Xerox, Ventura campaign to press would-be publishers

SPECIAL REPORTS:
- UNIX
- Desktop publishing
- Ink-jet and thermal printers
Now everyone can afford advanced laser technology for fast, high-quality printing with the Laserline 6, available now from Hall-Mark.

The Laserline 6 is a feature-rich alternative to models costing twice as much. First-time users will find it easy to set up and operate, and veterans of laser technology will appreciate its high performance.

15 resident fonts

The Laserline 6 comes standard with 15 built-in type-setting-quality fonts, using true boldface and italic for exceptional quality.

Compatible

The Laserline 6 is compatible with a wide variety of software, including Hewlett-Packard's LaserJet and Lasedet Plus.

Easy to use

All replaceable supplies feature snap-in installation and require no tools. The toner cartridge takes less than two minutes to change.

Outstanding paper handling

Up to 150 pages at a time can be stacked, and the pages are printed face down in proper order. Operators do not have to shuffle documents to get them out of reverse order after printing.

Call Hall-Mark today for a demonstration and more information on the Okidata Laserline 6 or any Okidata product. For outstanding service and delivery, Hall-Mark is the one.

* Provides Dickio® 630 API, EPSON® MX, IBM® Graphics Printer, NEC® 3550 and Qume® Sprint XI Emulations

CIRCLE NO. 1 ON INQUIRY CARD
How many more reasons do you need to Unplug your computer?

Until now, connecting 128 terminals to your computer meant one thing. A myriad of cards taking up precious space on the backplane. And accomplishing nothing but communications. All of which could frustrate almost any self-respecting system designer into hanging up his calculator.

Well, at Systech, we understand the serial communications problems of a multi-user system. So we developed The Unplug™ asynchronous distributed multiplexer that can be used with any Multibus®, VMEbus or Multibus® II system.

The Unplug can take those 128 connections off the back of the computer and turn them into just one. And presto, you've got all the expansion slots you need for more important things. Like disks. Streaming tapes. More CPU power. A synchronous communications processor. And your imagination.

You see, what we did was move part of the computer's operating system—the part devoted to managing traffic to and from the terminals—out of the computer and into The Unplug. Giving the host computer the freedom to concentrate on more important tasks.

When you're ready to expand, you simply run one cable from the last Unplug to the next. And you've hooked up 8 new users, without ever opening the computer cabinet.

We know it sounds simple. And the truth is, it is. In fact, you might wonder why no one thought of it before. Then again, no one else has our commitment to make your job easier. And a lot more gratifying.

Just give us a call at Systech to hook up with The Unplug. Then you can start figuring out what you want to add on next.

Instead of trying to figure out how to untangle all those wires.

Systech Corporation, 6465 Nancy Ridge Drive, San Diego, CA 92121, (619) 453-8970.

CIRCLE NO. 2 ON INQUIRY CARD

The Unplug.
An outlet for your frustrations.

© 1986 Systech Corporation. The Unplug patent pending.
The Workgroup Server™ Family:

There are only three primary colors. But by mixing and matching these three colors, an artist can create any color in the rainbow. This is the principle we've used in developing our computer solutions.

Standards. Enhancements. Connectivity. Convergent has put them all together in a family of Workgroup Servers that give resellers the leverage to solve a wide variety of specific problems.

We started with industry standards for hardware, operating systems, networking and software. Things like UNIX® System V, Motorola's 68000 microprocessor family, and VME and SCSI buses. The standards.

Then we enhanced these standards to give your customers increased performance and productivity. The simple windowing interface to UNIX is one example. Our fully integrated office automation package is another.

And finally, we went one step farther and connected our Workgroup Servers to a wide range of computers.

---

The S/320:
A 32-user system with optional VME expansion.

Third party packages like Ultra-Office from Lutzky-Baird enable you to connect Apple Macintoshes and IBM PCs to your Workgroup Servers.

With our PC Exchange™ software, Workgroup Servers connect heterogeneous LANs to share mail, file servers, print servers and common relational databases.

The S/640:
At 25 MHz, the S/640 is a processing powerhouse, supporting up to 64 users.

IBM PCs gain access to our UNIX databases through Multiplex®, a PC-UNIX interconnect.

---

See us at Uniforum Booth #1061  CIRCLE NO. 3 ON INQUIRY CARD
Where great systems converge.

from other vendors. Including IBM* PCs and compatibles, Apple* Macintoshes*, other UNIX-based systems and IBM minis and mainframes.

Sound interesting? There's one more thing.

Convergent offers a comprehensive VAR program to complement this strong product offering. Featuring the margins and support services you'd expect from a company exclusively dedicated to resellers.

With no cross-channel conflict.

Standards, enhancements, connectivity and a great VAR program. To find out more about these areas of opportunity, call us today at 1-800-832-2255, ext. 296.

In Europe, ring 44-3444-11707. Or write us: Convergent Technologies, 2700 North First Street, San Jose, CA 95150-6685, Mail Stop 10-015.

We'll help you find the end of the rainbow.

THE WORKGROUP SERVER FAMILY

<table>
<thead>
<tr>
<th></th>
<th>S/50™</th>
<th>S/120™</th>
<th>S/220™</th>
<th>S/320™</th>
<th>S/640™</th>
<th>S/1280™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Users</td>
<td>5</td>
<td>12</td>
<td>22</td>
<td>32</td>
<td>64</td>
<td>128</td>
</tr>
<tr>
<td>Max RAM</td>
<td>2 MB</td>
<td>5 MB</td>
<td>5 MB</td>
<td>16 MB</td>
<td>64 MB</td>
<td>24 + MB</td>
</tr>
<tr>
<td>Max Disk Storage*</td>
<td>80 MB</td>
<td>140 MB</td>
<td>280 MB</td>
<td>4.0 GB</td>
<td>4.0 GB</td>
<td>6 GB</td>
</tr>
<tr>
<td>Technology</td>
<td>10 MHz</td>
<td>12.5 MHz</td>
<td>12.5 MHz</td>
<td>12.5 MHz</td>
<td>25 MHz</td>
<td>4x16.67 MHz</td>
</tr>
<tr>
<td></td>
<td>68010 CPU</td>
<td>68020 CPU</td>
<td>68020 CPU</td>
<td>68020 CPU</td>
<td>68020 CPU</td>
<td>68020 CPU</td>
</tr>
<tr>
<td>MIPS</td>
<td>.75</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>4.25</td>
<td>8.8</td>
</tr>
</tbody>
</table>

*storage listed in unformatted capacities

The S/1280:
The most expandable system in the Workgroup Server Family. It uses multiple processors to support up to 128 users.

Our fully integrated WGS/Office* automation software includes a windowing interface, word processor, spreadsheet, calendar and electronic mail.

The S/220:
68020 performance for up to 22 users in a small package.

The S/320:
A "personal" UNIX system that doubles as a server for up to five users.

Convergent

When great ideas converge, great products emerge.
SWITCHING TERMINALS.

TERMINAL SWITCHING.

Get Connected With An Equinox Data PBX.

An Equinox Terminal Network lets you connect your terminal to any async RS-232 computer, modem or printer with a few keystrokes. No more cable swapping, A-B switches or moving between terminals.

Low-Cost, Easy Installation.
Equinox terminal networks cost under $100 per connection and are protocol transparent. “Plug and play” wiring accessories, menu-driven configuration and on-line “HELP” make installation a snap.

Network Growth With Compatible Products.
Whether you have a few terminals or thousands, we have a Data PBX to create the right size Terminal Network for your needs. And all of our Data PBXs are fully compatible, so they can be expanded and networked to accommodate growth and protect your investment.

Find out why thousands of terminal users rely on an Equinox Data PBX for terminal networking. For more information, an on-site demonstration or to find out about our 30-day no-risk free trial program,

Call 1-800-DATA-PBX.
In Florida call (305)255-3500.
Equinox Systems Inc.
12041 S.W. 144th Street
Miami, FL 33186-6108.

Equinox is a registered trademark of Equinox Systems Inc.

EQUINOX
Smart Connections For Dumb Terminals.

CIRCLE NO. 4 ON INQUIRY CARD
EXCLUSIVE

COVER STORY
Xerox Ventura campaign to press would-be publishers
Xerox desktop publishing series brings ease-of-use to IBM PCs

INTERPRETER

MINICOMPUTERS
IBM, Digital square off to capture “work-sharing” market
Tale of the tape for IBM’s mid-range contender

DATA STORAGE
High-capacity flexible disk drives invade low-end storage arena
Alternative storage solutions for system integrators

FEATURES

Government, IEEE favor POSIX interface
Software-transportability benefits of interface standard outweigh UNIX operating system shortcomings and pave way for POSIX acceptance

Desktop publishing: Sifting type from hype
Macintosh users have enjoyed desktop publishing benefits for more than a year. Now, powerful IBM PC packages have arrived. The big question is, “What can they really do?”

Scanners present maze of options
Driven by desktop publishing requirements, scanners are rapidly overcoming previous limitations, but the pathway to the right equipment still demands careful navigation

Improved color enhances nonimpacts
Color output joins better resolution and quiet operation to make ink-jet and thermal printers formidable contenders for high-quality, low-cost printing

Product table... Plotters

DEPARTMENTS

Editorial Staff
Letters
Breakpoints
New Products
Index to Advertisers
Mini-Micro Marketplace

Cahners Publishing Company: A Division of Reed Publishing USA • Specialized Business Magazines for Building and Construction • Computer Technology • Electronics • Food Packaging • Manufacturing Industries • Medical • Design & Publishing MINI-MICRO SYSTEMS (ISSN 0364-9342) is published monthly with additional issues in February, May and November by Cahners Publishing Company, a division of Reed Publishing USA, 275 Washington St., Newton, MA 02118. William M. Pratt, President; Terrence M. McDermott, Executive Vice President; Jerry D. North, Vice President of Publishing Operations; J.J. Walsh, Financial Vice President; Magazine Division; Thomas J. Deamaria, Vice President Production and Manufacturing; Edward V. Burkholder, Group Vice President. Copyright 1987 by Reed Publishing USA, a division of Reed Holdings Inc. Saul Goldwitz, Chairman; Ronald G. Siegel, President; and Chief Executive Officer. Circulation records are maintained by Cahners Publishing Company, 270 St. Paul Street, Denver, CO 80202. Second class postage paid at Denver, CO 80202 and additional mailing offices. Postmaster: Send address changes to MINI-MICRO SYSTEMS 270 St. Paul St., Denver, CO 80206. MINI-MICRO SYSTEMS is circulated without charge by name and title to U.S. and Western European-based corporate and technical management, systems engineers and other personnel who meet qualification procedures. Available to others at the rate of $6.50 per year in the United States, $8.00 in Canada and Mexico, $10.00 surface mail in all other countries, air mail surcharge $4.00 (6 issues). Special HAND BOOK issues, $15. Single issues, $6 in the United States; $8 in Canada and Mexico; $10 in all other countries.

Cahners Publishing Company • A Division of Reed Publishing USA • Specialized Business Magazines for Building and Construction • Computer Technology • Electronics • Food Packaging • Manufacturing Industries • Medical • Design & Publishing MINI-MICRO SYSTEMS (ISSN 0364-9342) is published monthly with additional issues in February, May and November by Cahners Publishing Company, a division of Reed Publishing USA, 275 Washington St., Newton, MA 02118. William M. Pratt, President; Terrence M. McDermott, Executive Vice President; Jerry D. North, Vice President of Publishing Operations; J.J. Walsh, Financial Vice President; Magazine Division; Thomas J. Deamaria, Vice President Production and Manufacturing; Edward V. Burkholder, Group Vice President. Copyright 1987 by Reed Publishing USA, a division of Reed Holdings Inc. Saul Goldwitz, Chairman; Ronald G. Siegel, President; and Chief Executive Officer. Circulation records are maintained by Cahners Publishing Company, 270 St. Paul Street, Denver, CO 80202. Second class postage paid at Denver, CO 80202 and additional mailing offices. Postmaster: Send address changes to MINI-MICRO SYSTEMS 270 St. Paul St., Denver, CO 80206. MINI-MICRO SYSTEMS is circulated without charge by name and title to U.S. and Western European-based corporate and technical management, systems engineers and other personnel who meet qualification procedures. Available to others at the rate of $6.50 per year in the United States, $8.00 in Canada and Mexico, $10.00 surface mail in all other countries, air mail surcharge $4.00 (6 issues). Special HAND BOOK issues, $15. Single issues, $6 in the United States; $8 in Canada and Mexico; $10 in all other countries.
The Intelligent AT™ Expansion for OEMs

Sigma Designs again leads the way with the industry's first intelligent AT expansion chassis specifically for OEMs and system integrators.

Designed for industrial performance, Sigma Designs' AT Expansion Chassis has both the intelligence and the flexibility needed to configure systems for factory control, graphics workstations, instrumentation and other applications, including multi-user.

Shielded cables insure data integrity, and multiple Expansion Chassis can be connected to a single AT, in either star or daisy chain configurations. The chassis can be programmed for 1 to 5 wait states in each 128K memory block, and in each block of 4 consecutive I/O addresses. The onboard EEPROM provides storage of configuration tables.

