state	1	208	12	2 wire + GND	52 x 38 x 24 (cabinet)	450	3,828
	BA0206-04	on-line solid state	1	120, 240	10	3 wire + GND	52 x 38 x 24 (cabinet)	450	3,828
	BA0207-00	on-line solid state	2.5	120	41	2 wire + GND	52 x 38 x 24 (cabinet)	675	5,295
	BA0207-03	on-line solid state	2.5	208	24	2 wire + GND	52 x 38 x 24 (cabinet)	675	5,295
	BA0207-04	on-line solid state	2.5	120, 240	21	3 wire + GND	52 x 38 x 24 (cabinet)	675	5,295
	BA0208-00	on-line solid state	5	120	90	2 wire + GND	62 x 42 x 24 (cabinet)	1,250	9,450
	BA0208-01	on-line solid state	5	120, 240	45	3 wire + GND	62 x 42 x 24 (cabinet)	1,250	9,450
	BA0208-02	on-line solid state	5	208	52	2 wire + GND	62 x 42 x 24 (cabinet)	1,250	9,450
	BA0209-00	on-line solid state	7.5	120	130	2 wire + GND	62 x 42 x 24 (cabinet)	1,450	11,300
	BA0209-01	on-line solid state	7.5	120, 240	65	3 wire + GND	62 x 42 x 24 (cabinet)	1,450	11,300
	BA0209-02	on-line solid state	7.5	208	75	2 wire + GND	62 x 42 x 24 (cabinet)	1,450	11,300
	BA0237-01	on-line solid state	10	120, 240	87	3 wire + GND	62 x 42 x 24 (cabinet)	1,750	14,150
	BA0237-02	on-line solid state	10	208	101	2 wire + GND	62 x 42 x 24 (cabinet)	1,750	14,150
	BA0238-01	on-line solid state	15	120, 240	130	3 wire + GND	80 x 58 x 30 (cabinet)	2,100	19,500
	BA0238-02	on-line solid state	15	208	150	2 wire + GND	80 x 58 x 30 (cabinet)	2,100	19,500
BA0250-00	on-line solid state	5	208, 240, 480	30-26/13	2 wire + GND	62 x 42 x 24 (cabinet)	1,250	10,580	
BA0251-00	on-line solid state	7.5	208, 240, 480	45-39/19	2 wire + GND	62 x 42 x 24 (cabinet)	1,450	12,650	
BA0252-00	on-line solid state	10	208, 240, 480	60-52/26	2 wire + GND	62 x 42 x 24 (cabinet)	1,750	15,800	

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## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD inches)	Weight (lbs.)	Price (\$)
	BA0253-00	on-line solid state	15	89-77/39	2	2 wire + GND	80 x 58 x 30 (cabinet)	2,100	21,600
	BA0254-00	on-line solid state	20	117-101/51	2	2 wire + GND	80 x 58 x 30 (cabinet)	2,600	25,900
<b>ICS INC. (ELECTRO-PAC DIV.)</b>									
520 Interstate Road Addison, Ill. 60101 (312) 543-6200 Circle 434	"E"	on-line solid state	2-20	120, 208, 240, 480	22-60/1	2	51 x 36 x 18, 75 x 66 x 30 (cabinet)		7,500-23,500
	LIFELINE	on-line solid state	.2-1	120	2-12/1	2	20 x 16 x 6.5, 24 x 20 x 10.5 (cabinet)	55-175	1,040-2,300
<b>INTERNATIONAL POWER MACHINES CORP.</b>									
11534 Pagemill Road Dallas, Texas 75243 (214) 343-6076 Circle 435	16 KW/20 KVA	on-line solid state	20	208, 220, 480, 600		3 wire + GND 4 wire + GND	78 x 70 x 35 (cabinet)	2,450	
	20 KW/25 KVA	on-line solid state	25	208, 220, 480, 600		3 wire + GND 4 wire + GND	78 x 70 x 35 (cabinet)	2,650	
	30 KW/38 KVA	on-line solid state	38	208, 220, 480, 600		3 wire + GND 4 wire + GND	78 x 70 x 35 (cabinet)	3,100	
	32 KW/32 KVA	on-line solid state	32	208, 220, 380, 480		4 wire + GND	78 x 64 x 32 (cabinet)	2,100	
	32 KW/40 KVA	on-line solid state	40	208, 220, 380, 480		3 wire + GND	78 x 64 x 32 (cabinet)	2,100	
	40 KW/50 KVA	on-line solid state	50	208, 220, 480, 600		3 wire + GND 4 wire + GND	78 x 70 x 35 (cabinet)	3,300	
	50 KW/63 KVA	on-line solid state	63	208, 220, 480, 600		3 wire + GND 4 wire + GND	78 x 70 x 35 (cabinet)	3,500	
	60 KW/75 KVA	on-line solid state	75	208, 220, 480, 600		3 wire + GND 4 wire + GND	78 x 70 x 35 (cabinet)	3,750	
	64 KW/64 KVA	on-line solid state	64	208, 220, 380, 480		4 wire + GND	78 x 64 x 32 (cabinet)	3,550	
	64 KW/80 KVA	on-line solid state	80	208, 220, 380, 480		4 wire + GND	78 x 64 x 32 (cabinet)	3,550	
80 KW/100 KVA	on-line solid state	100	208, 220, 480, 600		3 wire + GND 4 wire + GND	78 x 70 x 35 (cabinet)	4,400		
<b>ISOREG CORP.</b>									
410 Great Road Littleton, Mass. 01460 (617) 486-9483 Circle 384	UP 16-030-12-12-TS-UU	on-line solid state	.3	120	7	2	17 x 19 x 7.7 (cabinet)	110	1,582
	UP 050-12-12-TS-UU	on-line solid state	.5	120	15	2	17 x 19 x 7.7 (cabinet)	110	1,933
	UP 16-050-22-22-TS-UU	on-line solid state	.5	220	7	2	17 x 19 x 7.7 (cabinet)	110	1,971
	UP 16-100-12-12-TS-HU	on-line solid state	1	120	23	2	22.25 x 22.25 x 21.5 (cabinet)	320	3,568
	UP 16-100-21-21-TS-HU	on-line solid state	1	208	12	2	22.25 x 22.25 x 21.5 (cabinet)	320	3,639
	UP 16-100-22-22-TS-HU	on-line solid state	1	220	11	2	22.25 x 22.25 x 21.5 (cabinet)	320	3,639
	UP 16-200-12-12-TS-HU	on-line solid state	2	120		2	23.4 x 24.6 x 30.5 (cabinet)	400	5,390
	UP 16-200-21-21-TS-HU	on-line solid state	2	208		2	23.4 x 24.6 x 30.5 (cabinet)	400	5,498
	UP 16-200-22-22-TS-HU	on-line solid state	2	220		2	23.4 x 24.6 x 30.5 (cabinet)	400	5,498
	UP 300-12-12-TS-HH	on-line solid state	3	120	62	2	23.4 x 25 x 44.5 (cabinet)	612	7,382
	UP 16-300-21-21-TS-HH	on-line solid state	3	208	32	2	23.4 x 25 x 44.5 (cabinet)	612	7,530

## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD/inches)	Weight (lbs.)	Price (\$)
	UP 16-300-22-22-TS-HU	on-line solid state	3	220	30	2 wire + GND	23.4 x 25 x 44.5 (cabinet)	612	7,530
	UP 16-500-12-12-TS-HH	on-line solid state	5	120	104	2 wire + GND	23.5 x 30.9 x 61 (cabinet)	780	13,476
	UP 16-500-21-21-TS-HH	on-line solid state	5	208	53	2 wire + GND	23.5 x 30.9 x 61 (cabinet)	780	13,745
	UP 16-500-22-22-TS-HH	on-line solid state	5	220	50	2 wire + GND	23.5 x 30.9 x 61 (cabinet)	780	13,745
	UP 16-10K-12-12-TS-HH	on-line solid state	10	120	215	2 wire + GND	23.5 x 30.9 x 61 (cabinet)	780	20,500
	UP 16-10K-21-21-TS-HH	on-line solid state	10	208	108	2 wire + GND	23.5 x 30.9 x 61 (cabinet)	780	20,910
	UP 16-10K-22-22-TS-HH	on-line solid state	10	220	102	2 wire + GND	23.5 x 30.9 x 61 (cabinet)	780	20,910
<b>JEFFERSON ELECTRIC</b>									
1400 Center Circle Drive Downers Grove, Ill. 60515 (312) 691-2400 Circle 385									
	370-411-100	on-line solid state	.250	120	2.08	2 wire + GND	11.125 x 15 x 20.25 (cabinet)	145	
	370-611-100	on-line solid state	.5	120	4.16	2 wire + GND	11.125 x 15 x 20.25 (cabinet)	155	
	370-811-100	on-line solid state	.75	120	6.25	2 wire + GND	11.125 x 15 x 20.25 (cabinet)	160	
	370-1011-100	on-line solid state	1	120	8.33	2 wire + GND	11.125 x 15 x 20.25 (cabinet)	185	
<b>KALGLO ELECTRONICS CO. INC.</b>									
6584 Ruch Road Bethlehem, Penn. 18017 (215) 837-0700 Circle 436									
	LINE-SAVER LS-240	standby (response time: 2-4 msec)	.25	115, 120	2/1	2 wire + GND		17	485
	LINE-SAVER LS-480	standby (response time: 2-4 msec)	.5	115, 120	4/1	2 wire + GND		28	795
<b>LORTEC POWER SYSTEMS INC.</b>									
145 Keep Court Elyria, Ohio 44035 (216) 327-5050 Circle 437									
	ContinuAC	on-line	15-156	208, 240, 480		3 wire + GND	60 x 30 x 80 (cabinet)		3,800-14,000
<b>NOVA ELECTRIC MANUFACTURING CO.</b>									
263 Hillside Ave. Nutley, N.J. 07110 (201) 661-3434 Circle 386									
	11-3K60-Y11	on-line solid state	3	120	65	2 wire + GND	14 x 19 x 21 (rack)	245	5,335
	11-5K60 to 11-25K60	on-line solid state	5-25	120, 208, 240, 480	63-155	2 wire + GND	various	various	10,875-29,000
	11-7.5K-3/6 to 11-50K-3/6	on-line solid state	7.5-50	208, 220, 480	30-200	3 wire + GND	various	various	18,150-42,000
	12-4060-1A	standby (response time: 4 msec)	.4	120	5	2 wire + GND	14.25 x 6 x 19.5 (cabinet)	43	695
	12-8060-1A	standby (response time: 4 msec)	.8	120	10	2 wire + GND	14.25 x 6 x 19.5 (cabinet)	73	840
<b>PANAMAX</b>									
150 Mitchell Blvd. San Rafael, Calif. 94903 (415) 472-5547 Circle 438									
	PowerMAX 250XT	standby (response time: 2 msec)	.25	115, 120	2.5/1	3 wire + GND	5 x 6.5 x 10 (cabinet)	16	559
	PowerMAX 400	standby (response time: 5 msec)	.4	115, 120	4/1	3 wire + GND	5.5 x 8 x 11.5 (cabinet)	27	695
<b>PARA SYSTEMS INC.</b>									
11425 Mathis St., Suite 404 Dallas, Texas 75234 (214) 869-1688 Circle 439									
	MM250	standby (response time: 4 msec)	.25	120, 220	2.1, 1.1	2 wire + GND	5 x 6.5 x 10 (rack)	18	435
	MM500	standby (response time: 4 msec)	.5	120, 220	4.2, 2.2	2 wire + GND	6.3 x 10.6 x 15 (rack)	53	699

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# The TI 855 microprinter. No other printer says better so many ways.

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

**Two Printers In One.** With the TI 855 you get the speed of dot matrix draft copy. Plus the precise clarity of the most advanced matrix technology for letter-quality print. It's two printers in one — at one low price.

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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.

**Software Compatible.** The TI 855 uses industry standard escape sequences for compatibility with virtually all third-party software. And for those with proprietary software needs, a model is available with ANSI standard escape sequences.

**Tough Font Modules For Quick Character Change.** Three font modules can be inserted into the front of the printer at one time, and are accessed individually. Each contains both draft- and letter-quality character sets. They're easier to use, more reliable and more durable than traditional metal or plastic daisy wheels.

**More Productivity Than Any Other Microprinter.** The 855 offers both friction and tractor paper feed, to handle all types of word and data processing applications. A quick-change snap-in cartridge ribbon. Raster and mosaic graphics. And intelligent printing which maximizes document throughput — regardless of format.

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## TEXAS INSTRUMENTS

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## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD/inches)	Weight (lbs.)	Price (\$)
<b>POWER GENERAL (A SUBSIDIARY OF UNITRODE CORP.)</b>									
152 Will Drive Canton, Mass. 02021 (617) 828-6216 <b>Circle 387</b>	UPS 200	standby (response time: 1.5 msec)	.2	115, 230		3 wire + GND 2 NEMA 5-15R	5.9 x 7.3 x 13.25 (cabinet)	30	395
	UPS 210	standby (response time: 1.5 msec)	.2	115, 230		3 wire + GND 2 NEMA 5-15R	5.9 x 7.3 x 6 (cabinet)	8.8	249
	UPS 420	standby (response time: 1.5 msec)	.420	115, 230		3 wire + GND 2 NEMA 5-15R	6.5 x 14.25 x 15 (cabinet)	58	595
<b>PRECISE POWER CORP.</b>									
P.O. Box 2006 Bradenton, Fla. 33508 (813) 746-3515 <b>Circle 440</b>	9-60 (NIPS)	on-line constant frequency/ variable speed	9	208, 220, 480	27	4 wire + GND	6 x 32 x 38 (cabinet)	2,250	14,500
	15-60 (NIPS)	on-line constant frequency/ variable speed	15	208, 220, 480	44	4 wire + GND	66 x 32 x 38 (cabinet)	2,900	18,500
	35-60 (NIPS)	on-line constant frequency/ variable speed	35	208, 220, 480	100	4 wire + GND	72 x 40 x 38 (cabinet)	4,900	27,500
<b>PTI INDUSTRIES (DATASHIELD)</b>									
320 River St. Santa Cruz, Calif. 95060 (408) 429-6881 <b>Circle 441</b>	AT800	standby (response time: 4-10 msec)	.8	115, 120, 208, 220		3 wire + GND	12 x 8 x 15.5 (cabinet)	72	899
	PC200	standby (response time: 4-10 msec)	.2	115, 120, 208, 220		3 wire + GND	7 x 4 x 13.5 (cabinet)	24	359
	XT300	standby (response time: 1-4 msec)	.3	115, 120, 208, 220		3 wire + GND	8 x 11 x 13.5 (cabinet)	37.5	499
<b>RTE DELTEC CORP.</b>									
2727 Kurtz St. San Diego, Calif. 92110 (619) 291-4211 <b>Circle 442</b>	5248A-1	on-line solid state	5	120	69.4	2 wire + GND	61 x 24 x 30 (cabinet)	1,300	12,995
	5250A-1	on-line solid state	7.5	208	34.7	2 wire + GND 3 wire + GND	61 x 27 x 31 (cabinet)	2,350	15,995
	5255A-1	on-line solid state	15	208	68.5	2 wire + GND 3 wire + GND	61 x 56 x 32 (cabinet)	2,750	21,995
	6156-1	on-line solid state	15	208	60.9	3 wire + GND 4 wire + GND	78 x 60 x 31.6 (cabinet)	2,200	27,900
	6306-1	on-line solid state	30	208	121.8	3 wire + GND 4 wire + GND	78 x 60 x 31.6 (cabinet)	2,975	37,900
	6456-1	on-line solid state	45	208	182.6	3 wire + GND 4 wire + GND	78 x 60 x 31.6 (cabinet)	3,650	43,900
	7026R	on-line solid state	2.5	120	26.3	2 wire + GND	14 x 19 x 23 (rack)	195	6,295
	DSU 720	on-line solid state	.7	120	8.3	2 wire + GND	10.5 x 19 x 17 (rack)	115	2,995
	DSU 1220	on-line solid state	1.2	120	14.2	2 wire + GND	14 x 19 x 21 (rack)	150	3,395
	DSU 1820	on-line solid state	1.8	120	21.4	2 wire + GND	14 x 19 x 21 (rack)	183	3,895
<b>SAFT AMERICA INC.</b>									
2414 W. 14th St. Tempe, Ariz. 85281 (602) 894-6864 <b>Circle 443</b>	SPS-20C	standby (response time: less than 4 msec)	.2	115, 120		3 wire + GND	12.51 x 10.75 x 6 (cabinet)	40	
	SPS-400	standby (response time: less than 4 msec)	.4	115, 120		3 wire + GND	12.51 x 10.5 x 6 (cabinet)	40	
	SPS-1000VA	standby (response time: less than 1 msec)	1	115, 120		3 wire + GND	19 x 8 x 13 (cabinet)	74	

## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD/inches)	Weight (lbs.)	Price (\$)
<b>SOLA ELECTRIC</b>									
1717 Busse Road Elk Grove Village, Ill. 60007 (312) 439-2800 <b>Circle 444</b>									
	56-01-10001-7500	on-line solid state	.75	120	6.25	2 wire + GND	10.5 x 12 x 19 (cabinet)	120	1,862
	56-01-10021-1001	on-line solid state	1	120	8.33	2 wire + GND	16 x 17 x 23 (cabinet)	250	4,000
	56-01-10112-1501	on-line solid state	1.5	120	12.5	2 wire + GND	14 x 19 x 26 (cabinet)	300	5,665
	SPS 400 A	standby (response time: 4-10 msec)	.4	120	3.3	2 wire + GND	15 x 7 x 18.5 (cabinet)	65	828
	SPS 800 A	standby (response time: 4-10 msec)	.8	120	6.6	2 wire + GND	15 x 7 x 18.5 (cabinet)	87	983
	SPS 1200 A	standby (response time: 4-10 msec)	1.2	120	10	2 wire + GND	15 x 8 x 18.5 (cabinet)	115	1,150
<b>SOLIDSTATE CONTROLS INC. (SCI)</b>									
875 Dearborn Drive, P.O. Box 1216 Columbus, Ohio 43216 (614) 846-7500 <b>Circle 445</b>									
	3PB 2020	on-line ferroresonant	20	208, 240, 480	40/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 62 x 33 (cabinet)	4,025	19,000
	3PB 2030	on-line ferroresonant	30	208, 240, 480	62/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 62 x 33 (cabinet)	5,100	25,000
	3PB 2040	on-line ferroresonant	40	208, 240, 480	83/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 120 x 33 (cabinet)	6,625	30,000
	3PB 2050	on-line ferroresonant	50	208, 240, 480	104/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 35 x 33 (cabinet)	7,400	39,000
	3PB 2060	on-line ferroresonant	60	208, 240, 480	124/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 135 x 33 (cabinet)	7,975	43,000
	3PB 2075	on-line ferroresonant	75	208, 240, 480	157/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 135 x 33 (cabinet)	10,875	50,000
	3PB 2100	on-line ferroresonant	100	208, 240, 480	209/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 17 x 33 (cabinet)	12,975	66,000
	PB 1075	on-line solid state	.75	120	13/1	2 wire + GND	29 x 18 x 16 (cabinet)	180	under 2,000
	PB 1150	on-line solid state	1.5	120	22/1	2 wire + GND	31.5 x 18 x 20 (cabinet)	330	under 3,500
	PB 1300	on-line solid state	3	120, 208	39/1 13/3	2 wire + GND 4 wire + GND	40 x 18 x 26 (cabinet)	480	under 6,500
	PB 2010	on-line ferroresonant	10	208, 240, 480	20/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 62 x 33 (cabinet)	2,300	15,000
	PB 2020	on-line ferroresonant	20	208, 240, 480	40/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 89 x 33 (cabinet)	3,650	20,000
	PB 2030	on-line ferroresonant	30	208, 240, 480	62/3	2 wire + GND 3 wire + GND 4 wire + GND	77 x 89 x 33 (cabinet)	4,475	26,000
<b>SUN RESEARCH INC.</b>									
P.O. Box 210, Old Bay Road New Durham, N.H. 03855 (603) 859-7110 <b>Circle 446</b>									
	Mayday + S	standby ferroresonant (response time: 4-10 msec)	.15	90, 115, 120	2.5	2 wire + GND	7 x 11 x 12 (cabinet)	25	325
	Mayday + 3S	standby ferroresonant (response time: 4-10 msec)	.3	90	2.5	2 wire + GND	8 x 14.5 x 17 (cabinet)	44	500

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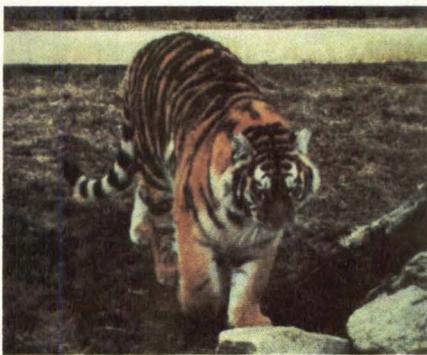
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Every LEX 90 model has the same basic components which use the latest bit-slice technology for rapid execution of complex calculations and set-up times.

The family's flexibility allows you to buy only the functionality you need now, and gives you the ability to add on later as required.

Exclusive SimulRes functionality allows simultaneous display of



A tiger shows off its "true colors" with the LEX 90 True Color display system from Lexidata.

8-bit color lookup table for each color. And where you're looking for high performance with high resolution, there's a LEX 90 model that can support up to 24 planes of 1280x1024 display memory at 60Hz non-interlaced refresh.

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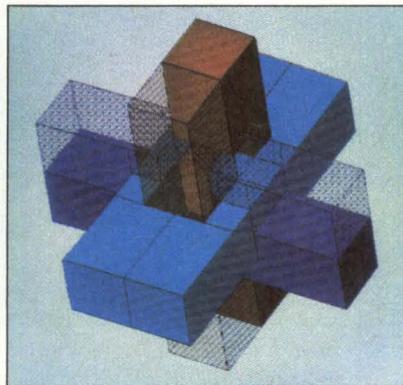
The LEX 90™ family is a good family to know. It's as advanced in a business sense as it is technologically. And what it has, compared to what it costs, makes it look very good indeed. For example:

Its software architecture is compatible both within the family

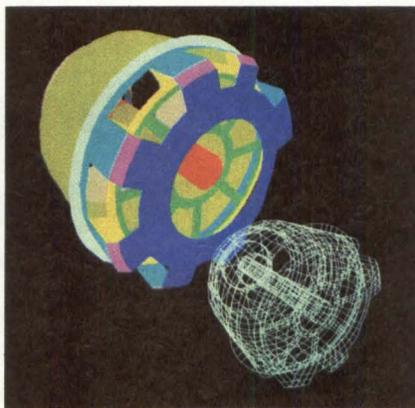
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Of course, the entire family is



SOLIDVIEW, Lexidata's patented technology for the display of solid models, is available as an option on selected LEX 90 display processors. Its translucent shading pattern allows you to see inside your solid model.



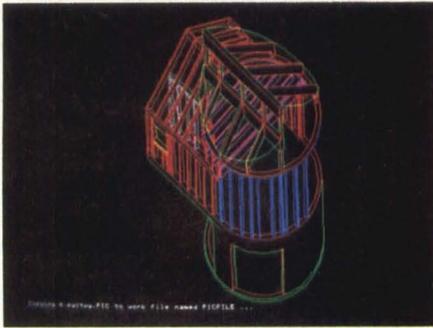
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640x512 and 1280x1024 images on the same screen. A True Color configuration offers two buffers of 640x512x24 with an

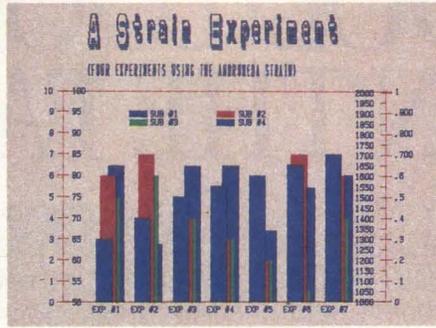
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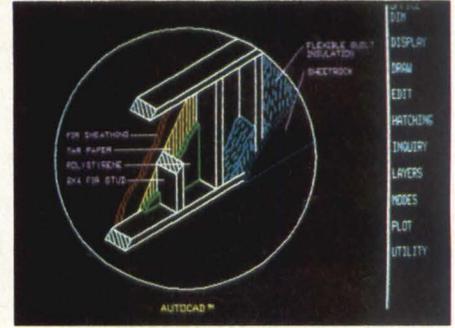
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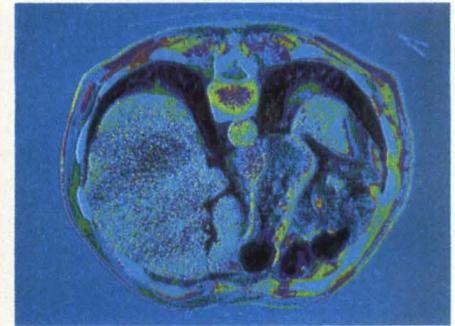
3. Simplified Processing (AutoCAD Software)



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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Even though IBM offers a color graphics card, professionals still choose Vectrix. It's not surprising. Especially once they've seen us in action. Professionals know that our VX/PC Board Set delivers the quality and performance they need for serious color graphics.

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But that's not all. Our 9 bit planes



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CIRCLE NO. 85 ON INQUIRY CARD

## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD/inches)	Weight (lbs.)	Price (\$)
Mayday	60+S	standby ferroresonant (response time: 4-10 msec)	.15	90, 115, 120	2.5	2 wire + GND	8 x 14.5 x 17 (cabinet)	41	475
	60+3C	on-line solid state ferroresonant	.3	90, 115, 120, 208, 220	7	2 wire + GND	9.5 x 17 x 23 (cabinet)	100	850
	60+3H	on-line solid state ferroresonant	.3	90, 115, 120, 208, 220	10/5	2 wire + GND	16 x 10 x 26 (cabinet)	118	930
	60+3S	standby ferroresonant (response time: 4-10 msec)	.3	90, 115, 120	5	2 wire + GND	8 x 14.5 x 17 (cabinet)	59	700
	60+3W	on-line solid state ferroresonant	.3	12 VDC		2 wire + GND	8 x 14.5 x 17 (cabinet)	45	565
	60+6C	on-line solid state ferroresonant	.6	90, 115, 120, 208, 220	15	2 wire + GND	9.5 x 17 x 23 (cabinet)	153	1,425
	60+6H	on-line solid state ferroresonant	.6	90, 115, 120, 208, 220	20/15	2 wire + GND	16 x 10 x 26 (cabinet)	173	1,535
	60+6S	standby ferroresonant (response time: 4-10 msec)	.6	90, 115, 120	7	2 wire + GND	8 x 14.5 x 17 (cabinet)	69	1,140
	60+6W	on-line solid state ferroresonant	.6	24 VDC		2 wire + GND	8 x 14.5 x 17 (cabinet)	65	800
	SR-3	standby ferroresonant (response time: 4-10 msec)	.3	90, 115, 120	5	2 wire + GND	16 x 10 x 26 (cabinet)	90	595
	SR-6	standby ferroresonant (response time: 4-10 msec)	.6	90, 115, 120	7	2 wire + GND	16 x 10 x 26 (cabinet)	80	995
	SR-30	on-line solid state ferroresonant	.3	90, 115, 120	7	2 wire + GND	16 x 10 x 26 (cabinet)	82	995
	SR-60	on-line solid state ferroresonant	.6	90, 115, 120	15	2 wire + GND	16 x 10 x 26 (cabinet)	151	1,495
	SR-100	on-line ferroresonant	1	208, 220	10, 20	2 wire + GND	18 x 15 x 26 (cabinet)		2,395
	SR-150	on-line ferroresonant	1.5	208, 220	15, 30	2 wire + GND	18 x 15 x 26 (cabinet)		3,195
	VR-3	ferroresonant	.3	90, 115, 120	5	2 wire + GND	7.5 x 11.5 x 11.5 (cabinet)		225
	VR-6	ferroresonant	.6	90, 115, 120	7	2 wire + GND	7.5 x 11.5 x 11.5 (cabinet)	41	350
	VR-10	ferroresonant	1	90, 115, 120	10	2 wire + GND	10 x 14 x 14 (cabinet)	65	500
	VR-15	ferroresonant	1.5	90, 115, 120	15	2 wire + GND	10 x 14 x 14 (cabinet)	95	630
	VR-20	ferroresonant		90, 115, 120	20	2 wire + GND	16 x 10 x 26 (cabinet)	135	800

## UNINTERRUPTIBLE POWER SYSTEMS

Company	Model	Type	Power rating (KVA)	Input voltage (AC at 60Hz)	Input current (amps/phase)	Input/output phase	Size (HxWxD/inches)	Weight (lbs.)	Price (\$)
<b>TERADO CORP.</b>									
1068 Raymond Ave. St. Paul, Minn. 55108 (612) 646-2868 Circle 447	50-168 Interceptor II	standby (response time: 8 msec)	.2	120		3 wire + GND	10.75 x 6 x 13.75 (cabinet)	31	261
<b>TOPAZ INC.</b>									
9150 Topaz Way San Diego, Calif. 92123-1164 (619) 569-7982 Circle 448	81000 Series	on-line solid state	3-15	120, 208, 240	13-125	3 wire + GND	60 x 42 x 24 (cabinet)		
	82000 Series	on-line solid state	.5-1.5	115	17-45	2 wire + GND	8.75 x 19 x 20 (rack) 37 x 24 x 27 (cabinet)	100 (rack) 240 (cabinet)	
	Powermaker Micro UPS	standby (response time: 4 msec)	.4-1	120			15 x 7 x 18 (cabinet)	48	760- 1,085
<b>TRIPP-LITE (DIV. OF TRIPP MFG.)</b>									
500 N. Orleans Chicago, Ill. 60610 (312) 329-1777 Circle 449	BC425FC	standby (response time: 10 msec)	.425	120	37		6.25 x 8.75 x 13.5 (rack)	38.5	559
<b>WILMORE ELECTRONICS CO. INC.</b>									
P.O. Box 1329 Hillsborough, N.C. 27278 (919) 732-9351 Circle 450	1252-SQ	standby (response time: 25 msec)	.5	115, 120		2 wire + GND	5.25 x 17 x 14 (rack)	46	
	1252-ST	standby (response time: 25 msec)	.25	115, 120		2 wire + GND	5.25 x 17 x 14 (rack)	43	
	1406	standby (response time: 10 msec)	.05	115, 120		2 wire + GND	7 x 8.5 x 11.5 (cabinet)	15	
	1407	standby (response time: 10 msec)	.25			2 wire + GND	8.75 x 12.75 x 11 (cabinet)	42	
	1408	standby (response time: 10 msec)	.5			2 wire + GND	9 x 12.75 x 16 (cabinet)	56	
	1409	standby (response time: 10 msec)	1	115, 120		2 wire + GND	9 x 12.75 x 16 (cabinet)	60	

# The new Canon TX-50 desktop computer.

## It fits any customer's business as well as his desk.



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- Seven-inch high-resolution monochrome CRT display.
- Fifty-function LED keyboard plus separate ten-key calculator pad and cursor control keys.
- Three-inch compact floppy disk drive with 150 K-bytes memory capacity per side.
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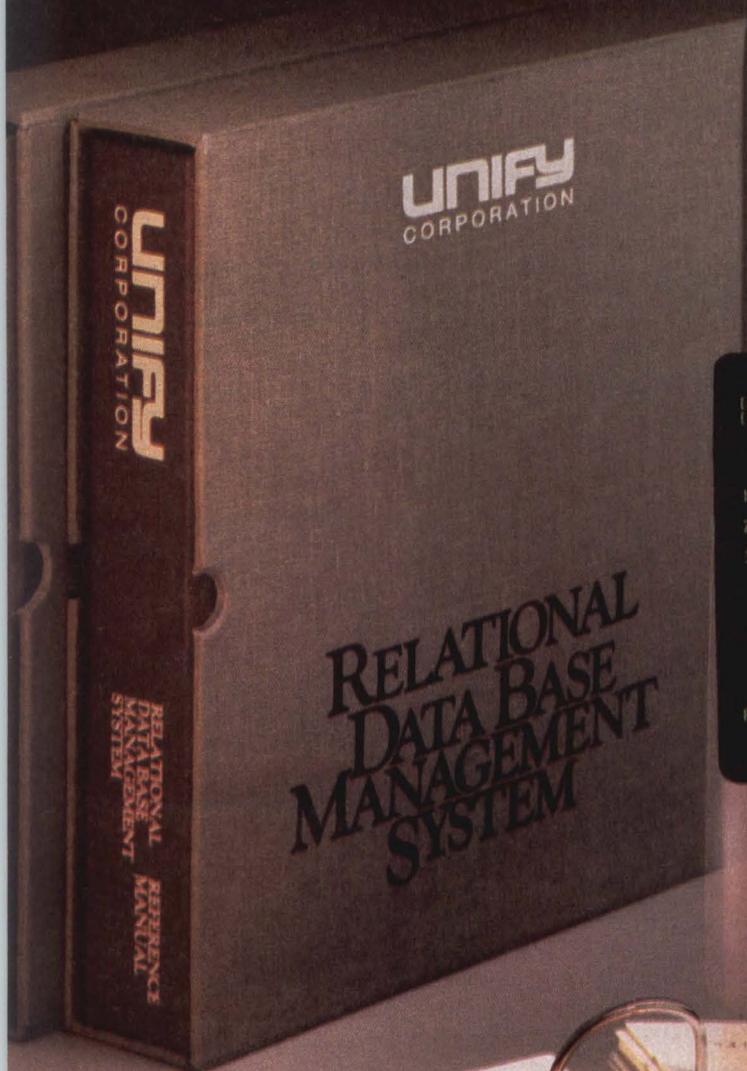
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CIRCLE NO. 86 ON INQUIRY CARD



```

[system]
UNIFY SYSTEM
17 SEP 1984 - 18:01
System Menu

1. Schema Maintenance
2. Schema Listing
3. Create Data Base
4. SFORN Menu
5. ENTER Screen Registration
6. GR. - Query/DML Language
7. SQL Screen Registration
8. Listing Processor
SELECTION: █

9. Data Base Test Driver
10. MENUH Screen Menu
11. MENUH Report Menu
12. Reconfigure Data Base
13. Write Data Base Backup
14. Read Data Base Backup
15. Data Base Maintenance Menu
  