For assistance in configuring your systems with Sigma Designs' AT Expansion Chassis, call us at (415) 770-0100

SIGMA DESIGNS, INC.
46501 Landing Parkway
Fremont, California 94538

STAFF

Vice President/Publisher
S. Henry Sacks

Chief Editor
George V. Kotelly

Managing Editor
James F. Donohue

Senior Editor: David Simpson
Senior Editor: Doug Pryor
Senior Editor: Tim Scannell

Senior Editor: Carl Warren
Irvine, (714) 851-9422
Senior Editor: Mike Seither
San Jose, (408) 296-0868

Associate Editor: Jesse Victor

Associate Editor/Research: Frances Michalski
Staff Editor/New Products: Megan Nields
Editorial Assistant: Lisa Kramer

Contributing Editors
Andrew Allison
Mini/Micro Computer
Product and Market Consultant
Raymond C. Freeman, Jr.
Freeman Associates

Special Features Editor: Wendy Rauch-Hindin
Dix Hills, N.Y.
(516) 667-7278
Gene R. Talsky
Professional Marketing Management Inc.
Robert E. Peterson, Jr., Edward Teja
Freehold Corp.
Rick Dalrymple
CAP International Inc.

Editorial Production
Senior Production Editor: Arsenic C. Davignon
Production Editor: Mary Anne Weeks

Editorial Services
Terri Gellegos
Assistant to the Publisher: Linda L. Lovett
Art Staff
Senior Art Director: Mary Anne Garley
Art Director: Cynthia Norton
Director of Art Dept.: Norm Graf

Production Staff
VP Production: Wayne Hueltzky
Director/Production: John Sanders
Supervisor: William Tomasselli
Production Manager: Betsy Cooper
Composition: Diane Malone

Editorial Offices
Boston: 275 Washington St., Newton, MA 02158,
(617) 964-3030. Irvine: 18818 Teller Ave., Suite 170,
Irvine, CA 92715. Los Angeles: 12233 W. Olympic Blvd.,
Los Angeles, CA 90064. San Jose: 3031 Tisch Way,
San Jose, CA 95128.

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 Katie Pyziak, Cahners Reprint Service, Cahners Plaza,
1350 E. Touhy Ave., Box 5080, Des Plaines, IL
60018. Phone (312)635-8800.
It's time to spread the news: XENIX® is the better choice. XENIX is full UNIX® System V, with improvements by Microsoft®. Enhancements like speed—XENIX System V/286 is the fastest version of UNIX available for the Intel architecture.

XENIX wins the software race as well. Over 160,000 XENIX sites are supported by a huge array of applications. From word processing and relational data bases to business packages for stock brokers and hotels—XENIX System V has more available software than any other version of UNIX.

And now we've made 386 software development faster as well. Our new XENIX System V/386 Toolkit—available for only $395—lets you develop and run 386 programs on advanced machines like the COMPAQ® DESKPRO 386®.

For more information on the XENIX Toolkit, call (800) 227-4679.

Microsoft® XENIX®
The High Performance Software.

The Microsoft XENIX System V/386 Toolkit requires either an IBM® PC AT with IBM PC XENIX Release 2.0 or SCO XENIX System V or a COMPAQ DESKPRO 286 or DESKPRO 386 with COMPAQ XENIX System V/286. Price shown is Microsoft's suggested retail price, and is subject to change without notice.
We’ve got the most affordable, state-of-the-art data PBX you can buy. Period.

Sequel’s SDC family is the first series of intelligent data switches to offer you all large network management features, whether you need a few or hundreds. Features like single sign-on, time-of-day clock, toggling, redundant power and logic, security call-back, and more.

Think Small. Then Grow Big.
You can start out with as few as six local ports and expand to as many as 1,536, worldwide. □ Sequel’s SDC family links together terminals, I/O ports, printers, modems, and any device that sends or receives data up to 19.2K bit/s. Without line drivers or multiplexers. Even at maximum usage, the 19.2K bit/s rate persists.

Meet The Three.
The SDC 660 gives you a range of six to 60 ports. □ If you outgrow it, keep all the cards and buy the SDC 6192 chassis. Now you can grow to 192 ports. □ If you need to expand further, the SDC 6192 Network is the answer. Plug Sequel’s local networking card into as many as 8 chassis and expand up to 1,536 lines.

Break The $100-Per-Port Barrier.
With all this to offer and more, our switch costs less than any other. The low $100-per-port price begins at 30 ports.

Find Out For Yourself.
Call today and we’ll demonstrate to you why Sequel’s SDC family is so fast, flexible, and affordable. And why Sequel means “We’re What’s Next.”
LETTERS

MORE FROM MAXTOR
To the editor:

The November issue of Mini-Micro Systems incorrectly stated in the Breakpoints section that large quantities of the 760M-byte model XT-8760E from Maxtor Corp. would not be available until 1988. Evaluation units of the product are available immediately, and production volume units will be shipped during the first quarter of 1987. Also, the article incorrectly identified Censtor Corp. as a supplier of vertical recording heads and media for the product. The XT-8760E achieves its capacity gains through longitudinal recording techniques.

Skip Kilsdonk
Director of Marketing
Maxtor Corp.
San Jose, Calif. 95134

MORE ON SINGLES
To the editor:

Your August product listing of single-board microcomputers was, as always, a comprehensive and highly useful reference guide. However, I would like to make a correction that may be of interest to your readers.

Our add-in board that contains a microprocessor, memory and other features for adding terminals to a multiuser system is listed under the product name PC-PLUS. Actually the $985 add-in board is called PC-SLAVE/16.

Nigel Spicer
Senior Vice President
Sales and Marketing
Alloy Computer Products Inc.
Framingham, Mass. 01701

HIGH INTEREST
To the editor:

The October issue (New Products) detailed Miltope's 3801 non-impact line printer. Thank you for including our product.

Unfortunately, the article listed a unit price of $4,000 rather than the catalog price of $84,000. Needless to say, it generated considerable interest!

Robert J. Ceonzo
Director of Marketing
Miltope Business Products Inc.
Melville, N.Y. 11747
Rip off hotel bills, airline tickets, invoices or any other type of form, up to six copies thick. Datasouth Demand Document printers put them out day and night, and let you rip them off without losing the next form.

Datasouth Demand Document printers feature bidirectional dot matrix printing at 180 cps. You can print to within 1/2 inch of the tear-off bar, without affecting the next form. The push-button front panel and LED readout make our printers exceptionally easy to use.

There's a Datasouth Demand Document printer for almost any communications environment. The DS 180 DD has standard Serial and Centronics-type parallel interfaces. The TX 5180 DD emulates the IBM 5256, 5224 and 5225 printers in System 34/36/38 environments. And the CX 3180 DD emulates the IBM 3287 in 3270 environments.

No matter what kind of form you're printing, there's a Datasouth printer that could be doing it better. So call us at 1-800-222-4528, and ask about our Demand Document printers.

When you consider all the money-saving advantages, it's really quite a steal.
DEC REELS OUT BUNDLE OF REAL-TIME PRODUCTS

Digital Equipment Corp. heightens its drive into such real-time processing areas as factory automation, assembly-line robotics, simulation and laboratory control when it introduces this month a group of board-level and system products based on its VAXELN application-development software. Upcoming: a single-board MicroVAX II computer, the KA620; repackaged 8000 series 32-bit minicomputers optimized for real-time; a variation of VAXLAB I/O software to allow data-input devices to exploit the VAXBI high-speed architecture; and a VAXBI version of the VAXELN MicroVAX board, as an alternative to the Q-bus board. The Maynard, Mass., company says it wants to be the first to offer higher performance throughout the VAX line and to provide a full set of VAXELN-based real-time software-development tools.—Tim Scannell

BIG OPPORTUNITIES SEEN IN SMALL BUSINESSES

Resellers and OEMs looking for new business avenues might have better luck pursuing small businesses rather than Fortune 500-type companies. The National Federation of Independent Business, Washington, released findings some time ago that showed that the average small concern spends from $25,000 to $36,000 for computer equipment and about $11,000 for software—for a total investment of about $33 million, or up to eight percent of total annual sales in the industry. In addition, large corporations may not even be the best place to peddle multiuser systems and software. Bonnie Digrius, director of software market analysis for INPUT, a research company in Mountain View, Calif., says that multiuser systems are “really geared for individual companies and small businesses” —Tim Scannell

MICROTEK TIES SCANNERS INTO PC-TO-FAX LINK

Look for February shipments of an add-in board from Microtek Lab Inc. that allows scanners, in conjunction with personal computers, to transmit documents to CCITT Group 3 facsimile machines. The Gardena, Calif., manufacturer plans to sell its MFAX card and software for $995. The MFAX has a standard J11 jack to connect the IBM Corp. PC and compatibles to phone lines and can automatically dial up to 10,000 numbers. When used without a scanner, the MFAX can send multipage documents stored on a PC to a number of locations. Users can also enter a document into the personal computer via a Microtek scanner and transmit it to fax machines.—Mike Seither

ISDN TESTS START IN EARNEST; FIRST SERVICES EXPECTED NEXT YEAR

Expect 1987 to be the year for intense testing of integrated services digital network (ISDN) products and technologies by the seven regional Bell holding companies. The first holding company to test ISDN at a user site, US West Inc., Denver, says it plans to have six tests under way by March. The first commercial ISDN service is expected in March 1988, offered by BellSouth Corp. in Atlanta (at the regional office of Prime Computer Inc. and at the Trust Company Bank of Georgia). How much for ISDN? A spokesman for BellSouth says the company will ask for rates 1.5
to 1.75 times higher than those for existing services. ISDN provides for simultaneous transmission of voice, data and video over twisted-pair wires.—*Jim Donohue*

**HEWLETT-PACKARD HIGH-END WORKSTATIONS BOAST LOW PRICE TAG**

Look this month for a high-end workstation in six configurations from Hewlett-Packard Co., Palo Alto, Calif. The company claims its HP 9000 Series model 350 is the industry's lowest priced entry into the CAE/CAD market. It utilizes the 25-MHz Motorola Inc. MC68020 microprocessor, supplemented by a 20-MHz Motorola 68881 floating-point coprocessor. Standard features include 8M bytes of RAM and HP-IB and RS232C interfaces. Prices range from $21,999 to $54,900.—*Megan Nields*

**FORCE BEGINS SAMPLING 80386 CPU BOARD FOR VMEBUS**

VMEbus board manufacturer Force Computers Inc., Los Gatos, Calif., a staunch supporter of the Motorola Inc. MC68000 line of processors, is now developing loyalties to Intel Corp.'s 80386. This month Force plans to ship small quantities of its CPU-386. The sample double-height VME boards come with 2M bytes of pipeline memory. Price: $5,775. The CPU-386 features four sockets to connect up to 512K bytes of EPROM, as well as a socket for Intel's pending 80387 math co-processor chip. Within the next few weeks, Force says, the real-time '386 VRTX kernel, file and I/O management software from Hunter and Ready Inc. will be available for the board.—*Mike Seither*

**DEC'S TIGHT LID ON VAXBI**

Peripherals manufacturers who feel left out by Digital Equipment Corp.'s unwillingness to open up its VAXBI high-speed bus architecture, which prevents connecting non-DEC disk drives, get no sympathy from the Maynard, Mass., company. According to Kenneth Olsen, president and CEO, VAXBI will remain proprietary, despite efforts by such subsystem makers as Emulex Corp. and System Industries to provide alternatives. Nor will VAXBI evolve to replace DEC's more popular Q-bus or UNIbus architectures. Olsen offered this rationale for VAXBI's technological aloofness: "It's expensive, and almost nobody needs it."—*Tim Scannell*

**SOFTGUARD GOES VIRTUAL WITH NEW '386 TOOLKIT**

Softguard Systems Inc., Santa Clara, Calif., the company that earned its spurs developing software-protection schemes for such notables as Ashton-Tate and Lotus Development Corp., has developed a VM 386 toolkit that allows developers to fully utilize the power of the Intel Corp. 80386 microprocessor by breaking the 640K-byte memory barrier. Members of the engineering staff of The Technical Assessment Group Inc. (TAGI), Saratoga, Calif., liken the tool kit to the IBM Corp. compiler/simulator development tool kit, SUPPAK 360.—*Carl Warren*

**ADIC PLANS LOW-COST QUARTER-INCH TAPE SUBSYSTEM**

Expect Advanced Digital Information Corp., Redmond, Wash., to introduce a 40M-byte quarter-inch tape subsystem for under $800. According to a company spokesman, the unnamed product will plug directly into the flexible disk controller on an IBM Corp. PC and will not require any modifications to the operating system.—*Carl Warren*
YOU'RE FACING THE PROBLEMS.

INTERFACE '87
The force behind communications and information networking solutions.


To help you understand and implement the solutions you need, the INTERFACE '87 Conference reveals and explains the most pressing technical, applications, and management issues. Industry experts explore such topics as Virtual Connectivity, Voice/Data Integration, Network Implementation, and LANs. You'll examine case studies that reveal how others have solved problems you're facing. Learn new methods of meeting the increasing challenges your people and systems face. And equip yourself with new skills for coping with and conquering the age of technology.

And with such highlights as the gala Awards Banquet and the Executive Briefing, the show gleams with excitement and innovation.

NOW COME FACE-TO-FACE WITH THE SOLUTIONS.

INTERFACE '87 turns technological promises into solutions. Register now.

INTERFACE '87
March 30–April 2, 1987
Las Vegas Convention Center

I WANT SOLUTIONS NOW!
☐ Send me complete attendee information.
☐ Send me information on exhibiting.

Name ____________________________
Title ____________________________
Company ____________________________
Address ____________________________
City ____________________________ State Zip

Return to: Mr. Irwin Stern
The Interface Group, Inc.
300 First Avenue, Needham, MA 02194.

© The Interface Group, Inc.
The people who make Seagate
The man who kept the moon clean now makes sure that Seagate drives are spotless.

Ron Hite, Seagate’s Contamination Control Manager, was one of the pioneers of federal microcontamination standards as a “dust hunter” for many of America’s space programs. He helped create the procedures that kept rocket interiors immaculate and the lunar surface free of contamination from the spacecraft.

Ron brings the same meticulous attention to detail to Seagate’s clean rooms and other manufacturing facilities. In disc drives, like rockets, even the smallest speck of dust can interfere with the precise operations. Ron’s expertise ensures the data integrity of our drives by keeping them free of microscopic contaminants.

OEMs have come to expect this kind of relentless emphasis on quality from Seagate. That’s one reason they’ve bought more than 4 million of our 5½” hard disc drives.

Seagate’s reputation is built by its people. If you think your drives should be made by dedicated experts like Ron, call us.

800-468-DISC. In California, 800-468-DISK.
DataFlex does windows!

The best DBMS just got better! Pop up help screens and pull down menus are now easy to accomplish in your DataFlex applications. Revision 2.2 gives you full and easily-programmed control over the size, color and location of every screen page and allows each to be displayed without disturbing other on-screen data. A new DataFlex command even allows you to temporarily suspend execution of your DataFlex application, run any other program or DOS command, and then return to DataFlex at the point you left it! But best of all, DataFlex applications can run flawlessly on over 30 single user, multi-user and LAN operating systems! See your nearest DataFlex dealer today or write us and ask for your free DataFlex demo kit.

GUARANTEED to run as specified on over 200 single-user and multi-user systems including IBM TOKEN RING NETWORK.

Data Access Corporation
8525 S.W. 129 Terrace
Miami, Florida 33156
(305) 238-0012

Log in | Data Entry | Reports | Admin | Quit

Help for Data Entry

CUSTOMER MASTER is for changing customer addresses, credit limits, contact names, etc.
INVOICING is for creating or changing existing invoices to customers
APPLY PAYMENTS is for applying or reversing payments from customers

Press F1 for Help

DataFlex is a Registered Trademark of Data Access Corporation.
XENIX is a trademark of Micro Soft.
UNIX is a trademark of AT&T.
VAX/VMS are trademarks of Digital Equipment Corp.

CIRCLE NO. 81 ON INQUIRY CARD
Xerox, Ventura campaign to press would-be publishers

Mike Seither
Associate Western Editor

It goes by the somewhat unwieldy handle of Xerox Desktop Publishing Series: Ventura Publisher Edition. Some industry pundits are calling it the darling of desktop publishing software for the IBM Corp. PC, PC/XT, PC/AT and compatibles. Ventura Publisher, they say, for the first time brings to the PC the ease of use of page-composition software written for Apple Computer Inc.’s Macintosh—most notably Pagemaker from Aldus Corp.

For its part, Xerox Corp., which last year scooped up worldwide marketing rights for the program from its developer, Ventura Software Inc. of Morgan Hill, Calif., believes it has a winner. Its marketing plans for Ventura Publisher are anything but modest. In fact, industry insiders claim that Xerox, headquartered in Rochester, N.Y., has a $10 million promotion budget in place to push desktop publishing systems. Although Xerox officials won’t disclose specific spending plans, it’s clear that the company is writing some sizable checks for advertising. Witness the recent spate of prime-time Xerox television spots.

“We want Ventura to do for desktop publishing what [Lotus Development Corp.’s] 1-2-3 did for spreadsheets,” declares Larry Spellhaug, product business manager for Xerox’s desktop publishing operation. “To do that, we are making the program as broadly usable as possible.”

Although Xerox has been selling the first commercial release of Ventura Publisher—it lists for $895—for only two months, a new version is scheduled to be in the distribution pipeline this quarter, says Spellhaug.

Ventura Publisher Edition, marketed by Xerox, was used to integrate the text and AutoCAD graphics in this document, which was produced on a Xerox 4020 ink-jet printer.

Version 1.1 of Ventura Publisher will feature three key enhancements: operation with all the major page-de-
MINI-MICRO SYSTEMS
EXCLUSIVE

scription languages (PDLs), support of more word processing programs and the addition of foreign-language editions.

With version 1.1, Ventura Publisher will offer support for two more page-description languages—DDL (Document Description Language) from Imagen Corp. and Interpress from Xerox. These languages sit between the page-composition program and the printer (or typesetter) and translate font and graphical information into raster images, which the printer reproduces. In addition, they control such printing functions as collating pages and determining the number of documents produced. The original Ventura Publisher works only with the PostScript PDL, which is licensed to manufacturers of laser printers and typesetters by Adobe Systems. PostScript was instrumental in making Apple’s LaserWriter printer and other manufacturers’ printers hits with desktop publishing fans.

Because of Xerox’s efforts to promote its own Interpress language, the company’s support of DDL and PostScript has baffled many analysts. “It’s confusing to me,” admits Ajit Kapoor, director of the electronic publishing industry service for Dataquest Inc., the San Jose, Calif., market-research concern. “How can a company go out and ask for one standard [Interpress], then support two others [DDL and PostScript]?”

To date, Interpress has only been available on the high-end Xerox 3700 and 9700 laser printers, which produce from 20 to 120 pages per minute. Whether Xerox will offer the language on its low-end laser printers, like the 4045 (or on newer ones), is still unclear.

Other observers claim that Xerox had no choice but to bite the bullet and support languages other than its own. “Xerox realized early in the game that Ventura [Publisher] would die, if it didn’t support PostScript,” says industry watcher Tony Bove, co-publisher of Desktop Publishing, a Woodside, Calif., newsletter. “Now Xerox realizes the same is true of DDL.”
One possible reason? Late last year Hewlett-Packard Co. announced that its best-selling Laserjet printers would support DDL. Not long after HP got behind DDL, Cordata Technologies Inc. also announced that its laser printers would operate with Imagen’s PDL.

Insofar as Ventura Publisher is concerned, the company line at Xerox now is to support any emerging standards. "Obviously, our primary support is for Interpress," says Spellhaug. "By the same token we feel very strongly about Ventura, and we don’t want it locked out of a segment of the market because it can’t address DDL. It’s still to be seen how the market will react to HP’s support of DDL, though a vendor of [HP’s] caliber certainly has to be respected."

The additional word processing programs version 1.1 will support are IBM’s DisplayWrite and XyQuest Inc.’s XyWrite. The new release will also support IBM’s Document Content Architecture (DCA) files. The program currently accepts formatted text from, and stores it back to, Xerox's Writer, MicroPro International Inc.'s WordStar, Microsoft Corp.’s Word and Windows Write, Multimate International Corp.’s Multimate and Satellite Software International’s WordPerfect, as well as word processors that generate standard ASCII files.

While the program now supports a full international character set, version 1.1 will feature user interfaces in U.K. English, French, German, Italian and Spanish, as well as hyphenation algorithms for each. "Our ultimate goal is to support a dozen languages," says Ventura president John Meyer.

All channels are open

Xerox’s marketing strategy for Ventura Publisher is to get the package into all the major distribution channels. The first effort has been through direct sales to Xerox’s existing base of corporate accounts. Xerox can now offer those customers a turnkey desktop publishing system by bundling Ventura Publisher with its...
GOOD LOOKS. GREAT PERSONALITY.

We've got more than just good looks. At $599 the Freedom® ONE Turbo terminal has more horsepower than DEC's VT220 and WYSE's WY-50 combined. The Turbo is loaded with emulations of the most popular ANSI and ASCII terminals plus the extra personality of a PC terminal that allows you to use it as an added workstation in a Personal Computer AT multi-user application. These versatile operating modes, ultra-sleek styling and display clarity second to none, make the Freedom ONE Turbo a pretty, smart alternative.

Built by the same people who manufacture Princeton Graphic monitors and workstation products for Harris Limier, the Freedom ONE Turbo is backed by a 'no worry' three year limited warranty and a nationwide network of Authorized Service Centers.

To get a good look at the great personality of the Freedom ONE Turbo, call us today at (415) 742-7000.

Liberty
We make terminals.
6065 personal computer and 4045 laser printer.

Second, Xerox has stepped up its emphasis on OEM deals. Among the first to sign on were Univation Inc., Milpitas, Calif., and Tall Tree Systems, Palo Alto, Calif. Univation sells Ventura Publisher with its $1,400 Turbo Publisher add-in board for the IBM PC. Tall Tree combines Ventura Publisher with its Jlaser PC boards, which can be used in conjunction with any printer built with the Canon U.S.A. Inc. laser engine. The Jlaser board occupies a PC expansion slot and uses a high-speed video connection that bypasses the printer's serial-port controller.

Bob Ford, manager of Xerox's OEM marketing program in Dallas, claims that about 50 OEMs are now evaluating Ventura Publisher. They run the gamut from minicomputer vendors established in the office-automation market to manufacturers of personal computers and laser printers, who would package the page-composition software with their products.

For customers who order more than 200 packages a year, Ford says that Xerox will consider writing conversion programs (on a bid basis) to allow Ventura Publisher to accept additional application packages like those for word processing and graphics. Besides its announced support for more than half a dozen word processors, Ventura Publisher also can integrate graphics from Lotus 1-2-3, Autodesk Inc.'s AutoCAD, Digital Research Inc.'s GEM Draw and GEM Graph, and Zsoft Corp.'s PC Paintbrush. It also integrates DXF files created by computer aided design programs.
Too big. Too noisy. Too much.

How to keep from buying the wrong UPS.

If you've been told a big, noisy, expensive uninterruptible power supply is the only way to really protect your power-based system from error or disaster, look again.

Yes, you do need a UPS.

But a UPS doesn't have to hog half your computer room, or put your staff—or your treasurer—into shock. Not when the UPS is from General Power Systems.

GPS is the pioneer in transistor-based UPSs with all the benefits that implies—small, quiet, cool, reliable, efficient. In fact, a GPS system is often half the size of another supply of comparable power. And because GPS manufactures the most complete line of UPSs on the market, we have what you need—on-line models from 500VA to 50KVA, and exceptionally small standby systems from 200VA to 2000VA with transition times as low as 2ms.

GPS systems have a low initial cost with many features, which are traditionally optional, included free. Plus, our extraordinary reliability, ease of use and service make the cost of ownership low.

So why buy the wrong UPS when the right one is as close as your telephone. Call GPS today. (800) 854-3469, in California (800) 824-8912, (714) 956-9321, Telex 182283.

General Power Systems, 1400 North Baxter St., Anaheim, CA 92806-1201.

Now, UL Listed models 1KVA–10KVA.

CIRCLE NO. 19 ON INQUIRY CARD
In the OEM world Xerox is also attracting the attention of monitor manufacturers, a number of whom showed Ventura Publisher running on high-resolution devices at Comdex/Fall. For example, Sigma Designs Inc., San Jose, Calif., introduced its LaserVue system, which consists of a driver for Ventura Publisher, an adapter board for the IBM PC, PC/XT or PC/AT and a choice of 15-inch or 19-inch monitors with resolutions of 1,664 by 1,200 pixels.

Conographic Corp., Irvine, Calif., also showed its Conovision 2800 operating with a Ventura Publisher driver. The system includes a raster image processor and adapter cards for the PC, plus a display with a resolution of 1,440 by 1,024 pixels.

And Verticom Inc., Sunnyvale, Calif., displayed its Desktop 480, an IBM PC video-display adapter card that operates multisynchronous monitors at 640 by 480 pixels.

Ventura president Meyer says that, with monitor vendors offering their support for PC publishing software, users are able to get performance previously available only with more expensive workstations from companies like Sun Microsystems Inc. With a monitor like Sigma Design’s LaserView Display System, it’s possible to display two full pages and work on both at the same time. Although Ventura Publisher supports most major graphics standards now available for the PC, such as IBM’s enhanced graphics adapter and Hercules Computer Technology’s monochrome adapter, they fall far short of the capabilities of high-resolution monitors.

Dealer’s choice

It should be noted that monitor vendors are supporting not just Ventura Publisher, but the growing number of page-composition programs now coming on the market for the IBM PC and clones (see “Desktop publishing: sifting type from hype,” Page 57). These include PageMaker from Aldus Corp. and Harvard Professional Publisher by Software Publishing Corp.

Besides moving Ventura Publisher through OEM and direct-sales channels, Xerox also hopes to attract dealers. Xerox recently announced distribution agreements for Ventura Publisher with two major computer retailers: ComputerLand Corp. and MicroAge Computer Stores Inc. Combined, these two companies have about 700 retail stores. In addition, they sell to large corporations. But it is in the dealer channel—which Xerox says it will strongly support—where the company is expected to meet its strongest challenge. The main contender will be Aldus, which has sold more than 30,000 copies of the Macintosh version of Pagemaker over the last year and a half. Most of the Pagemaker packages have gone out through dealers.

“Aldus has built up dealer awareness of Pagemaker,” says industry observer Bove. “Since the PC version is identical to the Mac version, dealers will be able to sell it more easily than Ventura.” However, Bove adds that, while Ventura Publisher may have a better feature mix than Pagemaker, Xerox has still to prove that it can sell personal computer software in volume to dealers.
IBM, Digital square off to capture 'work-sharing' market

Tim Scannell, Senior Editor

At Digital Equipment Corp.’s recent annual meeting, company president and chief executive officer Ken Olsen spent a lot of time talking about the past. As he addressed both stockholders and analysts, he cited such events as the unveiling of the first modem, the origin and evolution of networks and even the development of the first VAX minicomputer some 12 years ago. His audience listened patiently, not because they had not heard these things before, but because they knew Digital—having recently reported a 153 percent increase in profits and a 26 percent jump in sales—was on financially solid ground and could afford to take time out to look back.

IBM Corp., on the other hand, is not in a position to dwell on the past. Company employees are so concerned with the problems IBM is experiencing now, they can't afford to be anything but deadly serious about operations and directions.

For example, at a recent press conference in New York, IBM introduced a series of machines aimed directly at the DEC marketplace. IBM called upon a cadre of its vice presidents to explain how its new machines—unofficially dubbed “VAXBusters”—were designed for connectivity and departmental computing and how they would extend the company's 370 mainframe architecture downward. Also, for the first time, IBM used satellites and closed-circuit television to broadcast the introduction of the 9370 superminicomputer series to 15 locations and more than 3,000 customers.