```

```

[student]
[1]INQUIRE
UNIFY SYSTEM
25 Aug 1985 - 18:45
Student Registration Form

Invoice Number: 458

Last Name: Gordon      First Name: Richard

Company: Silicon Design Labs
        5558 Industrial Way
        Basking Ridge NJ 07898
        (201) 555-5400
Student's phone number (if different): (201) 555-5421

Class code (osmyy): CP8985      Subject: C Programming
Class fee: 995.00              Class date: 9/1/85
Deposit date: 8/15/85          Deposit amount ($): 188.00
Payment date: 8/25/85         Payment amount ($): 895.00
  
```

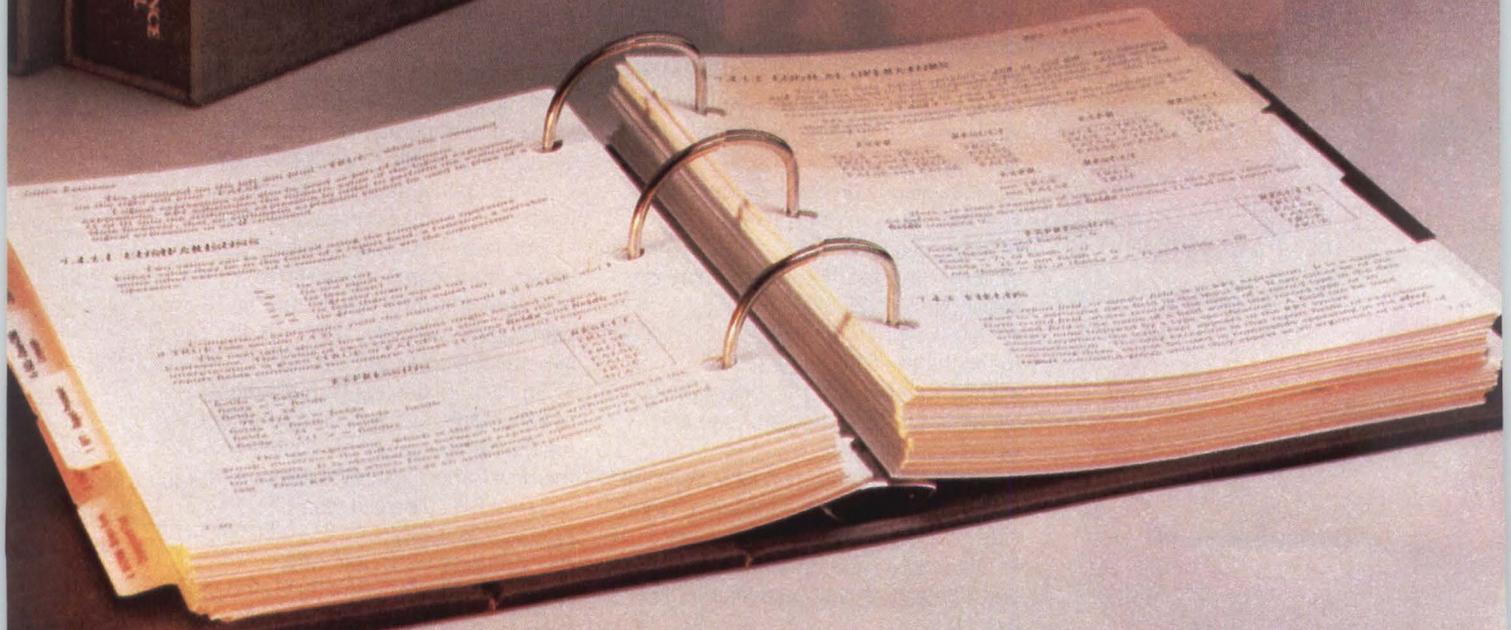
```

[student]
[1]INQUIRE
UNIFY SYSTEM
25 Aug 1985 - 18:45
Student Registration Form

Current: 1

REPORT          TO:  SCREEN  PRINT  FILE  FILENAME
1. Student Registration Listing  [x]  [ ]  [x]-listing
2. Student Billing                [ ]  [ ]
3. Billing Summary                 [ ]

REPORT #: 1
  
```



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UNIFY guides the nonprogrammer through data base development with minimal steps, comprehensive menus, on-line HELP, elementary Query By Forms capability, and clear documentation.

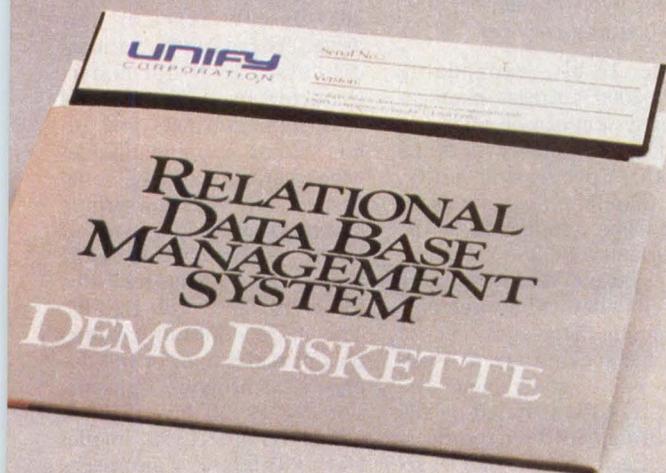
UNIFY expedites applications development for users of all skill levels with features like PAINT, for effortless forms design; SQL, the powerful, English-like query language; and a menu-handler that lets you quickly compile screens, queries and reports into menus customized to each user.

And for the skilled programmer, UNIFY offers the most extensive host language interface, for limitless flexibility when you need it.

All of which makes it mighty easy to see why UNIFY has been selected by more computer manufacturers than any other UNIX-based DBMS.

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CIRCLE NO. 87 ON INQUIRY CARD



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# NEW PRODUCTS

## SYSTEMS

Eileen Milauskas, Assistant Editor

### Portable computer holds 128K bytes

- 80C88 16-bit processor
- 640-by-200-pixels
- 80 characters by 25 lines

IBM PC compatible, the Datavue 25 lap-size computer comes with a 5¼-inch floppy disk drive and displays 80 characters by 25 lines. An 80C88 16-bit processor supports monochrome graphics with 640-by-200-dpi resolution. A four-level gray scale handles color software. Running on the MS-DOS operating system, the unit offers 128K bytes of memory expandable to 640K bytes, one RS232C port, one 8-bit parallel printer port, real-time clock with battery backup and a low-profile, 83-key keyboard with 10 function keys. Weighing 12.1 pounds, the system is powered by an optional 12V battery for up to four hours or by 110V/220V AC with an adapter. \$2,195. **Intecolor**, Intecolor Drive, 225 Technology Park, Norcross, Ga. 30092, (404) 449-5961.

Circle 300

### UNIX-like system supports DBMS

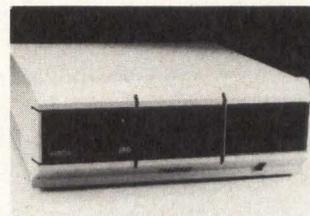
- Two microprocessors
- Multitasking
- 1M byte of memory

Utilizing a UNIX-like operating system called UNOS, the model 3200 32-bit computer supports a relational database management system (DBMS), RM/COBOL, C and DATABUS development languages. UNOS provides file management facilities including multitasking, device-independent I/O, I/O redirection, dynamic file allocation



and hierarchical directory structure. The system incorporates two 68000 microprocessors. One contains a 4K-byte cache memory that performs application processing at a 12½-MHz clock rate and the other directs I/O operations. Consisting of 1M-byte of memory, 32M bytes of disk storage with 1M byte of floppy disk storage and four serial ports, the system supports as many as 28 proprietary terminals. \$15,430. **Datapoint Corp.**, 9725 Datapoint Drive, San Antonio, Texas 78284, (512) 699-7542.

Circle 301



### System offers slave processing

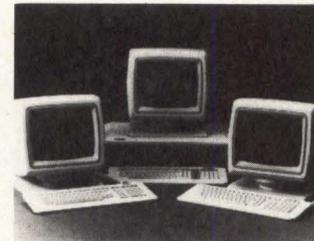
- 80286 microprocessor
- 800K-byte drive
- 512K byte memory

A multiuser business computer system, the CompuPro 286 combines Intel's 16-bit 80286 CPU with the proprietary Z80-based Slave Processor Unit to perform 8-bit "slave processing" tasks. Its operating system, Concurrent DOS 8-16, simultaneously executes 8- and 16-bit programs,

offers record-locking and file-sharing features and accesses more than 3,000 business application programs. The basic system comes with 512K bytes of main memory, an 800K-byte, 5¼-inch floppy disk drive, a 40M-byte, 5¼-inch hard disk, one parallel and one Centronics printer port and four serial ports. Software includes NewWord word processing, SuperCalc 2 electronic spreadsheet and AM-CALL/MCALL modem communications. \$9,995.

**CompuPro**, 3506 Breakwater Court, Hayward, Calif. 94545, (415) 786-0909.

Circle 302



### Multiuser system supports 14 users

- Six memory boards
- 768K bytes of memory
- Two storage devices

The 16-bit, expandable MAI 2000 business management system can be joined in a local area network of 63 desktop processing units, each handling as many as 14 users. The system runs on the proprietary BOSS/IX operating system and provides shared data files between programming languages, record and file locking and a Business BASIC-style menu system. Its CPU is based on the Motorola 68010 microprocessor. Each system holds six memory boards of 256K bytes each and five controller boards; 768K bytes of memo-

ry is standard. Two disk-storage devices, either two 5¼-inch Winchester hard disks or one fixed and one floppy disk drive, are available with a choice of 22M-, 43M- or 120M-byte hard disk drives. Dual-drive capacities allow 240M bytes of storage. Starts at \$14,250. **MAI/Basic Four Information Systems**, 14101 Myford Road, Tustin, Calif. 92680, (714) 731-5100.

Circle 303

### Workstations locally process

- 8086 microprocessor
- 12-inch terminal
- 256K bytes of RAM

Based on the 16-bit 8086 microprocessor, the DYNAMITE family of workstations adds local processing capabilities to the on-line functions of the proprietary 653X terminal. The family consists of two models, the 6541, furnishing dual 360K-byte floppy disk drives, and the 6546, which provides one 360K-byte floppy disk drive and one 10M-byte Winchester disk drive. The 12-inch terminal displays 7-by-9 dot-matrix characters in 40-, 66-, 80- and 132-column formats and offers smooth scrolling, double-wide character display, serial printer interface, low-profile keyboard and 256K bytes of RAM, expandable to 640K bytes. Software includes MS-DOS and GW-BASIC. The main communications port provides half- or full-duplex asynchronous transmission to 19.2K bps. \$2,995, model 6541; \$3,995, model 6546. **Tandem Computers Inc.**, 19333 Vallco Parkway, Cupertino, Calif. 95014, (408) 725-6000. Circle 304

# What do these popular micro printers have in common?

Access  
Apple  
Atari  
Burroughs  
C.Itoh  
Commodore  
Coleco  
CPT  
Cromemco  
Digital  
Epson  
Hewlett Packard  
IBM  
Integral Data  
Leading Edge  
NEC  
Northstar  
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Systems

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The brand names listed are intended only to show the compatibility of the above machines with products manufactured by Pelikan.  
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CIRCLE NO. 89 ON INQUIRY CARD

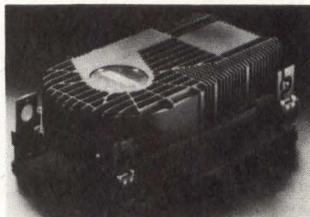
DISK/TAPE

Subsystem backs up tape files

- MFM recording method
- 1/4-inch tape
- Error correction

Capable of backing up two IBM 10M-byte hard disks at one megabyte per minute on a single, standard DC600A 1/4-inch cartridge tape, the Model 5210 FloppyTape backup system requires an IBM PC/XT. The 25M-byte system is based on the proprietary FloppyTape streaming 1/4-inch cartridge tape drive that uses the industry-standard floppy disk interface. Providing file-oriented backup, the system employs an MFM bit serial, six-track serpentine recording method. Data protection features prevent improper sequences during the backup or restore process. An error-correction scheme corrects single errors and detects multiple errors. \$1,095. **Cipher Data Products Inc.**, 10101 Old Grove Road, P.O. Box 85170, San Diego, Calif. 92138, (800) 982-8808.

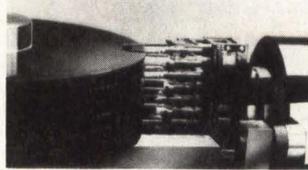
Circle 305



Drives suit CAD/CAM uses

- 11,057 bps
- 18-msec access time
- 330, 660M bytes

The models MV330 and MV660 8-inch Winchester disk drives suit artificial intelligence, CAD/CAM and multi-truser network applications. Track-to-track access time for both models is 3 msec; average access time, 18 msec. Model MV330 stores 330M bytes of formatted capacity. It contains seven disks and provides a track capacity of



20,480 bytes with 13 tracks per cylinder and 1,266 cylinders. Transferring data at 9.82M bytes per second, the unit offers a recording density of 11,057 bpi and 1,000 tpi. Providing 660M bytes on seven disks, the model MV660 furnishes 1,680 cylinders at 13 tracks per cylinder; the model's unformatted track capacity is 30,720 bytes. Track density is 1,034 tpi; data transfer rate is 14.7M bytes per second. \$4,420, quantity 100, model MV330; \$5,255, quantity 100, MV660. **Megavault Memories Inc.**, 6431 Independence Ave., Woodland Hills, Calif. 91367, (818) 884-7300.

Circle 306

Subsystem has 30-msec access

- 67M-byte rigid
- 60M-byte streamer
- 5M-bps transfer rate

Intended to increase mass storage for the IBM PC, PC/XT or PC-AT systems, the COLOSSUS disk subsystem consists of a 67M-byte Winchester disk drive and a 60M-byte, 1/4-inch, streaming-tape-cartridge backup unit. The disk drive achieves an average access time of 30 msec. Features include an 8-bit IBM PC or a 16-bit PC-AT host adapter; SCSI peripheral bus interface; ST506 or ST412 disk drive interface with a 5M-bps data transfer rate; streaming and file-by-file tape backup operations at 5M bytes per minute and QIC-36 and QIC-24 tape interfaces and format standards. A 320-bit ECC disk error correction ensures data reliability. \$7,499. **AST Research Inc.**, 2121 Alton Ave., Irvine, Calif. 92714, (714) 863-1333.

Circle 307

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Cromemco®

# CROMEMCO COMPUTERS: DESIGNED TO MAKE UNIX SYSTEM V EVEN BETTER...

UNIX System V, the new standard in multi-user microcomputer operating systems, gives you high performance features along with the portability and flexibility of a standard.

Cromemco computers can make UNIX System V even better. Because our systems are designed with UNIX in mind. First of all, we offer UNIX System V with Berkeley enhancements. Then, our hardware uses advanced features like 64K of on-board cache memory and our high speed STDC controller to speed up disk operations—very important with UNIX.

## **More capability and expandability**

We have a high-speed, 68000-based CPU that runs at 10 MHz, coupled with a memory manager that uses demand-paging and scatter loading to work *with* UNIX, not for it.

We provide room for expanding RAM to 16 megabytes—with error detection and correction—for running even the most sophisticated and advanced microcomputer programs. And the power to accommodate up to 16 users—all with plenty of memory.