These are tough times for IBM, and getting the word out about offerings is as crucial as coming out with the right products; particularly if it wants to make a dent in the U.S. VAX population—currently numbering about 41,500 sites, according to Computer Intelligence, a La Jolla, Calif., market-research company.

Which way did they go?

But whether or not IBM's new strategy to port 370 applications down and distribute system capabilities over physically different locations will be successful is the subject of much debate. Even DEC's Olsen, usually silent when asked about the competition, admits to some confusion over IBM's new direction.

"The 9370 seems to imply they are going after our [systems]. But there are so many changes taking place in that 'other world' that I can't keep up with them," Olsen said at DEC's annual meeting. "At least it doesn't make sense to me."

IBM's chief corporate target is not the only one confused. Although the idea of porting 370 applications to mid-range processors is a good one, present and future users of IBM systems may raise questions about the 9370's positioning and the company's strategy for new entrants.

For example, although the systems are designed to attack DEC's "work-sharing" architectures—which allow small groups of users to share a common database and files—field testing and early support of the 9370 systems will not start until sometime next month. Volume shipments, of several

---

THE BUILDING BLOCKS OF IBM 9370s

<table>
<thead>
<tr>
<th>Model</th>
<th>Memory (M bytes)</th>
<th>No. of internal I/O buses</th>
<th>No. of I/O card slots</th>
<th>Min./max. attachable storage (M bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9373-20</td>
<td>4/16</td>
<td>1</td>
<td>7</td>
<td>368/6,592</td>
</tr>
<tr>
<td>9375-40</td>
<td>8/16</td>
<td>2</td>
<td>17</td>
<td>368/13,184</td>
</tr>
<tr>
<td>9375-60</td>
<td>8/16</td>
<td>4</td>
<td>17</td>
<td>368/13,184</td>
</tr>
<tr>
<td>9377-90</td>
<td>8/16</td>
<td>2/6</td>
<td>10/54</td>
<td>368/39,552</td>
</tr>
</tbody>
</table>

In the 9370 model 90, logic chips are mounted on a substrate housed in an air-cooled thermal-conduction module (TCM).
With the right connections, you’ll open new windows of opportunity.

Your opportunities depend directly on your ability to react to a changing marketplace. And each step you save in R&D helps you get your products to the market faster — before they’re obsolete.

At KMW, we’ve got the connections to help you achieve that goal. So while your designers concentrate on what they do best, we supply data conversion and communications products ready to integrate with them.

For almost a decade, KMW has pioneered integrated answers to imaging and data conversion problems. Our Auscom division is the industry leader in reliable high-speed channel interfaces for IBM® mainframes.

Fourth generation KMW protocol converters allow local or remote attachment for serial and parallel asynchronous devices to IBM systems. And our graphic element processors offer a complete graphic subsystem for connecting monochrome or color raster hard copy devices.

So the technology that you need probably already exists at KMW. And if it doesn’t, we’ll design a custom solution.

By taking advantage of our connections, you can concentrate on your particular technology. R&D time and expenses are reduced, as is the need for support staff to service products for connectivity. You’re free to capitalize on new opportunities.

If you’re still not familiar with the total resources of KMW, join the growing number of Fortune 500 companies who are. Call 1-800/531-5167 (in Texas, 512/288-1453) or write KMW Systems Corporation, 8307 Highway 71 West, Austin, Texas 78735.

KMW Systems Corporation

For the right connections Auscom is now a division of KMW Systems Corp.

IBM® is a registered trademark of International Business Machines Corp.
NEC WOULD LIKE TO WISH ALL ITS DISK DRIVE COMPETITORS MANY HAPPY RETURNS.

NEC

Guaranteed

D.O.A. Rate
NEC guarantees a DOA rate of less than 1%.

A high DOA rate can take a big chunk out of your bottom line. After all it takes 15 to 20 minutes to test one drive. And if the drive doesn’t work you have to spend even more time repacking it and sending it back. Then you have to sit and wait for a replacement.

NEC can make your life much happier. Just ask and we’ll guarantee the lowest DOA rate in the industry—less than 1%. In writing. What you’ll likely get from our competitors is 5-10%.

A low DOA rate is just the icing on the cake. NEC disk drives are also more reliable over the long run. In fact, in the average lifetime of any NEC drive, 9 out of 10 will never fail.

NEC has been designing and improving disk drives for over 25 years. Way back in 1959, we were one of the first to create magnetic recording devices. NEC has grown up to be a 13 billion dollar worldwide company. So you can expect continuing products and support.

If other disk drive suppliers keep sending you surprises instead of drives that work right out of the box, call in NEC. You can reach us at 1-800-343-4418. (In Massachusetts call 617-264-8635.) Or write NEC Information Systems, Inc., 1414 Massachusetts Avenue, Department 1610, Boxborough, MA 01719.

NEC DISK DRIVES.
RELIABILITY RUNS IN THE FAMILY.

NEC Information Systems, Inc.
HI-TECH NOISE KILLER

SONEX acoustic foam is deadly to annoying computer room noise. And it'll look great in your hi-tech environment. Simply hang sheets of this patented, professional foam to quiet the combined clatter of fans, motors and printers.

Call or write for complete facts and a free brochure:

INTERPRETER

thousand processors or more, will not start until the second half of the year. In fact, some local area network and enhanced ASCII features will not be available until the fourth quarter, according to an IBM spokesman.

Also, while the 9370 computers open a pathway for 370 mainframe users to distribute computing power and applications, they further splinter IBM's systems line. They create yet another incompatible tier of computing. For example, the top 9370 system, the 9377-90, overlaps IBM's 4381 model 11 and offers from 10 percent to 15 percent more performance, according to Michael J. Quinlan, president of IBM's North Central Marketing Division in White Plains, N.Y. The low-end 9373 model 20 performs at a ratio of 1-to-5 compared with the 4361 model 3. The 9373 model 20 offers 25 percent more performance and roughly twice the price/performance ratio, Quinlan says.

They went disarray

Although the 9370 is presented as a small-systems solution to 370-architecture applications, present customers—especially those already using IBM System/36 and System/38 computers—may be confused as to which system is the right choice. All three compete in the same market.

Not to worry, says IBM Southwest Marketing Division president Robert E. Dies in Atlanta. The 9370 is specifically aimed at new users who want to distribute 370 capabilities and not at System/36 or /38 customers who already use those systems for distributed processing. In fact, at the time of the 9370 series unveiling, IBM announced a new link-protocol converter that reportedly lets users switch easily among 370 and System/36 and /38 applications.

"Many customers have extensive System/36 and System/38 applications code, and we would anticipate they will continue expanding their networks and using these systems, either one at a time or as part of a network."

The 9370 Information Systems family consists of four processors: the 9373 model 20, the 9375-40, the 9375-60, and the 9377-90. The lineup...
COST SAVING
CONNECTIONS
RS232 INTERFACE PROBLEM SOLVERS...FROM WESTERN TELEMATIC INC.

END DATA SWITCHING PROBLEMS

Is switching data cables becoming a pain in the ASCII? Automatically switch between computers, printers, instruments—just about any RS232 device.

Economically expand computer ports, access multiple computers or remote peripherals.

From simple AB switches to intelligent 196 port code activated switching systems, our reliable, easy to use, interface switches will help end your interconnect problems.

EFFICIENT PRINTER SHARING

It's time to make more efficient use of your expensive printers. Share up to two plotters, daisy wheel, dot matrix or laser printers with up to 8 computers, word processors or CAD systems.

Ideal for the automated office, school or engineering lab.

Our 4 or 8 port Printer Sharing Units work automatically with up to 256K buffering. No cable switching or knobs to turn. Software changes are usually unnecessary since they use standard Ready/Busy or XON/XOFF handshaking.

AFFORDABLE RS232 NETWORKING

Create your own local network with our Any-port to Any-port Smart Switches. Available in either 8 or 16 port versions, the Smart Switch is ideal for computer port expansion, computer sharing, engineering work clusters and much more.

Each port has its own spooling buffer. So any baud rate can communicate with any other baud rate and parity anywhere in the system.

A special supervisory port lets you monitor activity on any other port, connect ports together, broadcast messages or designate the supervisory power to other ports.

The Smart Switch is easy to use. User friendly commands allow you to select ports, disconnect and display port activity. A push button defines each port for either DCE or DTE. So if you need an intelligent, affordable way to link your RS232 system, you're ready for the Smart Switch.

CONCERNED ABOUT DATA SECURITY?

Prevent unauthorized access to your computer system. Our Dial-back Security Unit prevents outsiders from peeking at, destroying or tampering with your data. Only users entering authorized passwords and dial-back numbers stored in the 200 number battery backed directory will be allowed access.

An auxiliary command port is used to set-up the directory and security levels as well as log each password attempt and duration of each call.

Simply connect the DSU between your computer and modem and feel secure about who's using your data.

QUALITY PRODUCTS

Every WTI product is designed and manufactured with quality and reliability as a major requirement. We're so confident you'll like our products that we offer a 30 day return policy. Compare our features, quality, customer support and prices with any other manufacturer and you'll know why WTI is a recognized leader in the Data Communications industry.

IT'S ALL IN THE BOOK...IT'S FREE

Descriptions, diagrams, specifications and prices for the above products, plus many more, are in our colorful new catalog. It's your cost saving connection...just ask for it!

Call toll free: 1-800-854-7226

(in California 714/979-0363)

CIRCLE NO. 24 ON INQUIRY CARD
With the new MT 910sl laser printer, you can do more without paying more. And you can do it laser fast. The MT 910sl zips out crisp, clean copies at 10 pages per minute. That’s fast. But the real story is performance.

You’ll have dual paper bins with a 500 page total capacity. A short, simple paper path with fewer obstructions to virtually eliminate jamming. A special paper path to allow single feeds of envelopes, labels and transparencies without changing bins.

Five emulation modes — Diablo 630, Epson FX, IBM ProPrinter, LaserJet Plus, Qume II — to meet existing software needs.

Front panel programming to prompt an operator through easy operation without dip switches, without numeric codes.

Two resident fonts that allow bold, italic, enlarged or condensed type in both portrait and landscape mode.

And a laser engine designed to print 300,000 pages before servicing. Which is 5,000 pages a month for five full years.

Your options?
Two font cartridges, a one megabyte memory expansion (allowing, with the resident 512K, a total of 1.4 megabytes user-accessible RAM), a 5-bin output sorter and a shared interface that allows access from up to four separate stations.

And the price lists at just $3,695.

No other printer in the price range gives you as much for your money. Not in performance. Not in productivity. Combine that with the Mannesmann Tally reputation for quality and reliability, and your next step becomes clear.

Pick up a phone and dial (206) 251-5524.

And at the speed of sound, you can order an MT910sl for your own competitive evaluations.

When the results are on the table, we think you’ll be suitably impressed.

And why not? Our goal isn’t just to produce copies at the speed of light. But to do the same for your sales.

*Diablo* *Epson* *IBM* *Hewlett-Packard* *& Qume*

MANNESMANN TALLY

THE NEW MT 910sl LASER PRINTER
PERFORMANCE OF LIGHT.
offers varying amounts of memory, internal I/O buses, card slots and disk-storage capacities. For example, the entry-level 9373 model 20 can be equipped with from 4M to 16M bytes of memory and models 40, 60 and 90 with 8M to 16M bytes of memory. The model 20 also has a maximum of seven I/O slots and a single internal I/O bus. Models 40 and 60 each have 17 slots and four I/O buses. Finally, while users can upgrade from a model 40 to a higher level system, the entry-level machine cannot be upgraded, due to its limited bus and I/O structures, according to an IBM spokesman.

Prices for the 9370 systems range from $31,000, for a basic 9373 model 20, to $210,000, for a 9377 model 90 with the maximum memory.

All of the 9370 systems are equipped with new releases of IBM’s VM/Integrated System and VSE/System Product operating environments, which are said to be completely compatible with 370-developed software and to “offer the power of a System/370 without the complexity.”

The systems boast a variety of technological innovations ranging from IBM’s first use of its 1M-bit 7,500-circuit chips; more extensive use of rack-mounted components, which offers some incentive to value-added resellers and integrators; and even a newly developed thermal-conduction module (TCM) on the high-end model 90. The TCM houses the processor logic, cache memory and control storage to cool the densely packed logic and array chips.

Service and support shoot-out

Since the 9370 does target the DEC VAX marketplace—in fact, during the New York press conference IBM continually stressed the scientific performance capabilities of the new systems—IBM wrapped a number of announcements concerning software and maintenance pricing and applications around the 9370 introduction.

For example, IBM announced maintenance discounts of from 16 percent to 24 percent for minicomputer and personal computer users who agree to absorb some of the tasks related to keeping a computer fit. Customers who demonstrate they can “manage their own problems and facilities” by passing an inspection by IBM service personnel will receive the discounts. The company also unveiled software “SolutionPac’s” that tailor software and support to specific vertical applications, such as banking, plant automation and LAN implementations.

Perhaps the most significant software-related announcement, however, was IBM’s revelation that it will begin offering graduated one-time charges for more than 90 of its System/370 VM/VSE software programs. What the graduated program boils down to is this: the smaller the processor, the lower the one-time charge for software—a fact that may upset users of high-end IBM systems. IBM apparently realizes this but prefers to offer pricing incentives in a market where there is more competition.

“Clearly the benefits of graduated charges improve more with a small processor,” observes IBM’s Quinlan. “We weren’t trying to address the cost of software in the high-end so much as to take that software and make it more affordable for smaller processors.”