But we give you even more.

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We give you a choice in systems: the System 100 series, expandable up to 4 megabytes of RAM, and the System 300 series, expandable to 16 megabytes. A high speed 50 megabyte hard disk drive is standard on the systems. And you can expand the hard disk capacity up to 1200 megabytes using standard SMD drives. You can add floating point processing. High resolution graphics. Video digitizing and imaging. Communications through

standard protocols. Mainframe interface.

And software support is here to meet your needs. We offer major programming languages, database management systems, communications software, including SNA architecture, X.25 protocol, and Ethernet; even a program to interface to an IBM PC if you need to. And, of course, access to the broad range of standard UNIX applications programs that is growing dramatically every day.

## **Easy to use.**

We also make our systems easier to use, because we install the operating system before we ship your computer. No complicated installation procedures. And the Berkeley enhancements give you the standard UNIX System V operating system, but with the added convenience of these widely acclaimed improvements.

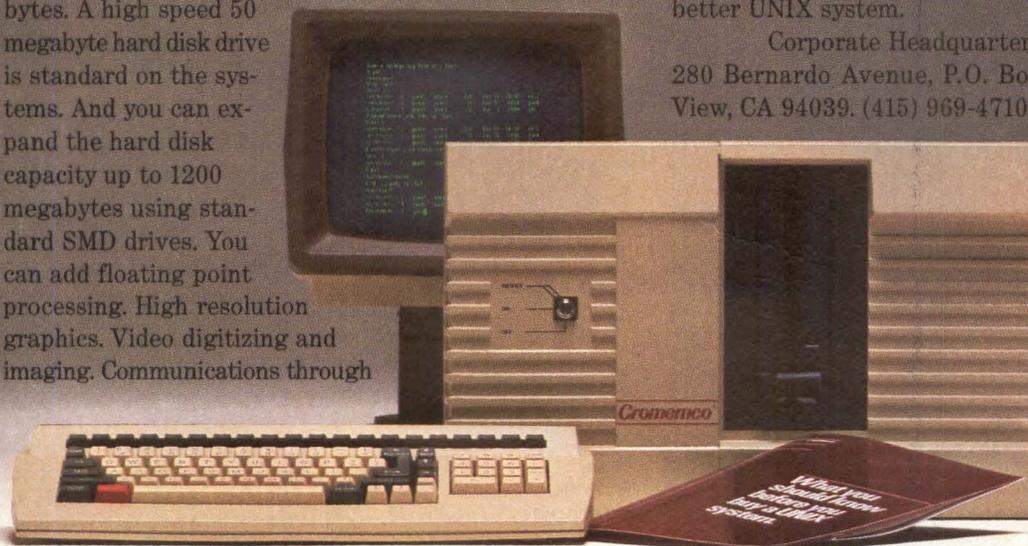
Cromemco's System 100 and System 300 computers: designed to be the highest performance UNIX systems available anywhere.

Just call or visit one of our UNIX System V Official System Centers to see for yourself. They'll also give you a copy of our new publication, "What you should know before you buy a UNIX system." Or contact us directly.

We'll be glad to show you how to get a better UNIX system.

Corporate Headquarters: Cromemco, Inc.,  
280 Bernardo Avenue, P.O. Box 7400, Mountain  
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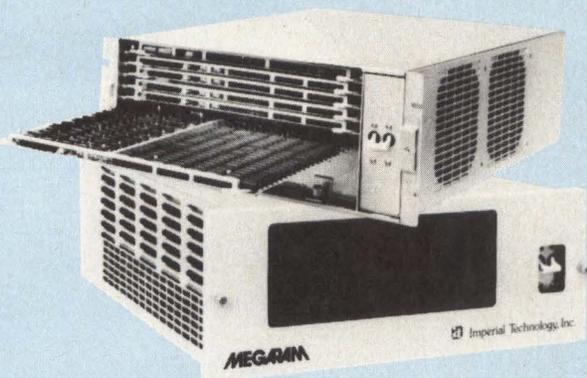
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CIRCLE NO. 90 ON INQUIRY CARD

# 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.

#### Advantages of The MegaRam Over Rotating Discs:

With no moving parts and easily replaceable sub-assemblies, the use of the solid-state MegaRam Disc Emulator assures dramatically increased performance and reliability. It further simplifies field maintenance.

Designed for use with the following computers:

- DEC • Data General • Sperry Univac (V77 Series)
- Hewlett Packard (HP1000 Series) • Modcomp
- SEL • CDC (System 17)

#### Replaces the Following Fixed Head Discs:

- DDC • Data Flux • Vermont Research
- Alpha Data

#### Typical Applications Include:

- Process Control • Mobile Equipment
- Telecommunications • Data Base Management
- Data Acquisition • Swapping Files • Automated Test Equipment • Graphics • Array Processors

Other configurations may also be available.  
Please consult factory for information.



**Imperial Technology, Inc.**

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CIRCLE NO. 91 ON INQUIRY CARD

## NEW PRODUCTS TERMINALS



#### Terminal has speaker phone

- 400-name database
- 1,200-baud modem
- 92K-byte memory

Linked with a personal computer in a point-to-point network, the CoSystem integrated voice and data terminal sends electronic mail, transmits data files to computers and executes intelligent telephone functions with a time-management system and a 400-name database. IBM Corp. PC-compatible, the terminal provides 92K bytes of internal memory, a 1,200-baud modem and a speaker phone. It uses standard telephone lines and is compatible with existing PBX systems. \$2,295. **Philips Information Systems**, Suite 300, 15301 Dallas Parkway, Dallas, Texas 75248, (214) 980-2000.

Circle 308

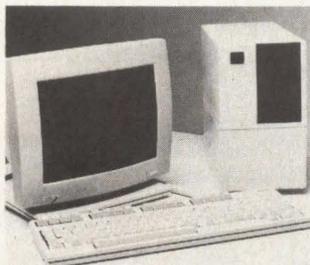
gent terminal can be upgraded to a workstation that is compatible with the IBM Corp. PC or PC/XT via a PC Connection module. The unit holds 16K bytes of ROM and includes two RS232C communication ports, one of which includes an RS422A interface; a 14-inch, monochrome, amber-phosphor display with 80-column-by-25-line alphanumeric and character graphics and a 50-Hz, non-interlaced refresh rate; and a 108-key keyboard. Plug-in expansion cartridges for firmware customization are provided. The WS-1000 PC Connection module includes an 8088 microprocessor, an optional 8087 arithmetic coprocessor and a 128K-byte RAM, expandable to 256K bytes. The module can be equipped with no disk drives, one or two floppy disk drives or one floppy and one Winchester half-height disk drive. \$995, WS-1000 terminal; \$2,595, terminal expanded with PC Connection module and one floppy disk drive. **Zentec Corp.**, 2400 Walsh Ave., Santa Clara, Calif. 95050, (408) 727-7662.

Circle No 309

#### Terminal emulates DEC VT220

- 25 lines by 80 columns
- 105-key keyboard
- Five character fonts

Compatible with the DEC VT220 display terminal, the Zephyr DD-220 alphanumeric-display terminal offers a 14-inch, green or amber phosphor display. Its 105-key, detached, DIN-standard keyboard provides an 18-key, accounting-style pad and 20 programmable function keys. Five character fonts include ASCII, U.K. National set, DEC special graphics, multinational characters and a downloadable, soft-character font. A 25-line-by-80- or 132-



#### Terminal upgrades to workstation

- Two RS232 ports
- 14-inch display
- 16K bytes of ROM

Compatible with the Digital Equipment Corp. VT220 terminal, the WS-1000 intelli-

# Technical Bulletin

## No. 2 in a series.



### 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 restrictions. 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 only 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.

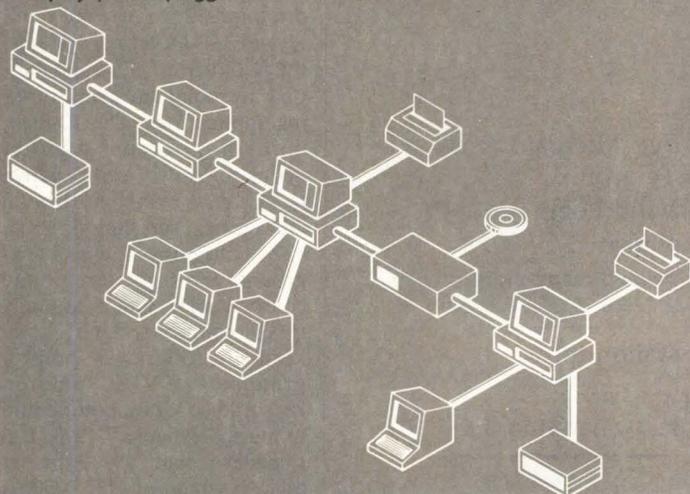
O/S	Computer	Processor	Measured time
QNX™	IBM-PC AT	80286	480 usec
XENIX™	Intel-286	80286	4,930 usec

#### 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 independent 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.

#### QNX Products:

QNX Kernel	Real Time Spelling Checker
Editor and Utilities	Electronic Mail
C Compiler & 8086 Assembler	Icon Menu Generator
Basic Compiler	Isam file utility
Qbol (dibol) Compiler	DOS Access Kit
Pascal Compiler	SofPlan Spreadsheet
Full Screen Multi-terminal editor	Networking Board
Document Formatter	

#### QNX Distributors:

Canada:	Quantum Software Systems (613) 726-1893
	Kanatek Micro (613) 726-1907
	Peripherals Plus Inc. (514) 364-5554
USA:	Micro Managers of Texas (512) 341-9544
Europe:	Xmit A.G. (Switzerland) (41) 57-311125
S. America:	Analysis Sistemas (11) 280-5930.



Moodie Drive, HiTech Park  
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Ottawa, Canada K2H 9C1 (613) 726-1893

QNX is a trademark of Quantum Software Systems Ltd. XENIX is a trademark of Microsoft Corp.

CIRCLE NO. 92 ON INQUIRY CARD

NEW PRODUCTS  
TERMINALS

column display with bidirectional, smooth scrolling can be formatted on the monitor. Blinking, bold, underline, normal or reverse video, double-height, double-width and blank attributes are offered.

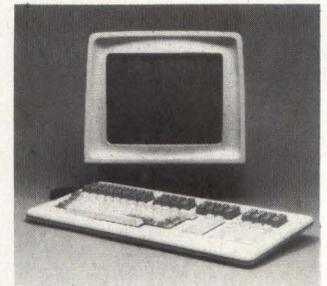
An RS232C, RS423 and a buffered RS232C interface come standard. \$850. **Zentec Corp.**, 2400 Walsh Ave., Santa Clara, Calif. 95050, (408) 727-7662.

Circle No 310

**Terminal duplicates Tandem 653x**

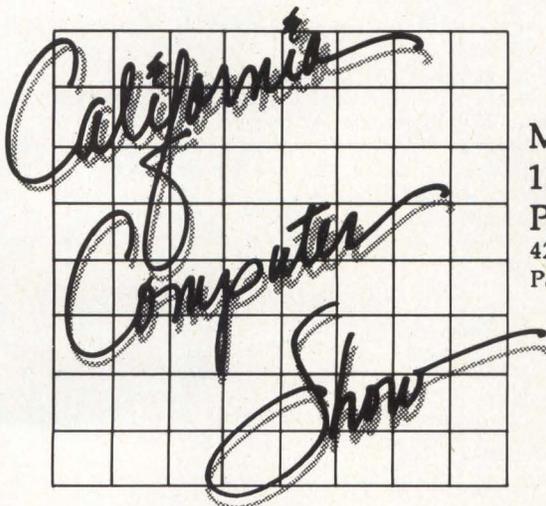
- Serial interface
- 14-inch screen
- Display memory support

Emulating the 653x family



of Tandem display terminals, the Elite terminal offers display memory support with 300 lines, 10 pages of which are supported in block mode. Its 14-inch, green screen is adjustable and displays alternate character sets for various languages. The unit performs asynchronous communications in half- or full-duplex mode. Compatible with Tandem software, the terminal includes RS232C and current-loop interfaces. A 300- to 1,200-baud modem is optional. \$1,295. **Soroc Technology Inc.**, 161 Freedom Ave., Anaheim, Calif. 92801, (714) 992-2860.

Circle 311



May 14th - 15th, 1985  
12:00pm - 6:00pm  
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**Terminal displays multiple windows**

- 64 colors
- UNIX-compatible
- 80 or 132 columns

Compatible with the proprietary 932 Supermicro family and UNIX-based systems, the ColorScan 90 color display terminal suits multitasking applications. The 12-inch, non-glare screen simultaneously shows eight active tasks, each with horizontal and vertical scrolling, in 80 or 132 columns. Eight background and eight foreground colors display data in as many as 64 colors. A UNIX-style keyboard offers 17 preprogrammed UNIX function keys and separate editing and numeric keypads. \$1,995. **Datamedia Corp.**, 491 Amherst St., Nashua, N.H. 03063, (603) 886-1570.

Circle 312

CIRCLE NO. 93 ON INQUIRY CARD

See us at  
**COMDEX/Spring '85**

May 6-9, 1985  
Georgia World Congress Center,  
Atlanta, Georgia

# THE "JUST WHAT YOU NEED" MODEM IS JUST

**\$299.**

Finally there's a 300/1200 baud modem—the Volksmodem 12—with just what you need to get the most out of your personal computer.

## THE FEATURES YOU NEED.

AutoDial/AutoAnswer, Bell 103 and 212A compatibility, control from any Hayes compatible program, full/half duplex, tone and pulse dialing, dial tone detect, busy detection, extra telephone jack.

## THE RELIABILITY YOU NEED.

We've built over 300,000 modems, and each one is 100% tested on our computerized, dedicated tester.



We build them right, that's why we can offer the industry's first 5 year warranty.

## THE VALUE YOU NEED.

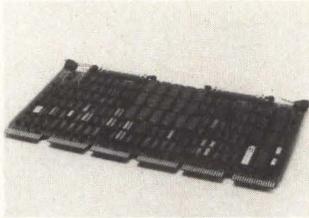
Only \$299, suggested retail, including our 5 year warranty at no extra cost to you.

## NOW WHY IN THE WORLD WOULD ANYONE PAY MORE?

Visit your local computer dealer and see for yourself that the Volksmodem 12 is exactly what you need! Anchor Automation, Inc. 6913 Valjean Avenue, Van Nuys, CA 91406. (818) 997-7758.

**ANCHOR AUTOMATION**  
A Leader in Modem Technology

CIRCLE NO. 94 ON INQUIRY CARD



**Controller links computers**

- Links 16 devices
- 34,800-bps transfer rate
- Bell 212-compatible

Connecting 16 asynchronous devices to DEC PDP-11 or VAX computers, the Optimux/16DMF+ multiplexer controller offers software-selectable data transfer rates to 34,800 bps. Its DMA burst mode reduces Unibus overhead during output operations. The controller is software-compatible with the printer driver contained in the VAX/VMS operating system, which supports print speeds of 900 lines per minute. Compatible with Bell 103 and 212 modems, the unit supports EIA RS232C or CCITT V.24 interfaces. Containing a 2901 bit-slice microprocessor, the controller comes on a single hex size printed circuit board that plugs into the Unibus backplane. \$3,000. **Distributed Logic Corp.**, 1555 S. Sinclair St., P.O. Box 6270, Anaheim, Calif. 92806, (714) 937-5700.

Circle 313

**Modem employs protection**

- 110, 300 or 1,200 bps
- Hayes-compatible
- Auto-answer, auto-dial

Utilizing password and call-back protection to guard host computers against unauthorized remote access, the Cermetek Security Modem offers 110-, 300- or 1,200-bps data rates. The unit provides an audit trail listing valid and invalid attempts to access the computer, prevents unautho-

rized outbound calls from the computer via a dial-out password and requires a key to change security levels, passwords and call-back numbers. Compatible with the Hayes communications control standard and with Bell 212A and 103 standards, the modem furnishes auto-dial and auto-answer capabilities, a memory for frequently called numbers and electronic call progress monitoring. \$695. **Cermetek Microelectronics Inc.**, 1308 Borregas Ave., P.O. Box 3565, Sunnyvale, Calif. 94088-3565, (408) 752-5000.