Recently, DEC extended its VAX-cluster networking software downward to run on MicroVAX II and VAXstation II systems operating within localized “work groups.” The software reportedly allows users to share systems and resources easily via Ethernet while eliminating the need for a dedicated computer acting as a resource manager. This elimination of a middle-man computer is basic to IBM’s 9370 series strategy.

DEC also announced that it will offer volume discounts of up to 40 percent for users of its MicroVAX II and VAXstation II systems—a departure for DEC and the company’s first venture into high-volume software discounts, according to a spokesman.

However, DEC’s Olsen insists that his local area VAXcluster and related announcements—unveiled little more than a week after the 9370—are not a direct response to IBM’s systems assault. “It’s presumptuous of us to compare ourselves to IBM,” Olsen said at DEC’s annual meeting. “But it’s dangerous not to take them seriously.”
Newbury’s solution to The Great American Printer Hang-up.

We’ve taken all the wrinkles out of paper handling. Now you can have reliable paper handling for more high-speed, dot matrix printing time. Newbury Office Systems Printers (OSP) are designed to more than match the capabilities of your Personal Computer—whether your application is word processing or financial modeling, using shared resources or local area networks.

Set-ups and change-overs have never been easier with our 3-way paper handling.
In addition to speedy printing, Newbury gives you a new standard in 3-mode convenience and flexibility. We’ve integrated a unique, automatic paper-feed mechanism that is fast and reliable. It features self-registration auto-load for single sheets. Simply snap in an interlocking paper cassette for faster automatic sheet-feeder applications. Or, snap in the interlocking tractor option with single belt and gear for true alignment of continuous forms.

Newbury offers more things for more offices.
Even at speeds of 200 cps, noise levels are quieted to less than 50 dBA. For print quality that is truly outstanding Newbury offers 9, 12 or 18-wire OSP models. All feature high-speed printing thru-put with Newbury’s exclusive 3-line look-ahead logic, low-mass, high-efficiency printheads, and fast-line advance. And when you’re ready for color, you have it by just inserting a clip-in color ribbon cartridge.

Document after document, Newbury delivers faster thru-put rates and a total-feature-package that just makes more sense for more offices.

Get more details immediately.

Newbury Data
Europe’s Leading Peripherals Manufacturer

Newbury Data, Inc. U.S. Headquarters
2200 Pacific Coast Hwy., Suite 208
Hermosa Beach, CA 90254
Phone: So. West 213/372-3775, No. West 415/254-8350,
No. East 617/273-2161, So. East 512/477-1221

For OEMs and Distributors Only.
□ Rush details on Newbury’s OSP Printers.
□ Send info on Newbury’s 8650 300 lpm serial dot matrix printer.
□ Send info on Newbury’s model 8933 240 cps Text Processing Printer.
□ Send data on Newbury’s 3.5” 160MB and 5.25” 65 to 380MB high-performance Disk Drives.

CIRCLE NO. 27 ON INQUIRY CARD
High-capacity flexible disk drives invade low-end storage arena

Carl Warren, Senior Editor

The newest flexible disk drives, with capacities as high as 20Mbytes, "provide system integrators with alternative storage solutions," says James Porter, data-storage industry analyst and president of Disk/Trend Inc., Los Altos, Calif.

The crux of such a statement, however, is a solution to what? In some cases, high-capacity flexible disk drives will replace tape storage, suggests Mountain Computer Inc.'s director of engineering, Eric Swartz. His company is bundling into its subsystem Iomega Corp.'s 20M-byte model Beta-20, a half-height 5¼-inch flexible version of the popular 8-inch, removable Bernoulli box cartridge.

Mountain of Scotts Valley, Calif., and Tandy Corp. of Fort Worth, Texas, are the first companies to incorporate the Beta-20 from Iomega of Roy, Utah, and both anticipate large sales. For example, Tandy's 3,000 captive stores expect to sell at least 100,000 Beta-20 systems this year.

Mountain, on the other hand, has to rely on retail distribution but will do equally well, says Phil Devin, senior data storage analyst for Dataquest Inc., San Jose, Calif. "I'd be surprised if they sell less than 5,000 units per month," he said.

Mountain's Bernoulli 9000 series is designed to match a user's system requirements. For example, its $3,995 subsystem contains a 40M-byte Winchester drive and the 20M-byte Beta-20 cartridge drive. "Essentially, we provide backup to the 40M-byte Winchester with the removable Bernoulli cartridge," says Swartz.

Iomega has elected to provide the Beta-20 only as an OEM product. "We have to create an established standard in the OEM world," says Michael Joseph, director of Iomega's product marketing. Early on, Iomega met with difficulty by trying to reach the OEM market with a single-sourced, non-standard product. Then, the company took the 8-inch Bernoulli box to the retail market via distribution and met with success. "We didn't have the burden of dual sources, compatibility and all the things OEMs demand. We did provide end-users with a solution to extensible storage—as you need more, you just add another cartridge," explains Joseph.

The Beta-20 uses a common-command-set (CCS) compatible small computer systems interface (SCSI)
Newbury brings its European winners to America!

Newbury Data is giving American OEMs and distributors their fast, their compact, their efficient, their reliable, their proven world-class disk drives.

Newbury now brings two high-capacity disk drive series to this side of the Atlantic—the 65 MB to 380 MB 5.25" and 50 MB 3.5" Winchesters—both proven leaders throughout Europe.

Newbury's world-class design, manufacturing and support capabilities are giving Americans a new freedom and opportunity to gain from competitive advantages that have long been recognized by Europe's leading advanced system developers. But then, this is the kind of total advantage you should expect from the company that is the leading independent peripherals manufacturer in Europe.

Newbury Data's proven 5.25" Winchesters are in a world-class of their own. This family of 5.25" disk drives delivers users a range of unformatted storage capacities from 65 to 380 MB. The 8000 (65, 85, 105, 140 MB) series offer ST-506/412 interfaces and the 4000 (175, 380 MB) series offers an ESDI interface. Data access times have been reduced a full 15 percent, to as low as 25 ms.

Newbury Data's brand new "Penny" 3.5" Winchester 50 MB has no world equal. The new 3.5" "Penny" is now in full production, fully proven and fully tested—unmatched in its advanced combination of unformatted high capacity, fast data access under 40 ms, and compact size. Newbury Data's 50 MB "Penny" drive is especially tailored for data-intensive microcomputer applications. The innovative use of surface-mounted devices and other advanced manufacturing techniques deliver major benefits including outstanding product durability and reliability.

Successful? Yes, Newbury Data disk drives are turning in world-class performances around the world.

Newbury Data
A member of the DRT Group
Europe's Leading Independent Peripherals Manufacturer
NEWBURY DATA, INC. North American Headquarters
2200 Pacific Coast Hwy., Suite 208
Hermosa Beach, CA 90254
Phone: (213) 372-3775

Regional Sales Offices: Austin (512) 834-7746, Boston (617) 273-2161, Los Angeles (213) 372-3775, San Francisco (415) 254-8350

For American OEMs and Distributors Only.
☐ Rush details on Newbury's 5.25" fully family of world-class drives.
☐ Rush details on Newbury's 3.5" "Penny" for my microcomputer applications.
☐ Send data on Newbury's world-class printers, too—both Text-Processing and Multi-Function models.

Name ____________________________
Company ____________________________
Address ____________________________
Phone ____________________________
City ____________________________
State ____________________________
Zip ____________________________

CIRCLE NO. 28 ON INQUIRY CARD
Imagine Going To Vegas And Winning 94% Of The Time.

Micro-Term did. And without anything up our sleeve. Several thousand people took Micro-Term’s Screen Test at Comdex and 94% of them chose our new ForeSight Edition’s letter quality screen as having the clearest, most readable display among the six terminals featured. We won despite some pretty amazing odds, since the choices included DEC, WYSE, CIE, TeleVideo and ADDS. But then our ForeSight Edition terminals are also pretty amazing. And you can see that for yourself just by giving us a call. We’ll arrange a personal Screen Test for you, through our nationwide network of distributors, featuring our new ForeSight Edition’s high speed Tektronix 4010/4014 graphics and DEC VT220 emulating terminals. Once you see The ForeSight Edition, with the best displays in the business, we think you’ll know why winning 94% of the time in Vegas had nothing to do with luck. For A Personal Screen Test Call 1-800-325-9056

MICRO-TERM
Solutions You Can See.
From The Company To Watch™
512 Rudder Road, Fenton, Missouri 63026, 314-343-6515
TWX: 910 760 1662 FAX: 314-326-0052

CIRCLE NO. 13 ON INQUIRY CARD

DEC and DEC VT220 are registered trademarks of the Digital Equipment Corporation. • Tektronix 4010/4014 is a registered trademark of Tektronix, Inc. • Nationwide service available through TRW, Inc.
What made manual mechanical engineering drawing obsolete in Japan?

Hitachi HICAD GM-1000™ micro-CAD software. Now, for $1,950, you can use the design tool that's #1 in Japan.

It took thousands of hours of engineering drawing for Hitachi to become one of the world's five largest producers of electrical and electronic hardware. But, you don't design computers without learning how to use them to become more productive. That's why Hitachi also became Japan's largest supplier of innovative CAD/CAM software.

The HICAD GM-1000 software package brings full-function CAD system capability to your desk top, turning your IBM PC*, XT* AT®, or compatible into a CAD workstation.

HICAD GM-1000 gives you the features you need the way you need them—easy to learn and use. HICAD GM-1000 provides prompts, error messages, and a help button to guide you.

Lines and basic figures can be drawn free hand or automatically constructed, then combined, moved, copied, rotated, or scaled to create complex geographic constructions. All entities are stored in a mathematical database that allows high-speed dynamic pan and zoom without interrupting another function. True ellipses and true splines are built-in commands.

User definable features include menus, keyboards, mouse, line styles, batches, and advanced macros. Dimensioning, leader lines, balloons, and fail-safe ten-command storage are automatic. Drawings may be separated into as many as 255 layers and displayed independently or grouped.

HICAD GM-1000 is a package that will make manual drawing obsolete for you, too. Our demo will show you why. Send for details today.

Hitachi America, Ltd.
Computer Division
950 Elm Avenue, San Bruno, CA 94066
Telephone: 1-800/842-9000 ext. 6672
In Canada: 1-800/843-9090 ext. 6672

IBM PC, XT, and AT are registered trademarks of International Business Machines Corporation.
Best solution for data acquisition systems designers:
an IBM PC/XT/AT* front-end that's both interactive and stand-alone...
yet starts at under $3,000. PICOBASYS™

PICOBASYS lets you put IBM PC’s, DEC Vax and MicroVax II*, and DEC mini’s into real-time control without sacrificing use of the computer for other important activities. PICOBASYS handles all of the signal conditioning and has an on-board I/O processor to provide event-driven, stand-alone control when needed. You can upload data from and download programs to PICOBASYS in fast, easy-to-use I/OBASIC language. PICOBASYS has 8 convenient, in-the-door module slots for hundreds of channels of I/O. Select from more than 30 plug-in modules for all manner of I/O including: AC, DC, T/C’s, RTD’s, strain gauges, TTL, mV, 4-20 mA, etc.

PICOBASYS is rugged, built for plant floor environments. Front panel terminal blocks make I/O wiring hook-up a snap. It even has 30-day, battery-backed program and data protection.

For the best and most cost-effective solution to using a PC in real-time control, design your system with PICOBASYS out front.
embedded on the master unit ($540 quantity 5,000) and a proprietary 50-pin connection on the slave ($360 quantity 5,000) unit. This combination, says Iomega's product manager for the Beta-20, Craig Brooksby, lets a user double the storage capacity by simply plugging in another unit.

Other solutions in the wings

Although Iomega has the lion's share of the market (an estimated 150,000 to 200,000 units) with their 8-inch Bernoulli box and can be assured of similar numbers in 1987 for the Beta-20, other manufacturers, including Data Technology Corp., Santa Clara, Calif., and Konica Technology Inc., Sunnyvale, Calif., expect to "byte" a share of the market as well.

DTC's TakeTen—a 10M-byte, 5¼-inch, hard-shell cartridge drive—is aimed at the retail distribution market. The $1,085 unit, for example, mounts directly into an IBM Corp. PC/XT. Alternatively, a $1,995 model comes as a complete subsystem: "A plug-in and run approach," says Michael Sugihara, DTC's director of strategic planning. The DTC TakeTen resulted from an OEM agreement with Eastman Kodak Co., Rochester, N.Y. Kodak has announced 6.6M-byte and 12M-byte versions of the drive but hasn't been aggressive in the marketplace. Sugihara, however, expects to be more aggressive with the current product and is already looking to the future. "We think that a 40M-byte version would be in great demand." No one, particularly industry analysts, disagrees with Sugihara. In fact, most predict that the 10M-byte version of the drive will be short-lived. Other factors may aid acceptance of the DTC drive: an encased media in a hard-cartridge shell, 333-tracks-per-inch (tpi) density and an embedded servo.

However, one retailer at Comdex/Fall complained, "I don't see any compatibility with anything." He felt, as did others, that Iomega had essentially established a standard with its 8-inch cartridge and that its new Beta-20, although not a retail product from Iomega, would establish a de facto standard for 5¼-inch flexible cartridge drives. Dataquest's Devin thinks that with both the DTC hard-shell approach and the Konica soft jacket route, an OEM partner is needed to guarantee success.

Undaunted DTC officials, however, expect to surpass sales projections of 75,000 units in 1988. "We think there are multiple ways, including adding software, that will make the TakeTen a compelling product for distribution," says a company spokesman. However, OEM buyers still recall defunct Amlyn Corp. and Drivetec Corp. and are leery of tackling high-capacity flexible disk drives. Amlyn and Drivetec were unable to develop an agreeable standard to build by, and media costs were well beyond acceptable limits. While they battled for limited market share, Iomega carefully mined the distribution/end-user market and established a base for follow-on products (such as the Beta-20), which would be acceptable to OEMs. Vendors of high-capacity flexible drives face similar marketing obstacles.

Konica, another company vying for OEM and distribution-market position, offers an under-$400 (in quantities of 10,000), 10M-byte, 5¼-inch flexible disk drive. It uses a standard 600-oersted (Oe) medium in a soft

The Konica KT-510 reads 360K-byte and 1.2M-byte standard disks and stores up to 10M bytes using 600-Oe medium.

REAL-TIME UNIX

D-NIX is a real-time, System V compatible operating system for transaction handling and process control applications. It fulfills all the requirements defined in the UNIX System V Interface Definition at Base System and Kernel Extension Level.

THE DIFFERENCE

What makes D-NIX different from other attempts at real-time UNIX is the handler concept. This extension of UNIX allows application programs to access local and remote resources, such as databases and non-UNIX file systems, but leaves the task of accessing local and remote resources to the handler.

D-NIX IS A REAL-TIME OS

D-NIX was developed for the transaction handling and process control applications which need a real-time environment and want full UNIX compatibility. This was achieved by writing a no-wait kernel from scratch. In practice, this means faster turnaround between different activities in the system. This demand page, virtual memory operating system achieves real-time response in an event driven environment.

UNIX V.2 compatible Real-Time OS with many enhancements

- Guaranteed interrupt response time.
- Event-Queue and NO-WAIT system calls for simultaneous requests.
- Contiguous files for fast disk I/O.
- Individual file buffer write for transaction checkpointing.
- Advanced color window handling option.
- Memory resident processes for faster response time.
- Extensive network support for TCP/IP.X.25, SNA/SDLC and others.
- Secure bit-map file system.
- File handlers for Unix, MS-DOS, and CP/M running concurrently.
- Userconfigurability of OS parameters.

D-NIX is available for M68000 and NS32000 family 32 bit CPU's.

MINI-MICRO SYSTEMS/January 1987
If you're a hardware OEM or system integrator, you have to build a product that can win in the marketplace.

You need a computer supplier who can give you more than the same off-the-shelf package your competitors have.

Charles River is the only supermicro builder who offers a UNIX System V.2-based operating system, plus conformance to the new IEEE POSIX trial-use standard, plus a compatible real-time kernel, UNOS™, that lets you tackle tough real-time jobs.

For more on how we can help you build a winner, from customizing to multi-vendor networking, contact Charles River Data Systems, 983 Concord St., Framingham, MA 01701, (617) 626-1000, Telex 681-7373 CRDS UW.

We'll help you build a winner.

UNIX is a registered trademark of AT&T. UNOS is a trademark of Charles River Data Systems.

CIRCLE NO. 35 ON INQUIRY CARD
Packing up to 20M bytes into a removable 5¼-inch cartridge, the Iomega Beta-20 contains an embedded SCSI interface on the master unit and a proprietary interface on the slave module.

There is a big market out there using so-called AT-compatible flexible disks. Our model KT-510 can read data from the standard 360K-byte and 1.2M-byte disks currently used in the IBM PC, PC/XT and PC/AT. Consequently, users aren't going to be dealing with anything foreign, such as a new and expensive media,” says Richard J. Freedland, Konica's director of business marketing.

Already, Konica is trying to establish strategic alliances with other companies, such as Citizen America Inc., Santa Monica, Calif., for manufacturing and possibly marketing purposes. “Right now it's a manufacturing agreement. We will work out other details later,” says Freedland.

Kodak will probably have to make similar arrangements for distribution, possibly with another one of its companies, such as Verbatim Inc. “They will need to set up various distribution channels, and the Verbatim people already have distribution lines in place,” suggests Disk/Trend's Porter.

To achieve high capacity, the KT-510 has 480 tpi: “We needed a multiple of 96 to maintain compatibility with 360K-byte and 1.2M-byte disks,” says Freedland. One concern voiced by analysts and expected buyers has been the viability of the media. However, Freedland says that bit-resolution really isn't the problem, and that Konica isn't even pushing the maximum resolution of the media. “We are below 18,000 flux-changes per inch. DTC is at 22,000 and Iomega is at 21,000, and we all use 600-Oe media. There is very little difference in the media except how we use and package it," he claims.

Freedland says that the real problem is in the servo system. The KT-510 uses an adaptive servo system, but that limits the drive tilt to no more than 30 degrees. “Above 250
THE FASTEST SERIAL DOT MATRIX PRINTER IN THE WORLD!

Made Proudly In The USA

700 characters per second / 200 lines per minute with reliability built in!

The best Price/Performers in the Industry!
At OTC, Price and Performance are inseparable. With our printers, high speed doesn't mean high price!

Round-the-clock printing for heavy-duty applications!
- Data Processing
- Financial
- Graphics
- Spreadsheets
- Bar Codes
- Near-Letter-Quality

Flexible features to meet your needs!
- Serial, parallel, or IBM 34/36/38 twin-ax
- Variable pitch printing
- EPSON, DEC, or IBM 5224/5226/5256 emulations
- Front panel menu programming (no DIP switches)
- 8K data buffers
- Front and bottom paper feed
- International character sets... and more!

Output Technology Corporation...
The Price/Performance Leader!

1-800-468-8788
(8am-5pm Pacific Standard Time)

E. 9922 Montgomery, Suite #6, Spokane, WA 99206
(509) 926-3855, Telex # 15-2269 OUTPUTSPOK
800-4-OUTPUT (468-8788)
The market impact seems clear. At least for the next 24 months, 5¼-inch solutions (in the 10M- to 20M-byte range) will most likely rule the roost. However, over the long term, the 10M-byte versions are at most risk because the demand is for greater capacity at lower cost. “Drives like the Iomega Beta-20 are in the $15- to $20-per-megabyte range, and we’d like them down around $5 per megabyte. But that can take some time until the volumes build up,” says Mountain’s Swartz.

**Applications broaden market**

With the strategic maneuvering by the various players in the high-capacity flexible disk market, users will end up the overall winners. Iomega is seeing much interest in using the Beta-20 as an interim cache between compact disk ROMs and the system and as a tape replacement. DTC and Konica claim (since neither is shipping) that potential buyers are eyeing the drives as ideal solutions for shipping large databases and managing images and copy in desktop publishing.

IBM may soon get into the high-capacity removable flexible drive business as well. There are reports that its Tucson, Ariz., division, primarily responsible for tape units, is seeking information on who buys Iomega-type drives and why.
Discover the secret behind the plot with Houston Instrument's line of low cost, high performance plotters. Within HI's impressive line, you'll find a full range of models suited for virtually any CAD application.

Secrets in flexibility and quality.
Define your requirements. You'll find a plotter that's uniquely suited to your CAD system in HI's lineup. Choose from models with one, four, six, eight, even 14 pens. Select the types of pens and plotting media you need. Decide on format sizes—from A through E. Whichever model you choose, your HI plotter will create accurate, crisp, colorful drawings.

Secrets in performance and price.
With high MTBF ratings, your HI plotter excels in reliability. And, depending on the model you select, you'll experience plotting speeds up to 22 inches per second and resolutions ranging from .005 to .001 inch.
As you examine features, performance, and especially price, you'll quickly realize that Houston Instrument's line offers outstanding performance at an affordable price.

Regardless of the model you pick, you'll find hundreds of compatible software packages. And, by using HI's popular DM/PL™ language, you can create your own custom software and be assured of upward compatibility with HI's entire line of plotters.

Discover more about the secret behind the plot. Also examine HI's full line of TRUE GRID™ digitizers. Call 1-800-531-5205 (512-835-0900 if in Texas) or write Houston Instrument, 8500 Cameron Road, Austin, Texas 78753.

CIRCLE NO. 37 ON INQUIRY CARD
GOVERNMENT, IEEE FAVOR POSIX INTERFACE

Software-transportability benefits of interface standard outweigh UNIX operating system shortcomings and pave way for POSIX acceptance

Wendy Rauch-Hindin
Special Features Editor

Companies have noted for some time that four out of five government RFQs (requests for quotations) for computer systems have specified UNIX. And the National Bureau of Standards made it official in August 1986. It published in the Federal Register an announcement of intent to adopt the IEEE UNIX-interface standard called POSIX (for Portable Operating Systems—IX) as the Federal Information Processing Standard should, as appears certain, POSIX become a "full-use standard."

Let there be no confusion about a UNIX standard, though. Most major organizations intend to adhere to a UNIX interface standard rather than to some particular version of the UNIX operating system. The closest thing to a commercial UNIX interface standard today happens to be AT&T Co.'s System V Interface Definition (SVID). In March 1986, however, the IEEE P1003 committee approved POSIX—also based on System V—as a trial-use standard.

"Trial use" means that controversial items are relegated to the appendix rather than placed in the main document. In July, the IEEE will vote on making POSIX a full-use standard. At that time, the items in the appendix will be re-evaluated based on feedback during the trial-use period, and many of them will be incorporated into the full-use standard.

POSIX defines the interface between applications and the UNIX operating system. It does not define UNIX. Its goal is to support source-level portability of application programs across diverse machines that run P1003-conformant versions of UNIX.

UNIX was chosen by default as the multiuser operating system on which to standardize. It is the only operating system that is widely supported by major vendors on different types and levels of machines. MS-DOS, which is the de facto standard on microcomputers, was not considered to be a suitable standard for application transportability, because it's a single-user operating system and is deemed to be constrained to certain classes of hardware (see "Why not standardize on MS-DOS?" Page 46.)

Necessity is the mother of migration

Application transportability, conservation of programmer skills and the resulting decrease in software costs are the driving forces behind the government's shift toward standardization. And UNIX fits in well with the way the government does business.

For example, government policy dictates competitive procurements for purchases above a certain price. If UNIX is specified as the baseline operating system, it is possible to design software and acquire hardware in parallel. In contrast, in the pre-UNIX days, it was necessary to first have the hardware and then either put out an RFQ for software or develop the software internally.

Needless to say, a UNIX-based interface
UNIX

standard reduces the time required to get systems into the field. In addition, having a standard also allows a maximum number of companies to bid on government contracts and forces them to be competitive. And, if the hardware is replaced at a later date, users can, for the most part, reuse the same software in the new operating environment.

There is also a fairness aspect to competitive bidding based on a UNIX specification. Bidding based on functionality alone was nice for the company that was awarded the contract. But, as Robert Borochoff, research computer scientist at the Federal Judicial Center and a member of the board of Unicorn (a federal UNIX user group) points out, “Suppose you bought a VAX running VMS for development. You were then likely to be locked in to supplying VAXes running VMS for perhaps 200 production systems, in which case every other vendor screamed bloody murder.”

It’s because they scream bloody murder that it is imperative to specify an interface standard like POSIX, which is defined by a voluntary standards body—the IEEE. In contrast, if a government specification is based on a standard defined by a company, vendors can contest contract awards. Moreover, there is precedent for the government being required to revise its RFQs to be more generic, even if it can show the need for, or benefits obtained from, a particular de facto standard. In the past, a solution to the problem has been to specify an interface.

Such is the case with POSIX. With the approval of POSIX as a trial-use standard, P1003 formed several working groups. For example, the P1003.2 working group is chartered to produce a standard interface to a shell, its command language and tools-level UNIX facilities. This standard is not intended to specify interfaces that are user-friendly, such as visual shells, desktop metaphors, command recall and mice. However, such programs will be expected to use the programmatic interfaces defined by the standard (Fig. 1).

Another working group, P1003.3, is defining the test-method specifications for testing conformance of a product to the standards. From these test-method specifications, the National Bureau of Standards intends to build a reference implementation for a test suite with which to check product conformance. But the Bureau will not certify a product. Instead, it will develop the test suite and then release it into the public domain.

Other IEEE subcommittees are working with the UNIX /usr/group technical committees to resolve issues of UNIX-based networking, security, graphics, database, internationalization, performance and real-time extension (MMS, September 1986, Page 61).

Procurement has significant impact

Meanwhile, the first government specification requiring POSIX has been released by the Bureau of Census. It calls for delivery of a full-use POSIX implementation, once that interface standard is approved. It is a large procurement, requiring the POSIX implementation on what are often called “IBM-class” machines.

This procurement will force many large-scale vendors to make known their POSIX or UNIX intentions. Some have started. IBM Corp., for example, has become active in the IEEE and /usr/group UNIX-interface committees to the extent of volunteering to sponsor the IEEE POSIX meeting in Toronto in April. It also put on quite a show at last October’s UNIX Expo in New York City with its UNIX-based RT PC and its VM-based UNIX blanketing almost every possible application.

Hewlett-Packard Co. also has positioned itself for the UNIX marketplace, offering both general-purpose and real-time versions of UNIX System V. The company is firmly committed to maintaining compatibility with the IEEE and SVID standards. Moreover, it offers a migration path from its proprietary operating system to UNIX, without the need to rewrite existing code. Amdahl Corp., Burroughs Corp., Concurrent Computer Corp., Data General Corp., Gould Inc., Honeywell Inc., Intel Corp., Motorola Inc. and Texas Instruments, as well as

---

**Fig. 1. The P1003.2 shell and utilities application interface standard defines an interface to the UNIX shell, its command language, utilities and tools.**
Gould: One-stop UNIX® shopping.

Everything you need, from the company that ties it all together. Gould offers the most complete range of UNIX-based systems in the world:

- Secure (C2) UNIX systems
- AT&T System V and BSD 4.x
- Integrated information systems
- Desktop-to-mainframe hardware

For more information on Gould's one-stop shopping, contact Gould Inc., Information Systems Computer Systems Division, 6901 West Sunrise Boulevard, Fort Lauderdale, Florida 33313
1-800-327-9716.