Circle 314



**PAD connects host, protocols**

- Operates at 64K bps
- Supports BSC protocols
- Uncouples remote devices

Allowing geographically dispersed IBM terminals and hosts to communicate via a

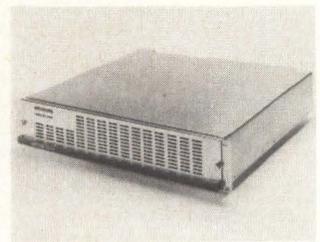
BBNCC X.25 packet-switching network, the Model C/10 Packet Assembler/Disassembler (PAD) supports SNA/SDLC, 3270 BSC, 2780/3780 BSC and asynchronous ASCII protocols. The protocols connect directly to IBM equipment without modification or software upgrades. Operating at 64K bps, the unit supports 32 BSC/SDLC synchronous multidrop lines and concentrates network traffic over one or two high-speed X.25 links. Uncoupling remote BSC devices from host device configurations, the PAD enables the BSC protocol to access multiple IBM hosts and applications from a single terminal. The PAD performs polling and selection of remote IBM peripherals; SDLC and BSC polling traffic is eliminated from the X.25 network. \$4,350. **BBN Communications Corp.**, 70 Fawcett St., Cambridge, Mass. 02238, (617) 497-3906.

Circle 315

**System multiplexes to DEC systems**

- 20A power supply
- Connects 16 lines
- Four card slots

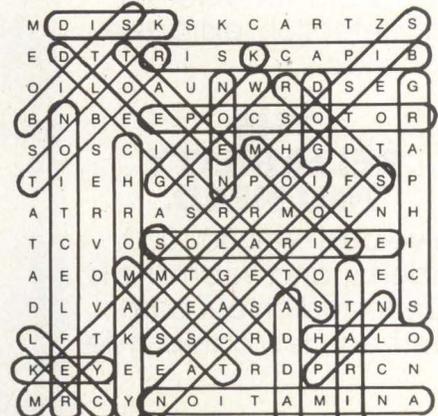
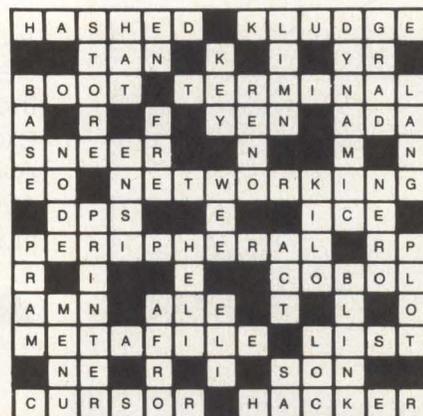
The Optimux/32DMF+ subsystem multiplexes from



16 to 128 local or remote communications devices to DEC PDP-11, VAX or DEC-System/10 computers. Containing a 20A power supply and four printed-circuit-card slots, the expansion unit comes with an Optimux/16DMF+ asynchronous communications controller and a distribution panel for connecting 16 lines. The subsystem implements either the DEC DMF32 or DH11/DM11 communications protocols. A flow-control feature prevents data-loss conditions in high-throughput applications. Software-selectable data-transfer rates range from 50 bps to 38.4 bps; the unit is software-compatible with the DEC VAX/VMS operating system's LCDRIVER printer driver, permitting the use of two channels as ports for supporting 900-lpm serial printers. \$4,500. **Distributed Logic Corp.**, 1555 S. Sinclair St., P.O. Box 6270, Anaheim, Calif. 92806, (714) 937-5700.

Circle 316

**ANSWERS TO MARCH'S PUZZLES**



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### IPI FORUM

### PERIPHERALS FORUM

<ul style="list-style-type: none"> <li>• Devoted to furthering the understanding and utilization of IPI (Intelligent Peripheral Interface) as one of the most important Input/Output interface standards for the industry</li> </ul>	<p><b>PURPOSE</b></p>	<ul style="list-style-type: none"> <li>• Charged with exposing peripheral purchasers and suppliers to all facets of the process by which system integrators select and integrate peripherals into their product lines, including disk, optical, tape, and print</li> </ul>
<ul style="list-style-type: none"> <li>• Marketing, engineering, and planning personnel of companies who are using or considering the use of IPI in systems, subsystems, intelligent peripherals, boards, or chips</li> </ul>	<p><b>WHO SHOULD ATTEND</b></p>	<ul style="list-style-type: none"> <li>• Engineering, marketing, planning, purchasing, test, quality assurance, and maintenance personnel who are involved in the peripheral selection and integration process of system integrators</li> <li>• Sales and marketing personnel of peripheral suppliers</li> </ul>
<ul style="list-style-type: none"> <li>• Hear from the world's leading experts on IPI and IPI applications</li> <li>• Take a guided tour through the interface "jungle"</li> <li>• Participate interactively in workshops and panel discussions and forums</li> <li>• Meet others to share IPI experience</li> <li>• Keep abreast of related peripheral technologies</li> <li>• See the latest in IPI products</li> </ul>	<p><b>BENEFITS</b></p>	<ul style="list-style-type: none"> <li>• Hear from the world's leading experts on disk, tape, printer, and optical technology</li> <li>• Participate in interactive panel discussions</li> <li>• Meet others to share peripheral selection experience</li> <li>• Take a guided tour through the interface "jungle"</li> <li>• Learn what's important in an OEM contract</li> <li>• Discuss how to improve your product planning process</li> <li>• Improve your peripheral selection process</li> </ul>
<ul style="list-style-type: none"> <li>• The importance of standardization</li> <li>• IPI status with ANSI, ECMA, and ISO</li> <li>• IPI Level 2 Device I/O</li> <li>• IPI Level 3 Intelligent I/O</li> <li>• The impact of IPI on suppliers of chips, boards, peripherals, subsystems and systems</li> <li>• The future of IPI</li> <li>• Comparison of IPI and SCSI</li> <li>• How is IPI being used and who is using it?</li> </ul>	<p><b>KEY ISSUES AND TOPICS</b></p>	<ul style="list-style-type: none"> <li>• The importance of standardization</li> <li>• Single-source products</li> <li>• Peripheral selection criteria</li> <li>• Cost of ownership</li> <li>• Testing tips</li> <li>• RAS (Reliability, Availability, and Serviceability) trends</li> <li>• Pricing trends</li> <li>• Product life</li> <li>• How much "technology" to buy</li> </ul>
<p style="text-align: center;"><b>Sunnyvale Hilton</b></p> <p>8:00 a.m. Monday, June 3rd through 4:00 p.m. Wednesday, June 5th, 1985.</p>	<p><b>TIME AND PLACE</b></p>	<p style="text-align: center;"><b>Sunnyvale Hilton</b></p> <p>8:00 a.m. Thursday, June 20th through 4:00 p.m. Friday, June 21st, 1985.</p>
<p>ENDL Consulting and Technology Forums.</p>	<p><b>SPONSORS</b></p>	<p>Disk / Trend, Freeman Associates, and Technology Forums.</p>

#### EXHIBITORS' RECEPTION

Both Forums will include an evening Exhibitors' Reception (cocktails and buffet hosted by the exhibitors) wherein delegates and other invited guests may view products which directly relate to the subject matter of the forum. Representatives from the exhibitors will also be on hand to discuss technical details. For information on becoming a forum exhibitor, please call (714) 861-3339.

#### REGISTRATION INFORMATION

- **Fees:**  
The registration fee of \$895 for the 3-day IPI Forum covers attendance at all scheduled sessions, conference materials, continental breakfast and luncheon each day, 2 receptions, refreshments during breaks, banquet, gratuities, and taxes. The registration fee for the 2-day Peripherals Forum is \$695 and includes the same items as for the IPI Forum, except the banquet.
- **Hotel Accommodation:**  
A block of rooms has been reserved for forum delegates at the Sunnyvale Hilton. It is recommended that you register early by returning the hotel registration card mailed to you with your conference registration confirmation or by calling (408) 738-4888 and identifying yourself as a forum delegate.
- **Attendance:**  
Since attendance will be limited in order to preserve an appropriate atmosphere within which to learn and interact with other delegates, it is recommended that your registration form and payment be mailed early.
- No cancellations after May 10th, 1985.
- **For further information call (714) 861-3339**

**CIRCLE NO. 95 ON INQUIRY CARD**

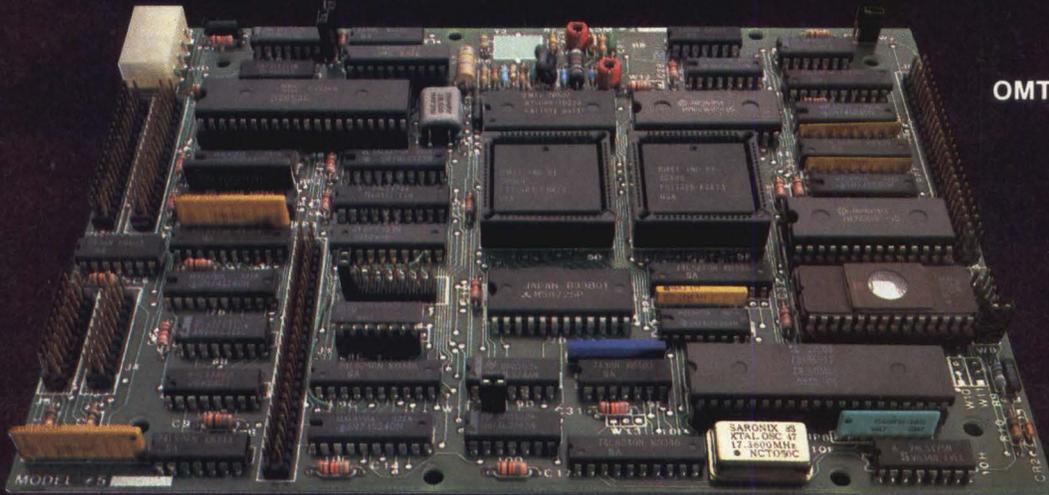
#### REGISTRATION FORM

- Please Register me for the following:
  - IPI Forum; Sunnyvale Hilton, June 3-5, 1985. \$895
  - Peripherals Forum; Sunnyvale Hilton, June 20-21, 1985. \$695
- Delegate information:

Name \_\_\_\_\_  
 Title \_\_\_\_\_ Phone \_\_\_\_\_  
 Company \_\_\_\_\_  
 Address \_\_\_\_\_

- I have enclosed the names and titles of additional personnel from my company and noted which Forum(s) they wish to attend.
- 25% Consecutive Forum Discount applies. I/We are attending both Forums as indicated above and in the enclosure.
- 25% Group Discount applies. There are a minimum of 4 additional delegates to the same forum from my company whose names are enclosed.
- Registrations cannot be accepted unless accompanied by full payment. Please make checks payable to **Technology Forums** and mail to 23409 Coyote Springs Dr., Diamond Bar, CA 91765.

# WINCHESTER, FLOPPY AND TAPE All on one board



OMTI 5400

Our OMTI 5400 SCSI (SASI) controller offers Winchester, floppy and tape support all on a single 5¼" footprint PC board. By using our proprietary VLSI chip technology, we were able to squeeze all these functions onto a board size that most controller companies are still using for single function controllers. This means increased capability and improved cost-effectiveness in your application.

As a forward-looking OEM, you want multifunction SCSI (SASI) data controllers that meet your needs today and can meet the challenges of future developments in peripheral device technology. As you would expect, we've applied our new technology to meet these challenges in a whole family of SCSI (SASI) data controllers, the OMTI Series 5000.

#### UNBEATABLE FLEXIBILITY

Our OMTI Series 5000 family of SCSI (SASI) controllers supports industry standard ST506/412 5¼" fixed and removeable Winchester disks, 5¼" and 8" floppy disks and QIC-02 compatible streaming tape. Each controller is SCSI (SASI) compatible to protect your software from change as you add next generation disk and tape technologies. And they are all second-sourced to guarantee availability.

#### HIGH PERFORMANCE

The Series 5000 controllers provide consecutive sector, non-interleaved data transfer and multisector buffering between host and peripherals. In addition, our data buffer supports simultaneous transfers between Winchester and streaming tape for fast image backup operation. No other manufacturer offers you performance like this!

#### EASY TO USE

Our high-level SCSI (SASI) command set off-loads your host CPU. Only one command is required to completely backup or restore Winchester data to and from tape, all without host intervention. Separate host-initiated commands allow selective file backup and restore. A sophisticated 32-bit ECC and automatic error retry means that reliable data is always available to the host. Finally, automatic Winchester flaw management handling prevents disk defects from corrupting your system.

To learn more about the OMTI Series 5000 data controllers, please contact us for additional information.

OMTI 5100  
Winchester



OMTI 5300  
Winchester  
plus Tape

OMTI 5200  
Winchester plus Floppy

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SALES OFFICES: Seattle, WA (206) 883-8303; Boston, MA (617) 246-2540; Atlanta, GA (404) 296-2029; Morton Grove, IL (312) 966-2711; Melrose Park, IL (312) 345-5320; Arlington, TX (817) 429-8527; Laguna Hills, CA (714) 643-8046; Greensboro, NC (919) 292-8072; Mountain View, CA (415) 964-5700; Philadelphia, PA (215) 860-8626.

DISTRIBUTORS: United States-Arrow Electronics, Inc. (516) 694-6800; Canada-Allan Crawford Associates Ltd. (416) 678-1500; International-Prima International (408) 732-4620.

CIRCLE NO. 96 ON INQUIRY CARD

### Plotter has four colors

- 256K bytes of memory
- Dual speed modes
- 2.6 cps

The Britewriter four-color pen plotter reduces spreadsheet information to presentation-quality graphics. Printing on standard bond or coated papers and transparencies, the black, blue, green and red pens can be changed without interrupting the printing process. HP 74-75 compatible, the plotter works with popular software packages such as Lotus' 1-2-3, PFS-Graph and both MS-DOS and CP/M versions of GraphWriter. With an MTBF of 4,000 hours, the unit operates at 60mm per second in low-speed mode and 112mm per second in high-speed mode.

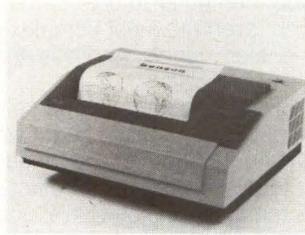
Plotting speed is 4.6 cps in monochrome and 2.6 cps in four colors. Other features include 256K bytes of character and instruction storage in memory, an ASCII character code and a serial or parallel interface. \$599. **NEC Information Systems Inc.**, 1414 Massachusetts Ave., Boxborough, Mass. 01719, (617) 264-8000.

Circle 317

### Plotter operates at .65 ips

- 240-dpi resolution
- Monochromatic
- .65 ips

Producing 240-dpi-resolution drawings at .65 ips, the B-90 tabletop thermal-transfer plotter features a dry toning technology that allows the use of plain or clay-coated



paper. The 11-inch, monochromatic plotter/printer conforms to U.S. and European (DIN) standards governing noise emission and power consumption. It interfaces to the host system by either the proprietary parallel interface, the Centronics 8-bit parallel interface, or V80 hardware plug-compatible interface. \$6,995. Delivery is 60 days. **Benson Inc.**, 2690 Orchard Pkwy., P.O. Box 32059, San Jose, Calif. 95152-2059, (408) 945-1000. Circle No 318

### Printer adapts to personal computers

- 20 cps
- Daisywheel
- 93-byte memory buffer

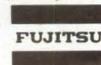
The 20-cps Alphapro 101 letter-quality, daisywheel printer adapts to personal computers with Centronics or RS232 ports via an intelligent printer cartridge. Using Diablo- and Qume-compatible print wheels and ribbon cartridges, the unit supports proportional spacing, boldface, double-strike, strikeout, phantom space, superscripts, subscripts and reverse line feeds. The 19-by-5½-by-11½-inch model accommodates paper as wide as 13 inches. \$399.95. **Alphacom Inc.**, 2323 South Bascom Ave., Campbell, Calif. 95008, (408) 559-8000. Circle 319

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**In Touch with Technology**

One of the easiest ways to interact with a computer is through a touch activated display. One that lets you merely point your finger at what you want your computer to do.

With touch, even the most complex application can become user friendly. And less susceptible to user error.

But the advantages of the highly reliable infrared touch input systems have been overshadowed by cost. Placing them out of the range of medium to low-cost turnkey systems manufacturers.