CIRCLE NO. 38 ON INQUIRY CARD
When Sun Microsystems began looking at Multibus disk and tape controllers for their high performance engineering workstations, they demanded a lot.

"We needed a fast Multibus SMD disk controller, one that could read fast drives, like the Fujitsu Eagle, at full speed," says Sun Director Jon Garman. "The boards we were evaluating simply couldn't measure up."

That's when Sun discovered Xylogics.

"Getting Xylogics' 440 controllers operational with Sun's workstations was a positive experience," Garman remembers. "What the manual said, the Xylogics boards did, and the software interface was simple to use.

"We had our first Xylogics board up and running with UNIX in just four hours. It was quite phenomenal," he says.

Next, Sun integrated the Xylogics 450 in its second-generation family of workstations because it was the fastest, most reliable Multibus board they could find.

"From the start, our number one concern has been performance," says Garman. "But just as important is the support Xylogics gives us. They've always been very responsive. They listen. And take us seriously. We have a close working relationship: engineering to engineering and management to management. They've always delivered on their promises."

Xylogics' newest product, the 751 VME controller, is now being integrated into Sun's third generation of workstations, The Sun-3 Series.

Little wonder that Xylogics is the secret behind virtually every supermicro and workstation company. Or that nearly half of all high performance Multibus disk and tape controllers in use today are Xylogics.

Find out how Xylogics performance, reliability and support can be part of your success story. Call or write for information about our complete line of Multibus and VME bus products.
Apollo Computer Inc. and Sun Microsystems Inc. are other major computer manufacturers committed to System V.

Digital Equipment Corp. supports UNIX too. However, DEC supports (even if it does not push) its own ULTRIX, which is based on Berkeley UNIX Version 4.2. As its white paper on UNIX indicates, DEC is lukewarm to the System V SVID and says it prefers POSIX, if its customers want it.

If the government and the manufacturing community moves indicate public attitude, DEC's customers do want it. Although based on System V, POSIX does have some Berkeley features. The National Bureau of Standards and several vendors expect that, once POSIX becomes a full-use standard, ULTRIX will begin to resemble POSIX. The user base appears to be moving in the direction of POSIX and it is unlikely that DEC will let that customer base slip through its fingers. What is more likely is that DEC is resisting UNIX because DEC stands to lose more than any other computer manufacturer by adopting UNIX. The VMS operating system, along with DECnet, are major features differentiating DEC from other companies, and both VMS and DECnet have been under attack in the interest of standardization and compatibility.

**Supersets abound**

One way that computer vendors are dealing with the differentiation problem is by adding features to a basic SVID UNIX or POSIX to make it special. If the story ended there, such construction of UNIX supersets would allow system integrators to port basic UNIX applications to their environments but not from their environments to anyone else's. As a result, manufacturers are still able to maintain a captive installed base.

This practice could backfire, however. With the government's and other major users' emphasis on compatibility, it is conceivable that something less than 10 percent of a manufacturer's loyal followers could become dependent on these features. The manufacturer would then be stuck with having to support its special version, practically forever.

Fortunately for compatibility, most third-party vendors and software developers are refusing to use these superset features. For third-party vendors and software developers, a single, standard operating system ensures that their applications will run on the maximum number of machines with the least amount of rewriting. Consequently, major UNIX database vendors—such as Informix Software Inc., Oracle Corp., Relational Technology Inc. and Unify Corp.—are writing only for the standard operating system features. Other features that would be nice to have are either written by the database companies themselves or by the application developers.

Application developers have also adopted strategies that permit them to create a single application for various machines running different supersets of UNIX. For instance, many of them have indicated that they will provide for UNIX extensions in library routines. These library routines will interface to the core standard (P1003 or SVID) on one side. The other side will interface to the application (Fig. 2).

The system calls for any particular service will appear the same to each UNIX system's library. Portability results for the following reasons. The system calls that the application makes directly to the core standard UNIX do not affect portability because the core is standard. If a feature does not exist in the core standard, but does exist in a certain UNIX superset, the application will make a system-call request to that superset's system library, which will perform the service in its own way. In the case of a UNIX system (call it the ABC UNIX) that does not provide the feature at all, the identical system call will go to the ABC library, which will contain a vendor-written service routine able to perform the function.

The federal government hopes to use this library scheme to run its numerous applications, both in the Department of Defense and in civilian agencies, on different UNIX-based computers, with few modifications. These applications run on mainframes, minicomputers,
workstations and personal computers. They encompass standard engineering graphics, modeling, computer-aided design/computer-aided manufacturing, and laboratory-control applications so often associated with UNIX. But a major, less recognized, thrust points toward UNIX-based office automation and productivity systems. These systems include electronic mail, all kinds of applications involving departmental databases, typesetting, decision support, electronic spreadsheets and word processing.

The fundamental applications needed to run an organization, such as payroll, general accounting and corporate accounts, still run within the mainframe's batch environment rather than under UNIX. There are several reasons for this setup. These applications are heavily dependent on tape storage, and UNIX does not offer a lot of support to tape drives. There is also a cultural barrier. Traditionally, these kinds of applications had been developed and maintained by data-processing shops before UNIX was a concern. There is often no reason for MIS (management-information system) people in these shops to switch operating systems. Moreover, MIS people tend to deal with high-level data structures and security while UNIX and the C programming language have been oriented toward lower level objects.

However, UNIX's strength in office automation should not be surprising. UNIX originally was a text manipulator. This orientation underlies its strength as a software-development system—a computer program is really composed of structured text. In fact one of the early major UNIX vendors—Fortune Systems Corp.—made its claim to fame by emulating the Wang Laboratories Inc. word processor. This was a relatively easy product to develop because of all the text handling utilities in UNIX.

UNIX's other technical strength—its ability to handle low-level objects such as registers, program counters and memory locations—makes it attractive to system programmers developing communications applications. This capability, in conjunction with economic factors, also makes UNIX attractive for distributed-processing applications.

Great expectations

Nothing is perfect, and UNIX has its shortcomings. Some of them are intrinsic weaknesses; others are really the lack of features that users expect in production environments.

Among weaknesses that users cite are lack of database-application development tools, ANSI tape tools and standardized system-administration tools; poor error-handling capabilities, flimsy file systems, poor security and subpar handling of flexible disks. Users also feel that UNIX, like production operating systems, should provide for writing the data to disk immediately upon request, instead of holding

Why not standardize

MS-DOS, ubiquitous in the microcomputer world, is, for several reasons, not considered to be a suitable operating system to provide software transportability across multitasking, multiuser mainframes and minicomputers. Principally, although it recently received multitasking capabilities, MS-DOS is not a multiuser operating system. In addition, it does not have software-protection facilities to supervise and coordinate the machine resources that a program can access, and it is written in assembly language.

Multitasking, software protection and multiuser capabilities are related but not mutually dependent. For example, DOS 4.0 is multitasking, but it is not necessarily protected. Consequently, even on a single-user multitasking DOS 4.0 system, a background process could run rampant and clobber other processes. The Intel Corp. 80286 version of DOS 4.0 provides protection, because it is designed to take advantage of the 80286's memory-management hardware. But most existing applications written for DOS will not run in DOS 3.0, DOS 4.0 and the 80286 DOS 4.0 environments, because they violate the programming rules for protection. Applications behave differently in protected and unprotected environments.

For example, most existing applications deal directly with the hardware in some way, whether it be to write directly to graphics memory, read directly from the basic input/output system, write directly to various parts of memory, or read or write to the disk without going through DOS. But, even if the applications were rewritten to deal only with the operating system, porting MS-DOS to multiple-class computers would require rewriting the entire operating system because MS-DOS is written in Intel Assembler rather than in the C language. Microsoft Corp. admits that such a rewrite is a lengthy and impractical task.

Even if all these problems were miraculously solved, DOS would still not be suitable as a generic operating system for personal computers and large multiuser computers because DOS is single-user oriented, claims Mark Ursino, manager of strategic accounts at Microsoft. Multiuser implies a number of capabilities with regard to understanding different users, such as different user privileges and different scheduling techniques. MS-DOS doesn't support these multiuser capabilities and, Ursino says
the data in a buffer until the buffer is full. Both third-party vendors and the IEEE have been working to alleviate these and other concerns. The IEEE is even sponsoring a contest to find the worst problems in POSIX.

Differences between POSIX and the SVID are also being resolved. It is not generally realized, but it is now possible to have an operating system implementation that conforms to POSIX and also passes the test for UNIX.

Figures indicate that, although scientific and engineering applications have been one of UNIX's largest growth areas, UNIX has found its greatest use in office automation and business applications.

**on MS-DOS?**

emphatically, "Microsoft has no plans to make MS-DOS multuser. XENIX is our multuser operating system."

It turns out that time-sharing UNIX, with its round-robin scheduling and fairness principles, rather than privileges, doesn't have many of these capabilities either. For this reason, Ursino believes that UNIX is not the optimal portable operating system for multiple-class machines and applications. Applications that make use of the scheduler won't work, if they are transported across workstations and different-purpose time-sharing machines all running the same operating system but with different schedulers.

AT&T Co., the IEEE and the UNIX /usr/group are all working to design a version of UNIX with the priority-scheduling capabilities needed for applications such as real-time and transaction processing. But as far as making MS-DOS multuser, Ursino views such an idea as "a cruel joke, because it will not provide users with the capabilities they think they would be getting."

There are several problems. One is that most DOS applications do not support multuser requirements such as record- and file-locking. An even bigger problem is that most DOS applications are graphics-based. Currently, nobody builds anything that even approaches a cost-effective multuser computer that offers each user full graphics capability. As a result, whether users hang dumb terminals off their multuser MS-DOS systems, or run MS-DOS as a task under UNIX, they would quickly discover that applications like Lotus Development Corp.'s 1-2-3 or window-based applications would not run. These applications could run on the main system console or on an intelligent terminal that emulated the DOS graphics environment. But that only buys an expensive DOS machine.

There is yet another problem. "Multuser" implies a single processor supporting a number of terminals. In that configuration, supporting multiple graphics terminals is not cost-effective.

This is as true for multuser UNIX as it is for MS-DOS. Consequently, the highly graphical UNIX systems used in engineering design are usually operated as single-user workstations. Information in these environments is then shared via closely coupled networks.
SVI D conformance. This does not require changes to either SVID or POSIX, but it does require adding certain features to each so they can mutually conform.

The differences between POSIX and SVID are considered to be superficial. For example, the SVID requires a certain directory structure in order to locate the password file and manipulate it. POSIX does not specify such a structure. Instead, it specifies the presence of a subroutine that knows how to get the password file wherever it may be and whatever its format may be. To conform to both SVID and POSIX, an implementation needs to implement the SVID password-file format and location, but it also must have the POSIX-specified subroutine for accessing the same information.

Many of the issues surrounding items in the appendix of the trial-use standard, such as "locking," have also been resolved. The locking controversy centered on "advisory locking" vs. "mandatory locking." Mandatory locking sounds like something that must be necessary to ensure data integrity. Yet the agreement favored advisory locking for two reasons. First, it was realized that mandatory locking had some problems. In particular, if the accounting file is locked, no one can log on to the system, and all processes stop running because they can't log their accounting data. A second reason was that, in the aftermath of such realizations, no one was able to come up with any example where mandatory locking would be required.

As it now stands, an International Standards Organization effort has already been initiated, and approval of POSIX 1003.1 as a work item is expected this month. The IEEE hopes to get and incorporate feedback from ISO before its own, full-use, document is voted on in July.
Fujitsu's line of compatible SCSI data storage products will help you drive your system to its full performance potential.

If you want cartridge tape drives, optical disk drives, 5¼-inch, 8-inch, and 10½-inch Winchester drives — or any combination thereof — on your SCSI bus, you'll never miss with Fujitsu America.

Our SCSI storage systems and products can keep up with the most sophisticated multi-host, multi-tasking SCSI-based system you can design. You can take full advantage of the extended performance features of SCSI — with products that set performance standards of their own.

Our Intelligent Disk Controller (IDC) can be configured with up to four drives on a single node, for a storage capacity that can exceed 2.7 Gigabytes. Choose our 8-inch, 337 and 690 MB drives or our 10½-inch Eagle XP, 689 MB drives. The SCSI IDC offers either single-ended or differential drivers and Common Command Set support for easy integration into any SCSI environment.

For 5¼-inch drives, our 172 MB drive, with its embedded SCSI controller, offers you large capacity and high performance in a compact package.

And Fujitsu's SCSI family also meets your need for cost-effective back-up devices. Our 130 MB, ½-inch cartridge tape drive or our new 600 MB, 5¼-inch optical disk drive provide unique solutions to meet your SCSI requirements.

If you'd like to put your SCSI system into high gear — stop! And find out more about Fujitsu's compatible data storage products. Call (408) 946-8777. Or write Fujitsu America, Inc., Storage Products Division, 3055 Orchard Drive, San Jose, CA 95134-2017.

Put Fujitsu drives on your SCSI bus. And give superior system performance the green light.

WE'RE DEVELOPING TECHNOLOGY FOR YOU.

Fujitsu America, Inc. 1986. All rights reserved.
One of the most significant developments in IBM ASCII terminals is the one you may never use.
Announcing an IBM first: the three-year ASCII terminal warranty.

Here’s how it works. Should you have a problem with any of the three elements* of an IBM ASCII terminal purchased after June 15, 1986, just take the problem element to any IBM Service Exchange Center or IBM authorized remarketer. They’ll exchange the non-working element for one that works. So you’ll be on your way with a minimum of downtime.

How will you know which element isn’t working properly? Our built-in diagnostics let you know quickly.

Of course, all this may well be academic. For given the reliability that’s built into every IBM ASCII terminal, the three-year limited warranty is one feature you’ll probably never need.