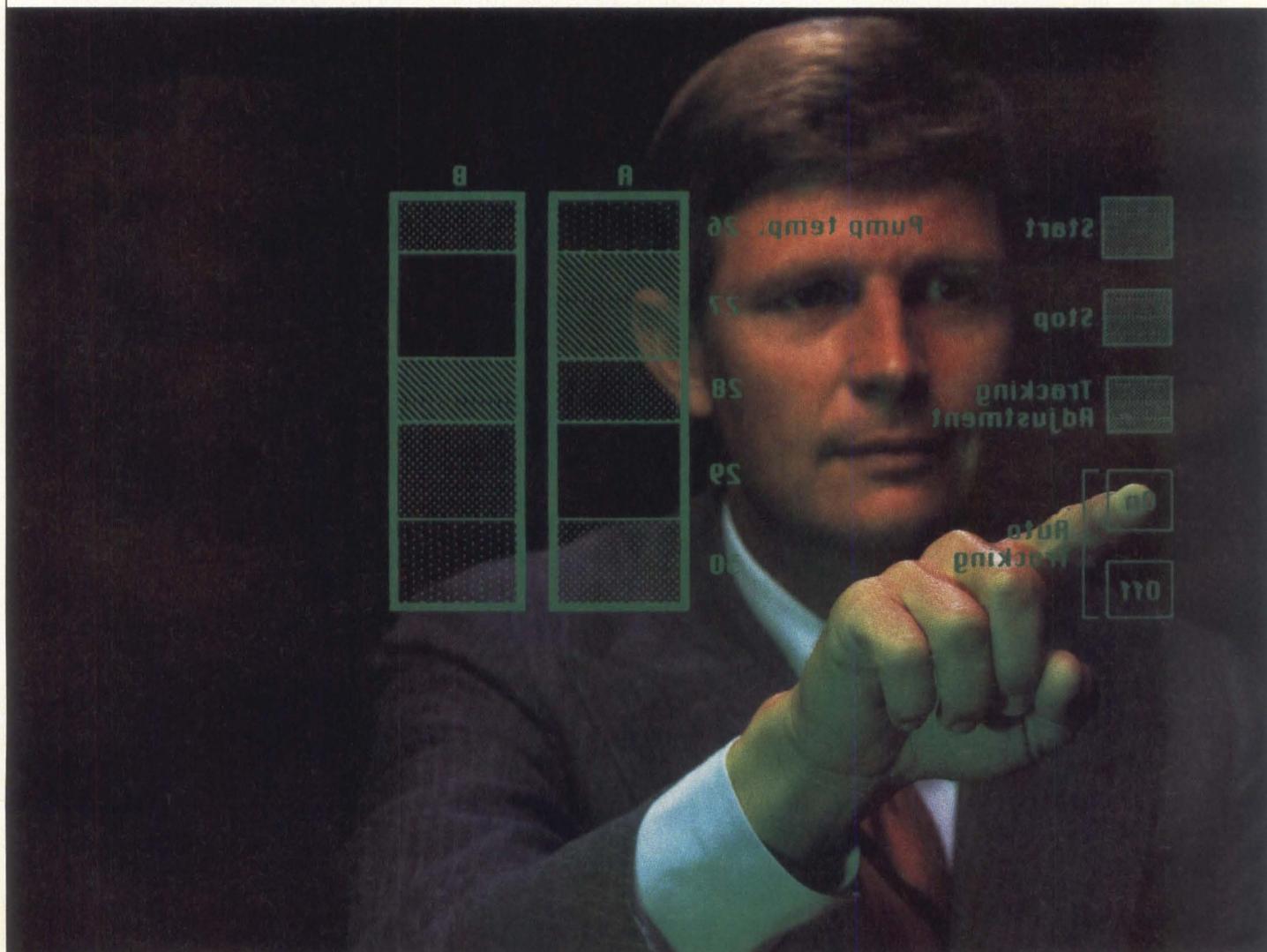
Which is the main reason Carroll Touch completely redesigned its line of touch input products.

We call it Smart-Frame™. Because it contains a powerful microprocessor built into the frame. And because it uses scanning infrared technology—a touch technology which is incredibly reliable, rugged, accurate, and fast. A technology Carroll Touch pioneered and refined.

As a result of the Smart-Frame design, Carroll Touch units contain 45 percent fewer components than before. Which means the cost to you is about 50 percent lower too.

We think that's pretty smart. And Carroll Touch did it just so you could get in touch. Today.

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Round Rock, Texas 78680  
512/244-3500, Telex 881906



CIRCLE NO. 98 ON INQUIRY CARD



### Software diagnoses problems

- Operates on IBM PC
- Requires 128K bytes
- Uses three disks

Trigger software monitors key business performance areas, identifies exceptions to performance guidelines and issues memos, identifying problems, causes and corrective action. The three program application disks included in the software meet

the user's needs, update data and generate action reports. The software comes with a proprietary training program and operates on an IBM PC or PC-compatible with 128K bytes of memory and dual disk drives. Applications include sales quotas, administrative indicators, manufacturing processes and marketing strategies. \$495. **Thoughtware Inc.**, Suite 1000A, 2699 South Bayshore Drive, Coconut Grove, Fla. 33133, (305) 854-2318.

Circle 320

### CAD package works with PCs

- Three-dimensional
- Interactive menus
- Relational database

A computer-independent,

mechanical computer-aided design package, Supercads, suits the IBM PC/XT and PC-AT personal computers, the DEC VAX or the ELXSI Super Mini and creates a three-dimensional model on the screen using construction primitives. All drawings are automatic; scaling is from one to 1,000,000. Standard viewing capabilities include six orthographic views and an isometric view and the ability to rotate an object or model on the X, Y and Z axes. Four different objects can be viewed simultaneously. The software package also features dynamic interactive menus and relational database support. \$15,000 per year per user. **Tasvir Corp.**, 2490 Charleston Road, Mountain View, Calif. 94043, (415) 969-5602. **Circle 321**

### Debuggers work with assembly

- Symbolic debugging
- Breakpoint capabilities
- Multiple windows

Pfix 86, a dynamic debugger, and Pfix 86 Plus, an enhanced version, find use in systems based on the Intel 8088/8086 family of microprocessors running PC-DOS and MS-DOS operating systems. Pfix 86 works with assembly or high-level programming languages in an MS-DOS environment. It features a multiple-window display, breakpoint settings, current machine register, stack contents and support of single-keystroke tracing. Advanced capabilities include permanent and temporary breakpoints, which can be set in the code window with one

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keystroke. An in-line assembler allows temporary patches. Pfix 86 Plus offers symbolic debugging of overlaid programs when used with the proprietary Plink 86 linkage editor. \$195, Pfix 86; \$395, Pfix 86 Plus. **Phoenix Computer Products Corp.**, Suite 220, 1416 Providence Highway, Norwood, Mass. 02062, (617) 762-5030.

Circle 322

### Software integrates seven functions

- 9,600 baud
- 100 help screens
- Two levels

Integrating seven functions into one program, the Integrated 7 software program for personal computers features a



relational database management system with as many as 100,000 records per file. Level one is quick-analysis graphics; level two is presentation-level graphics. The other five include a 256-column-by-2,047-row spreadsheet; datamail that includes 100,000 customized documents; a word processor with a 35,000-word dictionary; 9,600-baud-rate communications and emulation of DEC VT52, VT100, IBM 3101 and

similar terminals. The software package provides over 100 on-line help screens and an audio tutorial. It runs on an IBM PC with two disk drives or on an IBM XT, 320K bytes of RAM and monochrome or color monitors. \$695. **Mosaic Software Inc.**, 1972 Massachusetts Ave., Cambridge, Mass. 02140, (617) 491-2434.

Circle No 323

### Development tool converts VAX

- PL/M-86 compiler
- Debugs 8086 units
- Object-code linker

The integrated PL/M-96 microprocessor software development tool, REX-PLM/

86, converts VAX host computers under VMS or UNIX operating systems into a multiuser engineering system for developing, testing and debugging 8086, 8087 and 8088 microprocessor-based products. It includes a PL/M-86 compiler that implements an Intel ASM-86 compatible macro assembler package which, in turn, contains an 8086/87/186 structured macro assembler, object-code linker, locator and object-code librarian. The PL/M compiler and cross assembler produce Intel-compatible object-code modules (OMF) with optional symbolic debug information. \$14,750. **Systems and Software Inc.**, C-11, 3303 Harbor Blvd., Costa Mesa, Calif. 92626 (714) 241-8650.

Circle 324

# There is a band printer that operates at an acoustic noise level of 55dBA.

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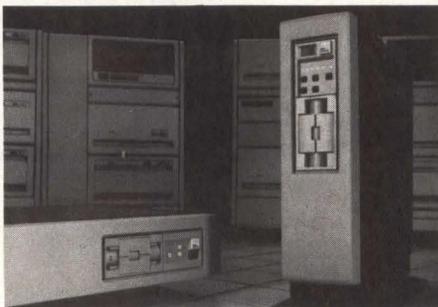
CIRCLE NO. 101 ON INQUIRY CARD

# UNITRONIX distributes DIGITAL computers

As a member of Digital Equipment Corporation's network of independent computer distributors, Unitronix can define your needs and help you choose the right Digital computer system for your company. Best of all, Unitronix provides fast delivery of your Digital computer from our multi-million dollar inventory.

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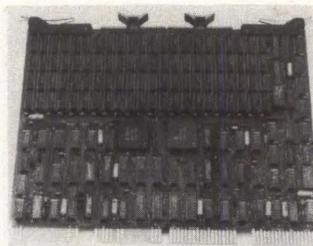
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CIRCLE NO. 102 ON INQUIRY CARD

## NEW PRODUCTS SUBASSEMBLIES



### Board provides error correction

- Q-bus compatible
- 128K to 2M bytes
- Control status register

The CI-1173-EDC memory board for Q-bus compatible systems, particularly the LSI-11/73 and Micro-VAX, offers double-bit error detection and single-bit error correction. Memory configurations range from 128K bytes to 2M bytes; each module consumes one quad slot in the Q-bus backplane. The board starts and stops addresses on any 16K-byte boundary in the 0-to-4M-byte address range. Key features include memory protect logic and battery backup power. A control status register, addressable anywhere in a 4K I/O map, allows instant memory status and location of any failing RAM. \$1,395, 512K-byte version; \$3,395, 2M-byte version. **Chrislin Industries Inc.**, Computer Products Division, 31352 Via Colinas, #101, Westlake Village, Calif. 91362, (818) 991-2254.

Circle 325

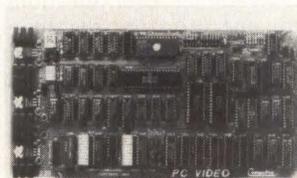
### Controller works with VMEbus

- Caching scheme
- 24M-bps data rates
- 12K-byte buffer

The V/SMD 3200, a Storage Module Device (SMD) disk controller for the VMEbus, supports 32-bit data transfers and 32-bit addressing. The controller implements a "virtual buffering" architecture whereby its 68000 microprocessor con-

trols 12K bytes of buffer space. Two bipolar state machines control disk-to-bus and bus-to-operating system transactions. A 1:1 interleave and an intelligent caching scheme assist throughput. The controller addresses the disk by physical or logical sectors, acts as bus master, allows for one to seven software-programmable interrupt levels, provides strap-selectable bus priority and supports disk data rates to 24M bps. \$2,750. **Interphase Corp.**, 29525 Merrell Road, Dallas, Texas 75229, (214) 350-9000.

Circle 326



### Board creates color graphics

- Motorola controller
- 24-bit addressing
- 16K-byte CMOS RAM

The IBM PC-compatible PC Video Board produces color graphics in the IEEE 696/S-100 bus environment while running under the proprietary Concurrent DOS 8-16 operating system. Based on a Motorola 6845 video display controller, the board comes with 16K bytes of static CMOS RAM, 24-bit memory addressing and 16-bit addressing for I/O ports. In color display mode, the graphics screen offers 160 horizontal by 200 vertical pixels in 16 colors, 320 horizontal by 200 vertical pixels in four colors or 640 horizontal by 200 vertical pixels in one color and black. The alphanumeric screen displays 80 normal or 40 double-width columns by 25 lines. In monochrome display mode, the graphics screen generates 320 or 640

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Senior Vice President  
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Consider that our M304X series band printers are extremely reliable. Easy to use and service. And so quiet they don't have to be banished to an inaccessible corner in the computer room.

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MODEL	LPM (64 char. set)	MTBF (HRS)	SIZE (H x W x D)	NOISE (dBA)
M3040	300	6,000	41.7 x 26.8 x 35.4	55
M3041	600	6,000	41.7 x 26.8 x 35.4	55
M3042	900	4,000	41.7 x 26.8 x 35.4	55
M3043	1200	4,000	41.7 x 26.8 x 37.8	55

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### MCG Data Line Protectors **stop** "transients" from causing downtime and costly equipment failure.

High voltage transients, caused by lightning, by switching surges, relays, solenoids, and heavy machinery, etc. can be coupled into data lines directly. High voltage transients cause immediate and cumulative damage to semiconductor junctions that results in equipment failure. A direct lightning strike even many miles away can do serious damage.

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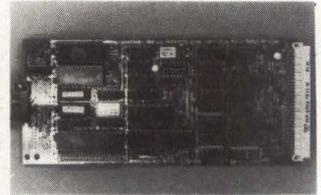
Protection you can depend on

CIRCLE NO. 88 ON INQUIRY CARD

## NEW PRODUCTS SUBASSEMBLIES

horizontal by 200 vertical pixels. \$495. **CompuPro**, 3506 Breakwater Court, Hayward, Calif. 94545, (415) 786-0909.

Circle 327



### Tape controller links IBM PCs

- QIC-24 recording format
- 16-bit CRC
- Suits 1/4-inch drives

Based on the VD24C02 read/write formatter chip, the WD1036-WX2 tape controller links the industry-standard QIC-36 streaming tape interface to the IBM XT, -AT, and PC system bus. It conforms to the QIC-24 recording format and supports 1/4-inch streaming tape drives. The board measures 3.9 inches by 13.1 inches and performs read-after-write verification and includes a 16-bit cyclic redundancy check (CRC) for error recovery. Command-set software backs up and restores files from Winchester to tape and vice versa on the IBM system bus. The unit contains an on-board 2-byte buffer for potential latency on the system bus. \$295. **Western Digital Corp.**, 2445 McCabe Way, Irvine, Calif. 92714, (714) 863-0102.

Circle 328

### Interface aids display systems

- 32 graphics characters
- Dual display memory
- Double-width Eurocard

Allowing OEMs to implement custom display systems connected to Intel's Bitbus distributed-control network, the dDCM100 CRT display controller serves data-acquisition, process-control, plant-automation and robotics applications. The single-height, double-width Eurocard offers a serial interface, 32 block-graphics characters, dual 80-by-25-character display memory, CRT timing and refresh

circuitry and Intel's integrated RMX 51 display interface task. Each display page is independently cursor-addressable with four cursor types and supports auto wrap-around and scroll and non-scroll display modes. Field attributes include blinking, reverse video, highlight or underline. \$686, three weeks ARO. **Datam Ltd.**, 148 Colonnade Road, Nepean, Ontario, K2E 7J5, Canada (613) 225-5919.

Circle 329

### Processor handles fast communications

- 68000 microprocessor
- DMA controller
- 16 full-duplex channels

Relieving input/output congestion in a 68000/UNIX environment, this I/O processor handles data bursts of 9600 baud on 16 full-duplex asynchronous serial data channels. Synchronous data rates to 1.5M baud are possible on two on-board full-duplex channels. The processor includes a 4-channel DMA controller, buffer memory and two programmable synchronous communication channels. It occupies a dual-width Q-bus circuit board that couples with dual-width option cards via an expansion bus. Asynchronous lines are RS423- and RS232-compatible; synchronous lines are RS422- or RS423/RS232-compatible. The unit integrates with the REGULUS real-time, UNIX-compatible operating system. \$2,345. **Alcyon Corp.**, 8716 Production Ave., San Diego, Calif. 92121, (619) 578-0860.

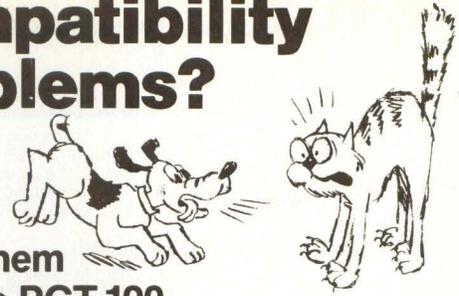
Circle 330

# CALENDAR

## MAY

- 1 Yates Perspective on AT&T, IBM and UNIX: Desktop Directions**, Red Lion Inn, San Jose, Calif., sponsored by Yates Ventures. Contact: Glenn Chase, Yates Ventures, Suite 201, 3350 W. Bayshore Road, Palo Alto, Calif. 94303, (415) 424-8844.
- 1-2 Kansas Information Expo**, Century II Exhibition Hall, Wichita, Kan., sponsored by Wichita Chapter, Data Processing Management Association; managed by Industrial Presentations West Inc. Contact: Industrial Presentations West, 12371 E. Cornell Ave., Aurora, Colo. 80014, (303) 696-6100.
- 6-8 "Introduction to Design of Fault-Tolerant Microcomputer Systems" Course**, The Wisconsin Center, Madison, Wis., offered by the University of Wisconsin—Extension. Contact: William C. Dries, University of Wisconsin—Extension, Department of Engineering and Applied Science, 432 N. Lake St., Madison, Wis. 53706, (800) 262-6243.
- 6-9 COMDEX Spring '85**, Georgia World Congress Center, Atlanta Apparel Mart, Atlanta, presented by The Interface Group Inc. Contact: The Interface Group Inc., 300 First Ave., Needham, Mass. 02194, (617) 449-6600.
- 7-10 "16-Bit Microprocessors" Course**, Toronto, sponsored by Integrated Computer Systems. Contact: Ruth Dordick, Integrated Computer Systems, 6305 Arizona Place, P.O. Box 45405, Los Angeles, Calif. 90045, (213) 417-8888.
- 8-10 "Artificial Intelligence and Expert Systems" Course**, Georgia Institute of Technology, Atlanta, sponsored and conducted by the Department of Continuing Education, Georgia Institute of Technology. Contact: Dee Ann Pickering, Department of Continuing Education, Georgia Institute of Technology, Atlanta, Ga. 30332, (404) 894-2547.
- 8-10 Integrated Services Digital Network/Future Networks '85**, Claridge Hotel and Casino, Atlantic City, N.J., sponsored by Information Gatekeepers Inc. Contact: Joan Barry, Conference Director, Information Gatekeepers Inc., 214 Harvard Ave., Boston, Mass. 02134, (617) 232-3111.
- 8-10 Personal Computer Exposition/Conference**, Montreal Convention Centre, Montreal, sponsored by Personal Computer Association, Canada, in conjunction with Personal Computer Association, U.S.A. Contact: Industrial Trade Shows Inc., 20 Butterick Road, Toronto, Ontario M8W 3Z8, Canada, (416) 252-7791.
- 8-10 "X.25 and Packet Switching Networks" Course**, Holiday Inn Westwood, Los Angeles, sponsored by

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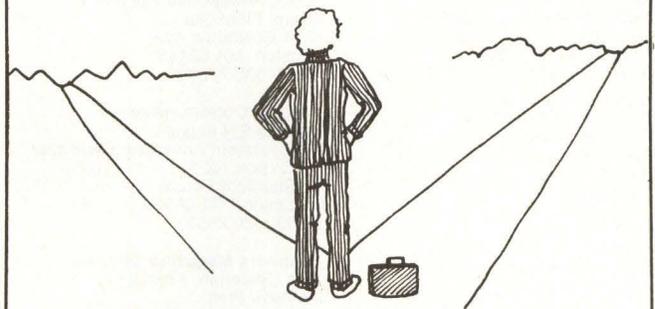


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- 13-15 Expert Systems and Their Applications Conference and Exhibition**, Avignon, France, sponsored by Agence de l'Informatique. Contact: Jean-Claude Rault, Agence de l'Informatique, Tour Fiat-Cedex 16, 92084 Paris-La-Defense, France, (1) 796.43.21.
- 14-15 California Computer Show**, Hyatt Hotel, Palo Alto, Calif., sponsored by Norm De Nardi Enterprises. Contact: Norm De Nardi Enterprises, Suite 204, 289 S. San Antonio Road, Los Altos, Calif. 94022, (415) 941-8440.
- 14-17 AUTOMAN '85**, Birmingham Exhibition Center, Birmingham, England, sponsored by Cahners Exposition Group. Contact: Tom Cox, Clapp & Poliak International, 7315 Wisconsin Ave., P.O. Box 70007, Washington, D.C., 20088, (202) 657-3090.
- 14-17 The National Database and 4th Generation Language Symposium**, Arlington Park Hilton, Chicago, sponsored by Software Institute of America Inc. Contact: Kristin Kittle Lynch, Operations Coordinator, Digital Consulting Associates Inc., 6 Windsor St., Andover, Mass. 01810, (617) 470-3870. Also to be held on June 17-20, New York.
- 19-21 Document-Based Optical Memories Conference**, Holiday Inn, Monterey, Calif., sponsored by the Institute for Graphic Communication Inc. Contact: Richard D. Murray, Director of Conferences, Institute for Graphic Communication Inc., 375 Commonwealth Ave., Boston, Mass. 02115, (617) 267-9425.
- 20-22 "Commercial Artificial Intelligence: Myths and Realities" Conference**, Century Plaza Hotel, Los Angeles, sponsored by Gartner Group Inc. Contact: Lynn M. Bentley, Gartner Group Inc., 72 Cummings Road, P.O. Box 10212, Stamford, Conn. 06904, (203) 964-0096.
- 21-22 1985 Trends and Applications Conference: Utilizing Computer Graphics**, Sheraton N.W. Washington, Silver Spring, Md., sponsored by The IEEE Computer Society and National Bureau of Standards. Contact: Mark Skall, Conference Chairman, National Bureau of Standards, Technology Building, Room A-265, Gaithersburg, Md. 20899, (301) 921-2431.
- 23 "Distributed Data Switching" Seminar**, New York, sponsored by Timeplex Inc. Contact: William A. Flanagan, Public Relations Manager, Timeplex Inc., 400 Chestnut Ridge Road, Woodcliff Lake, N.J. 07675, (201) 930-4600. Also to be held on June 13, San Diego, Calif., and on July 18, Washington, D.C.

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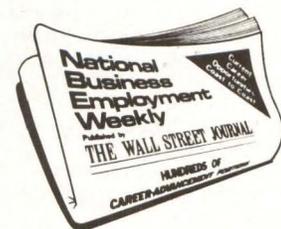
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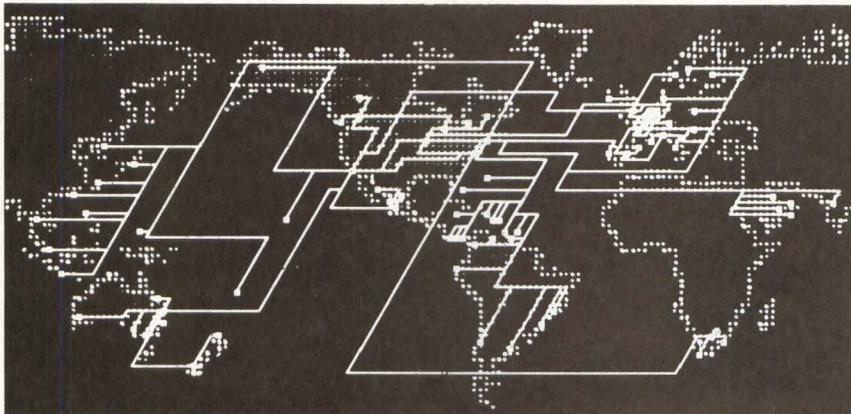
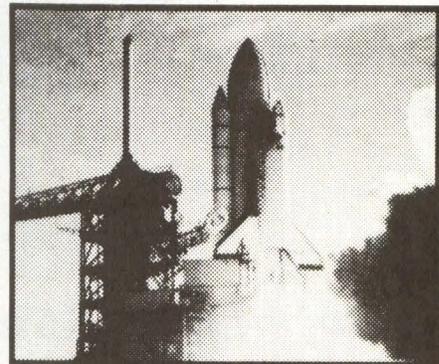
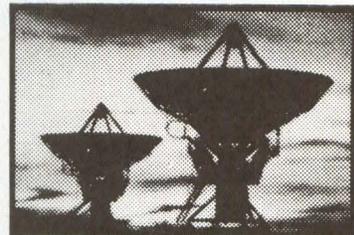
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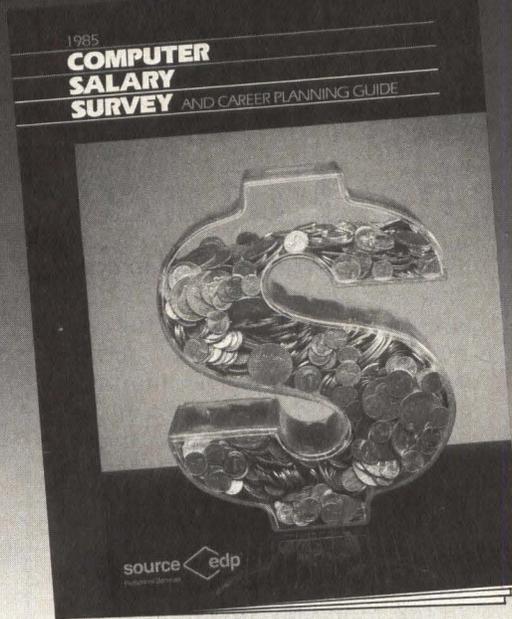
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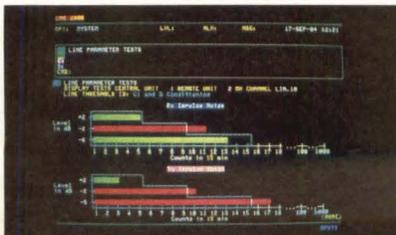
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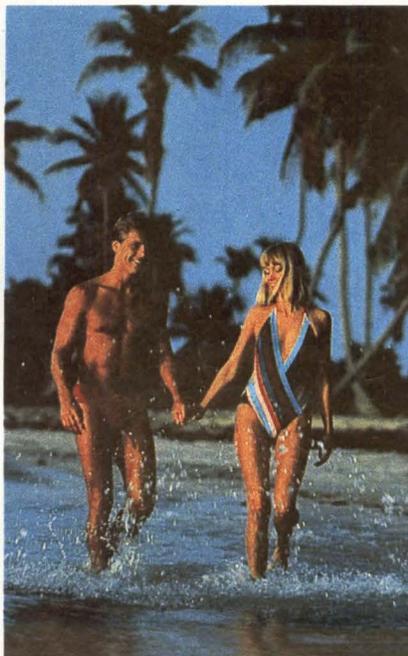
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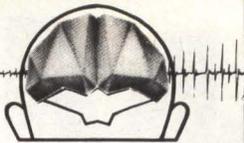
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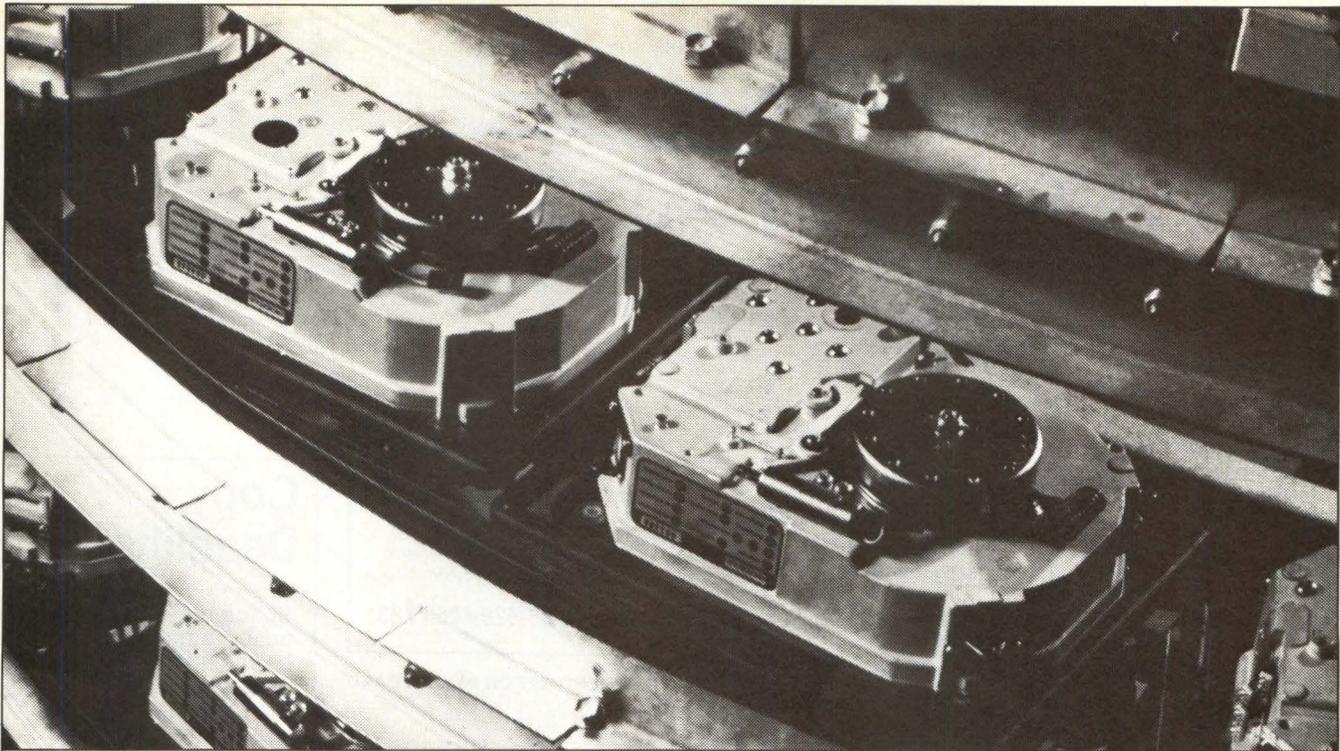
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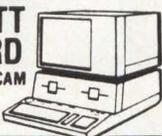
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# SYSTEM INTEGRATORS' NOTEBOOK

*Tips that make dollars and sense*

## TAKE ADVANTAGE OF PC'S SECOND PARALLEL PORT

Carl Warren, Western Editor

End users and system integrators say they sometimes need a second parallel port on the IBM Corp. PC and compatibles. Although adding the second port is as easy as plugging in an extra board, directions for using the port aren't spelled out anywhere.

It's not surprising that none of the early-generation application software takes into account the availability of a second port. Thus, users are faced with diving into the internals of the application code to make the switch (i.e., to take advantage of a second port). The problem is that making the switch from one parallel port to another inside the program means, unfortunately, that the output will always go to the hard-coded port.

Word processing is an application in which using two parallel ports might be important. For example, port one (denoted as "LPT1:" in a PC) could be connected to a draft-quality printer. Port two (denoted as "LPT2:") might have a letter-quality printer attached. Of course, if you're using a serial printer, the problem solves itself.

To take advantage of the second port, install all applications to address LPT1:. On boot-up, the system always checks what's available and assigns ports. The printer port locations, which are defined in the ROM BIOS, are discussed in the IBM technical reference manual on Pages 5 to 25. They are located in segment 40 at hex 8, 9, A and B. The system puts the first parallel port it finds at 8 and 9 and the next one (LPT2:) at A and B. The trick is to swap them.

Do so by entering the following BASIC program:

```
5 REM define the segment location
10 DEF SEG = &H40
15 REM find the contents of the ports
20 A = PEEK (&H8) : B = PEEK (&H9)
30 C = PEEK (&HA) : D = PEEK (&HB)
35 REM now swap them
40 POKE &H8,C : POKE &H9,D
50 POKE &HA,A : POKE &HB,B
```

The program will work itself backward on the next run, thus returning the ports to a normal (boot-up) state. With the switch in place, any program installed for LPT1: will output to LPT2:. You can combine this switch program with DOS batch files to invoke the program automatically.

Here's a way to perform a redundant task, such as changing file attributes, on a computer system. The pro-

gram listed below demonstrates a method of taking the output of a file and converting it for use by a BATCH file.

```
100 'carl's fixer
1000 OPEN "zork" FOR INPUT AS #1
1010 OPEN "zork.bat" FOR OUTPUT AS #2
1020 TEXT$ = ""
1100 WHILE MID$(TEXT$,1,2) <> ". ."
1110 LINE INPUT #1,TEXT$
1120 WEND
2000 IF EOF(1) THEN CLOSE : END
2005 LINE INPUT #1,TEXT$
2010 PTR = 1 'pointer into the text
2020 PRINT TEXT$
2025 GOSUB 9000 'skip to next space
2030 OUTPUT$ = MID$(TEXT$,1,PTR-1)
2040 GOSUB 8000 'FIND NEXT NON SPACE
CHARACTER
2050 BEGIN = PTR
2060 GOSUB 9000 'SKIP TO NEXT SPACE
2070 OUTPUT$ = OUTPUT$ + ". ." +
MID$(TEXT$,BEGIN,3)
3000 PRINT #2,"ALTER" + OUTPUT$ + "/n"
3005 PRINT OUTPUT$
3007 PRINT
3010 GOTO 2000
8000 'subroutine to skip over space and find a character
8010 IF MID$(TEXT$,PTR,1) <> ". ." THEN RETURN
8020 PTR = PTR + 1
8030 GOTO 8010
9000 'subroutine to skip to next space
9010 IF MID$(TEXT$,PTR,1) = ". ." THEN RETURN
9020 PTR = PTR + 1
9030 GOTO 9010
```

The file ZORK is created by directing the output of the directory to the file name ZORK using: DIR > ZORK. This file now becomes the input for the process file, and the result—called ZORK.BAT—is created as file 2, on which most of the work is done.

Essentially, the program reads the contents of ZORK, removes all excess information relating to a directory and adds an attribute change by attaching a backslash and the attribute code (/N). In this case, the attribute code is N for normal so the files in the directory are put into a read/write status. The ALTER program is public domain software that allows the setting and changing of file attributes.

Once you've run the BASIC program, the next step is to execute the resultant batch file by typing ZORK. The process of changing the file status is then automatic.

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# MARKET TRACK

**Sharon Hassell**  
Assistant Editor

## Sevenfold shipment surge seen for interface devices

The workstation interface device industry, a \$131 million market in 1983, will experience a sevenfold shipment increase by 1989, according to a recent study by International Data Corp. (IDC), Framingham, Mass. By the end of 1989, over 40 million interface devices, including data tablets, desktop digitizers, joysticks, light pens, mice, speech-recognition systems and trackballs, will be used in the United States, with annual shipments totaling \$962 million.

Expected product-line extensions for traditional vendors, keyboard integration and increased emphasis on end-user needs will be the major factors influencing the interface device market surge, says IDC.

Although the mouse has been a popular interface device, small data tablets integrated into keyboards will claim the largest share of the device market, the report says. According to IDC, data tablet advantages over the mouse include lower cost, a smaller footprint, suitability for portable computer use and less arm and hand motion needed for cursor control and pointing.

The study also includes market analysis of workstation interfaces used with personal computers, graphics workstations, data terminals and point-of-sale applications.

## Briefcase-sized computers to dominate portable market

Although 1984 sales of briefcase-sized personal computers, at \$300 million, were less than those of either hand-held or suitcase-sized portables, briefcase-sized computers will dominate the \$12 billion portable computer

market in 1990, says a report by Market Intelligence Research Company (MIRC), Palo Alto, Calif. At \$8.5 billion, or 70 percent of the total portable computer market, briefcase-sized computers will top sales of both hand-held and suitcase-sized units at \$2 billion and \$2.5 million, respectively, by 1990.

Expected to increase at an annual rate of 75 percent between 1984 and 1990, the briefcase-portable market will be the fastest growing segment of the portable computer industry. According to MIRC, this increase will result from the increased use of CMOS technology, which demands less electricity.

## Sales to reach \$45 billion in office-equipment industry

Sales of office-automation equipment, totaling \$28.8 billion in 1984, are expected to reach almost \$45 billion by 1990, according to a study by International Resource Development Inc. (IRD), Norwalk, Conn. Areas covered in the study deal with private automatic branch exchanges and local area networks, text-generation, text-reproduction, text- and data-processing, information storage and communications.

Although total sales will increase almost 35 percent, text-generating equipment and several components within other equipment categories will experience a decline in sales over the forecast period. For example, copiers, which will experience a 4 percent decrease by 1990, will gradually be replaced by intelligent copiers/printers, of which unit shipments will grow from zero in 1984 to 7.5 million in 1990.

The top 31 vendors discussed in the study represent a combined total of \$21 billion in office-equipment sales in 1984, or about 84 percent of the total office-automation market. Projected 1990 figures are not listed in the study. According to IRD, IBM Corp., Xerox

### OFFICE AUTOMATION EQUIPMENT SHIPMENTS

Type of equipment	1984-1990 (\$ millions)	
	1984	1990
<b>PABX and LAN equipment</b>		
PABX	\$ 2,710	\$ 2,885
LAN	300	200
<b>subtotal</b>	<b>3,010</b>	<b>3,085</b>
<b>Text generating equipment</b>		
office typewriters	970	495
office dictation	152	61
OCR page readers	28	9
<b>subtotal</b>	<b>1,150</b>	<b>565</b>
<b>Text reproduction equipment</b>		
copiers	8,095	8,470
duplicators	250	105
phototypesetters	120	95
intelligent copiers/printers	0	7,500
<b>subtotal</b>	<b>8,465</b>	<b>16,170</b>
<b>Text and data processing equipment</b>		
personal computers	7,000	3,750
word processors	3,600	2,890
personal workstations	0	7,000
<b>subtotal</b>	<b>10,600</b>	<b>13,640</b>
<b>Information storage equipment</b>		
micrographics	310	300
electronic storage systems	1,855	6,220
<b>subtotal</b>	<b>2,165</b>	<b>6,520</b>
<b>Communications equipment</b>		
key systems	1,890	2,110
telephone sets	900	1,325
facsimile transceivers	425	730
integrated voice/data terminal	120	420
teleprinters	95	90
<b>subtotal</b>	<b>3,430</b>	<b>4,675</b>
<b>Total</b>	<b>\$28,820</b>	<b>\$44,655</b>

SOURCE: INTERNATIONAL RESOURCE DEVELOPMENT INC.

Corp., Wang Laboratories Inc., AT&T Information Systems and Canon U.S.A. Inc. are the top five suppliers in the office-equipment market in terms of revenue. □

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# ARTFUL INTELLIGENCE

By John K. Young

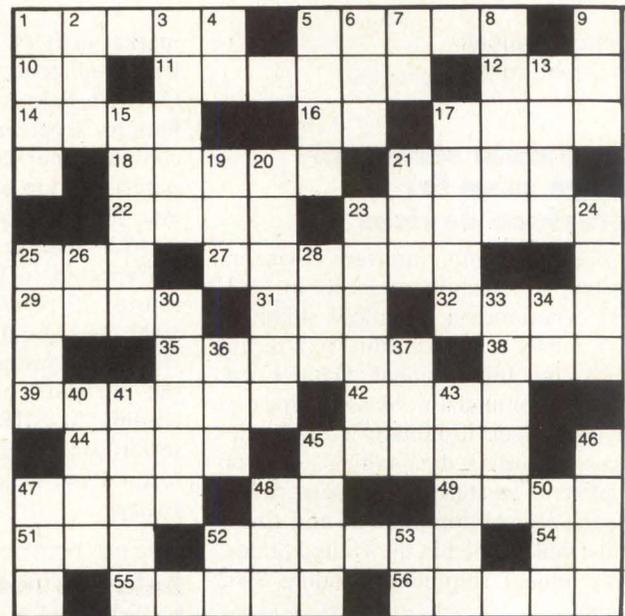
ACROSS

- 1 Repeat a set of operations
- 5 Data transfer speeds
- 10 Scottish "one"
- 11 Computer data entries
- 12 Trigonometric function
- 14 Source of a condition
- 16 French "the"
- 17 Printer output copy
- 18 Crudely built cabin
- 21 Was a stool pigeon
- 22 Options list
- 23 Display segment on monitor
- 25 Last day of work week (Abb.)
- 27 Kind of oil that forms hard but elastic solid
- 29 Peruvian tribe
- 31 How hacker feels with computer in repair shop
- 32 Do this to your file frequently
- 35 Farmer
- 38 Command
- 39 Feat in which drawn shape is echoed in four places on screen
- 42 Hacker's handle
- 44 Appear
- 45 Founder of Ottoman empire
- 47 Kind of printer that does row of print in one high-speed operation
- 48 A continent (Abb.)

- 49 System software function
- 51 Adjective suffix
- 52 Solution to slow-printer problem
- 54 Prefix meaning "early part of period"
- 55 Switches back and forth between two resident screens
- 56 Install on something

DOWN

- 1 Printed-circuit board
- 2 Petty officer assigned to clerical duty: \_\_\_ \_\_\_ man
- 3 Bends easily
- 4 Printer's measure
- 5 How user groups buy disks to save money
- 6 Had a meal
- 7 You and me
- 8 Small table for monitor
- 9 Function
- 13 Jason's ship
- 15 Designating chemical compounds in which osmium has higher valence
- 17 Gets lost and stops computer completely
- 19 \_\_\_ \_\_\_ gate
- 20 Graphic symbol showing where next character will be displayed on CRT
- 21 Trigonometric function
- 23 What computer expertise does to your horizons
- 24 Small insect-eating bird



- 25 Thin \_\_\_ \_\_\_ \_\_\_ coating on magnetic disk
- 26 One who is registered to care for sick (Abb.)
- 28 Deviate from planned course
- 30 Are in harmony
- 33 Where the action is
- 34 If you've been here before, you have feeling of deja\_
- 36 Permanent computer memory
- 37 Opposite of 36-Down
- 40 Wife of Osiris
- 41 Gets temporary use of by paying fee
- 43 Machine code
- 45 Keep these bumblers away from your computer
- 46 Control chart
- 47 Statement
- 48 Have evening repast
- 50 Function
- 52 This college degree is no guarantee you'll be computer whiz
- 53 Symbol for emanation

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 W O N D T T T L T A T D F  
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| Base          | Dump       | Line   | Tape     |
| Bit           | Ergonomics | Macro  | Terminal |
| Bug           | Floppy     | Menu   | Tree     |
| Byte          | Format     | Mode   | Window   |
| Cache         | FORTTRAN   | Modem  | Reset    |
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| Data          | Interface  | Patch  | Split    |
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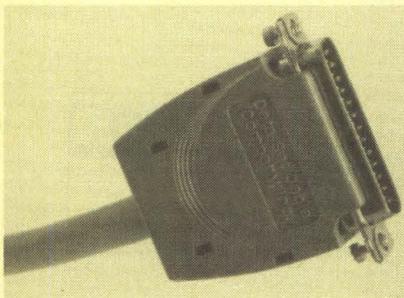
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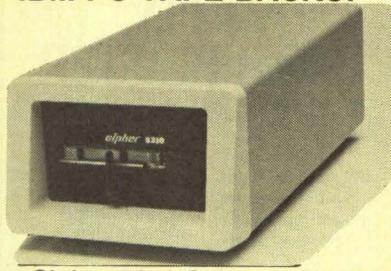
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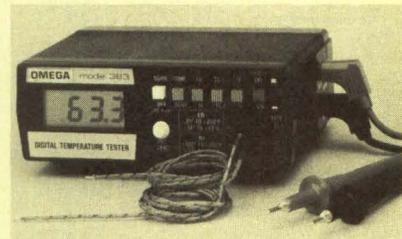


- Cipher 5210 Subsystem
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  - No Additional Card
  - \$1025<sup>00</sup> with 6 mos. warranty
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Complete temperature tester in one compact hand-held instrument. Features include 3" display, dual type J thermocouple inputs, differential/normal temperature mode, DC millivolt range, analog output. All these features and more in this unique instrument. Unit is supplied with 2 type J glass-braided thermocouples, test lead kit, 9v battery, and operator's manual. For more information, call 203/359-7613 or write **Omega Engineering**, One Omega Drive, Box 4047, Stamford, CT 06907.

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DEC VAX, PDP-11, DG MV-Series, DG Eclipse, Apollo, UNIX Systems, IBM PC, Data General/ONE, HP 150, DEC Rainbow and others.

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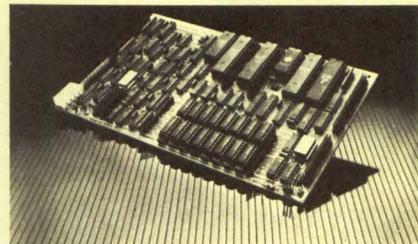
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## HIGH PERFORMANCE Z-80 SINGLE BOARD COMPUTERS

Available with either Z-80A or Z-80B CPU, 64-256K RAM, 2-64K ROM or EPROM, 2 or 4 RS-232 serial ports, high speed bi-directional parallel port or an I/O expansion bus. All models have 5 1/4" & 8" disk controller and Centronics parallel printer port. SCSI port and RS-422 ports are also available. Private label systems available. IBM PC compatible coming soon. **DAVIDGE CORPORATION**, P.O. Box 1869E, Buellton, CA 93427 (805) 688-9598

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# Micromate

CP/M 3.0 COMPUTER



System or Board Level to suit your application



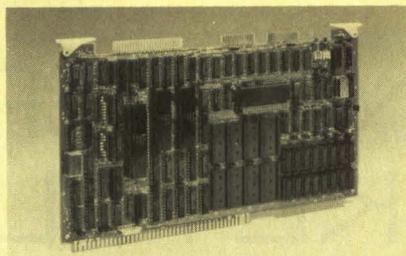
- Use with RS 232C terminals
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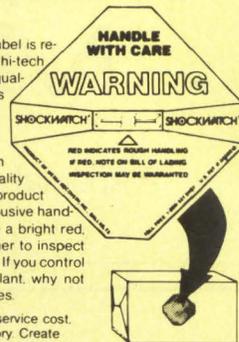
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In addition to 10 MHz, the NEW MBx8000 SBC features a single width SBX connector for adding standard expansion modules, such as the SBSxFDC Floppy Controller. MBx8000 maintains all the capabilities of its predecessor, the MB8000: Z8001/Z8002 CPU 4/6/10 MHz; 32K/128K/512K DRAM; up to 48K static RAM or EEPROM: up to 128K EPROM; 2 RS-232 ports; 40 parallel I/O lines; six 16-bit counter-timers; etc. Z8000™ Zilog. SINGLE BOARD SOLUTIONS, 7669 Rainbow Drive, Cupertino, CA 95104. (408) 253-0181

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## THE RSX/VMS SPECIALISTS

THE LSI-11/73 BASED CM-300/Q22 COMPUTER SYSTEMS WITH RSX-11M+ SUPPORTING SUPERVISOR-MODE LIBRARIES AND SEPARATE I AND D SPACE

THE MICRO-VAX I BRINGS VAX POWER AND HIGH PERFORMANCE TO THE Q-BUS

CM-300/Q22 computer systems are configured with DEC's LSI-11/73 CPU, giving these systems 11/70 PERFORMANCE AT LSI-11 PRICES. CM-300/Q22 systems can be configured with up to 1200MB of fixed Winchester disk, up to 4MB of main memory and up to 64 terminals. System back-up is provided by an industry standard 9 track 1/2" 1600 BPI tape drive. Optional software packages include Automatic Date/Time for RSX, Memory Assisted Disk, Cached Pseudo Disk, Memory Dump, Mail List RSX, accounting software, FORTRAN 77, FMS-11, BASIC +2 and DATARETRIEVE. An LSI-11/73 based 300MB system including RSX-11M+ license, media and documentation, with a VT220 terminal may be purchased for \$23,033.

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Call A.C.S. and let us configure a hardware/software solution for your specific problems.

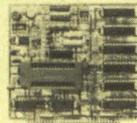


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Waltham, Massachusetts 02154  
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## 28 PIN PROM BLASTER WITH LIFETIME WARRANTY\*

Plugs into your IBM PC, XT or PPC and programs most 28 pin EPROMs. Includes the following features:



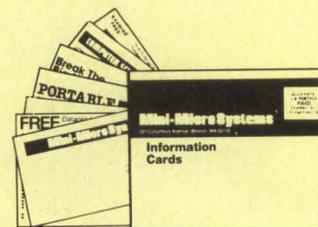
- Menu Driven • Edit function for the data buffer • Moves systems memory into data buffer • Performs a check sum • Reads EPROM into data buffer. Will program the following EPROMS: • 2764 • 27128 • 27256 • 2764A • 27128A

OTHER APPARAT ADD-ONS: 24 Pin Prom Blaster, AT 3Mb. Combo Card, 512K RAM Card, 384K RAM/Clock, Hard Disk Subsystem, Add-on Disk Drive, Clock/Calendar, 256K RAM Card, Parallel/Serial Card for PPC, 128/384K Short Slot RAM Card for the PPC and more.



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## MINI-MICRO SYSTEMS DIRECT RESPONSE POSTCARDS

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## Advertise in the MINI-MICRO MARKETPLACE

Please run my advertisement in the following issues

### EFFECTIVE JANUARY 1985

1x	3x	6x	12x	18x
\$660	\$595	\$575	\$560	\$545
	24x	48x		
	\$525	\$505		

### MATERIALS

1. Glossy photo with 50-75 words.  
We will typeset your ad at no charge.
2. Camera ready artwork.
3. Film negatives: right reading emulsion side down.

AD SIZE: 2 1/4" x 3 1/16"

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_

ZIP \_\_\_\_\_

TELEPHONE \_\_\_\_\_

SIGNATURE \_\_\_\_\_

Space reservation by the first week of the month proceeding issue date.

- Materials enclosed  Materials to come  Please send information

Send to: Norma Lindahl, **MINI-MICRO SYSTEMS**  
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15% Agency commission to accredited agencies. Please specify agency.

## LINE PRINTER COMPARISON CHART

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

# This printout proves we out-print the competition.

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

barcode applications. Barcode applications are easily developed with optional graphics card.

Interfacing is not a problem either. RS232-C Serial, Centronics® and Dataproducts Parallel, and IBM-compatible interfaces accommodate most types of computer systems.

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

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

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