Introducing the 132-column IBM 3162.

But our three year warranty isn’t the only significant development in IBM ASCII terminals. There’s our new full-function 3162.

It features a crisp, clear, readable 9 x 15 character cell**

And it’s available with our new amber-gold 14-inch screen. Or our new green 14-inch screen. Your choice.

What’s more, not only is the IBM 3162 switchable between 132 and 80 columns, it shows 28 rows of data. Which enables it to display even more information.

The 3162 comes with a compact, yet fully-functional, 102-key keyboard. Or a space-saving 84-key keyboard.

But, of course, size isn’t everything. Read on.

New developments in emulation.

Our exclusive plug-in Emulation Cartridges allow all our ASCII terminals to operate in the most widely-used data streams. (Including the DEC VT 220 and WYSE 50+) So that instead of changing terminals, you merely change cartridges.

And, in addition to their changeable personalities, all IBM ASCII terminals share another trait. The ability to operate in their own function-rich native mode.

What isn’t new.

Our superb ergonomics, for one thing. And our quantity discounts, for another.

Neither is the availability of financing from IBM Credit Corporation. Or the quality and support you’d expect from IBM.

For more information, contact IBM or your marketing representative. Or call 1 800 IBM-2468, Ext. CM/96 for the IBM authorized supplier nearest you.

---

*Keyboard, display and base. **9 x 15 character cell in 25-line mode only.
The JDL-850 EWS brings a new level of convenience and capability to workstation output. High quality drawings from A to C-size can be produced in 14 colors with line quality and accuracy exceeding most pen plotters. For continuous plot production, an optional automated media feeder accepts A through C-size papers and vellum. And, with the 850 EWS you never have to worry about changing pens, having the right pen color, or running out of ink. You spend more time on productive output and less time on set-up and maintenance.

The HP-GL™ compatible GL Processor™ option frees the host computer from the CPU-time consuming task of vector to raster conversion. Optimizing the 850 EWS performance, the GL Processor produces faster plot times and significantly increased system productivity. In micro to mainframe applications the 850 EWS/GL Processor provides high resolution plotting with CAE/CAD/AEC and graphics software that supports HP-GL.

For added workstation functionality the 850 EWS emulates the Diablo 630, IBM 5182 Color Printer, and Epson printers for text and graphics compatibility with word processing, spreadsheet and business graphics programs.

Speed, output versatility, desktop size, unattended operation and low cost media and supplies make the 850 EWS Printer/Plotter so convenient and affordable, every CAD workstation can have one.

The JDL-850 EWS family:
- 850 EWS with GL Processor Controller for maximum performance and features.
- 850 EWS/GLP - internal card for HP-GL compatibility.
- 850 EWS Printer/Plotter.

For specifications and a plot sample call (805) 495-3451. In the eastern half of the U.S. call (704) 541-6352.
Macintosh users have enjoyed desktop publishing benefits for more than a year. Now, powerful IBM PC packages have arrived. The big question is, "What can they really do?"

David Simpson, Senior Editor

Desktop publishing seems to be an ideal profit vehicle for value-added resellers and system integrators. Few end users are capable of hooking up the disparate components that these systems require, which often include scanners, personal computers, high-resolution monitors, device drivers, disk drives, laser printers and page-composition software. But so much hype has been lavished on desktop publishing that it's difficult to understand just what the systems can and cannot do.

At the heart of a desktop publishing system is the page-composition program, also called a page-makeup or page-layout program. These packages were preceded by simpler printer-control programs and souped-up word-processing programs. At first glance, all the packages appear identical in functionality, but by closely evaluating them, differences between product brochure and product performance become as evident as differences between product A and product B.

For example, most packages claim to be "what you see is what you get," or WYSIWYG: what appears on the screen is exactly what will appear on the hard copy. However, even with high-resolution monitors, you can often confuse different typefaces on IBM Corp. PCs.

Buyers should also be aware that with many packages, they can't edit entire pages in WYSIWYG mode—they can only "preview" the screen on demand. In other words, the programs don't have true interactive WYSIWYG capabilities.

A fundamental feature of page-composition programs is the ability to hyphenate and justify. But be sure to find out whether hyphenation is automatic or manual. And, if it's automatic, whether it performs hyphenation by referring to a dictionary—the size of which varies widely.
Another key consideration is whether or not a package can accept formatted text. Most packages import unformatted ASCII text files, but page-composition packages vary widely in acceptance of formatted files from popular word-processing packages. Also be sure to ask whether those imported files will retain type styles and formatting codes.

Less expensive packages, such as Letraset USA's $199 MacPublisher II, Orange Micro Inc.'s $395 Ragtime and Software Publisher Corp.'s $185 ClickArt Personal Publisher do not maintain the type style and formatting codes of imported files. In contrast, Xerox Corp.'s $895 Ventura Publisher does retain the formatting codes from five popular word-processing programs.

Other packages are essentially word-processing programs with added page-composition capabilities. They include Spellbinder Desktop Publisher, based on the Spellbinder word-processing program, Orange Micro's Ragtime, incorporating a MacWrite-like word-processing program, and International Microcomputer Software Inc.'s PagePerfect. Such packages give you full word-processing functions within the page-composition environment, thus eliminating the need for outside text editors.

Most desktop publishing applications require mixing text and graphics. One way to get graphics on-screen is with an image scanner. Another method is to import images from a graphics program. Many PC-compatible page-composition packages accept images from popular graphics packages such as Autodesk Inc.'s AutoCAD, Digital Research Inc.'s GEM Draw, Lotus Development Corp.'s 1-2-3, Media Cybernetics Inc.'s Dr. Halo and Microsoft Corp.'s PC Paintbrush. Macintosh-compatible packages usually accept images directly from Apple's MacPaint and MacDraw.

There are two levels of graphics manipulation. With most packages, you have to exit the page-composition environment and go to a separate graphics program (or to a separate module of the page-composition program), perform the sizing and cropping, and then import the image back to the page-composition package. In the higher level of graphics manipulation, you can actually draw, or change, the images on the page while in the page composition-environment. Examples of this type of package are Megahaus Corp.'s First Impression and White Sciences Inc.'s Pagebuilder package.

Also important is how long a document the package can handle, which is related to how you get the various elements on the page. This can be done either in batch mode or interactively; in other words, does the program perform automatic pagination or does it require enhanced graphics, but I configured Ventura for [IBM Corp.'s] CGA and now GEM is configured for CGA . . . In fact, installing Ventura is a long and tedious process, so you better make sure you've got it the way you want it. The documentation is not bad, and most things you can figure out by just banging around on the system."

Jose Ramos, publisher of the WYSIWYG newsletter, Redwood City, Calif.,—which focuses on the electronic publishing industry—on Ventura Publisher:

"The key thing about Ventura is that it was designed for the XT, and they wanted it to be fast. So they wrote the screen drivers in 8088 assembler language. They also selected a geometric model that is denominated in integer arithmetic. What that means is that you don't need a floating-point co-processor chip. With other packages, you have to go out and buy a co-processor chip and plug it into the motherboard of the PC.

"It was a very clever decision. They wound up with a very fast package on the XT and then by luck they found themselves well-positioned for the Compaq 386 because the Compaq doesn't yet have the..."
manual page makeup? For example, with Studio Software’s Corp.’s FrontPage, the operator uses cut-and-paste techniques to manually create pages one at a time. Software Publishing’s ClickArt is another example of a manual page makeup program.

Xerox’s Ventura Publisher allows you to create documents interactively as well as in batch mode. In batch mode, you select a style sheet, identify the text and graphics by simply pointing a mouse and clicking and then tell the program to make the page(s). Ventura Publisher automatically “pours” text and graphics onto the screen in the proper format. In addition, the program automatically updates the source file when changes are made and reflows and repaginates pages when images or text are added.

Bestinfo Inc.’s high-end ($7,000) multiuser Superpage II is another package that combines batch and interactive capabilities. Similarly, Software Publishing’s Harvard Professional Publisher, which is based on the original Superpage, can handle long documents in batch-layout mode. In general, interactive mode is slower than batch mode.

Other functions to look for in a desktop publishing package include automatic reflowing of text to different page formats, spelling checkers, automatic image scaling, repagination, table of contents generation, vertical justification, text runaround (text flowing around an image) and availability of predefined style sheets or page templates. Armed with such a checklist, buyers can quickly eliminate certain packages but, as with most software, the only way to decide on a package is to test-drive a few.

The list of typographic functions to look for in a desktop publishing system is bewilderingly long, notes CAP International Inc.’s Arlene Karsh. But, Karsh, director of the Marshfield, Mass., computer publishing systems market-requirements service, adds, “The key to future, widespread adoption of desktop publishing and all levels of computer publishing, is not in platforms or features, batch vs. interactive, codes vs. WYSIWYG, or whether one should scan, paint or draw and at what resolution, at what output speed and via which page-description language. Rather, the real issue is integration.”

Vendors target VARs

Some vendors of desktop publishing software specifically target VARs. For example, White Sciences’ Pagebuilder sports a programmable user interface that can be tailored for vertical-market applications. Alternatively, buyers can choose from three vendor-supplied interfaces: beginner, intermediate or advanced, depending on whether the targeted users are novices or have graphic-design experience.

Studio Software offers an advanced version of FrontPage that the company sells only to VARs. Called FrontPage Plus, the $1,295 pack-

---

you wait for: users speak

floating-point co-processor. The raw speed of the Compaq makes Ventura even faster.

“We did a benchmark comparison between the Ventura package and an Interleaf Version 2.0 package [Interleaf has since released Version 3.0] running on a Sun [Microsystems Inc.] workstation. There was little difference in functionality.

“I don’t see PageMaker in the same category as Ventura. PageMaker is just a page-layout package whereas Ventura offers you much more than that. I see PageMaker as the first generation and Ventura as the second.

“The biggest statement that I can make for Ventura is that it is probably the king package right now if it runs on a Compaq. But those statements are moving targets because now that everyone sees what Ventura has, they’ll all rush to put bells and whistles into their packages and we have this leap-frogging effect.”

Larry Graff, managing editor of Marketing News, published by the American Marketing Assoc., on Bestinfo Inc.’s Superpage II:

“It’s really nice. It makes things much more interactive [than the original Superpage]. We put out tabloids. We didn’t really look hard at Xerox’s or Aldus [Corp.] packages because they just don’t give the look and . . . the professional typeset quality that we wanted.

“We’re also installing a network and there’s some problems. One of the main problems that we’ve had is that they haven’t yet written the proper driver for our typesetter. We telecommunicate to a commercial type house. We want to go directly to a Mergenthaler 202 and they haven’t finished writing the program for that. They also had to write software to support the [MicroDisplay Systems Inc.] Genius monitor.

“All this stuff was supposed to come out in the spring [of 1986] . . . they showed a prototype version in April, then they said it’s coming out in June, and then July, then September, then October 15 . . . and then they started installing it on the 30th and the guy told me we couldn’t telecommunicate yet, that we’d have to send disks over to the typesetter. Right now, we’re just waiting.”
DESKTOP PUBLISHING

Incorporating its own word processing program, IMSI's PagePerfect allows users to lay out a complete document in advance and then enter text directly into the layout. The package also features nine zoom levels.

age is aimed at professionals who need additional drivers and interfaces to link systems to wide arrays of output devices, including photocomposition systems. VARs can add a variety of options to the Plus version, including kits for alternate laser printers, typesetters, scanners and high-resolution monitors. FrontPage Plus is available only through Studio Software VARs, called "Certified Desktop Publishing Specialists."

"You've got so many competing pieces of software and hardware that the consultant-VAR-system integrator is likely to be king," says Univation Inc. consultant Lewis Perdue. Univation has an OEM agreement with Xerox to bundle Xerox's Ventura Publisher with Univation's Turbo Publisher board. "I think you'll see a bigger rise in VARs in this field than in almost any other," adds Perdue. "They'll act as a combination of distributor and system integrator."

One of the most eagerly awaited desktop publishing packages was Xerox's Ventura Publisher, formally titled "Xerox Desktop Publishing Series: Ventura Publisher Edition" (see "Xerox, Ventura campaign to press would-be publishers," Page 17). Xerox acquired exclusive marketing rights to the package from Ventura Software last April and started shipping the product last November.

The package has received almost universal approval. Aside from the considerable clout of Xerox, the Ventura package stands a good chance of success because of a rich set of features, some of which are not found on similarly priced packages. Ventura Publisher runs on a 640K-byte PC/XT or a Xerox 6065, but you can also use it on a 512K system, if you can tolerate limited performance.

Ventura Publisher runs under Digital Research's GEM operating environment; the package's prime competitor—Aldus Corp.'s PC version of PageMaker—runs under Microsoft Windows. "Running under GEM or Win-

### SELECTED MACINTOSH-COMPATIBLE DESKTOP PUBLISHING PACKAGES

<table>
<thead>
<tr>
<th>Company Package</th>
<th>Price ($)</th>
<th>Memory requirements</th>
<th>Import characteristics</th>
<th>Printer support</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldus Pagemaker Version 2.0</td>
<td>495</td>
<td>512K, plus rigid disk</td>
<td>MacWrite, Microsoft Word, Microsoft Works</td>
<td>Postscript (inc. typesetters), ImageWriter</td>
<td>scheduled shipments late '86/early '87</td>
</tr>
<tr>
<td>FTL Systems MacTeX</td>
<td>750</td>
<td>512K, plus rigid disk</td>
<td>MacWrite, Microsoft Word</td>
<td>Postscript (inc. Linotron 300 typesetter)</td>
<td>typesetting program that combines TeX and Postscript</td>
</tr>
<tr>
<td>Letraset MacPublisher II</td>
<td>199</td>
<td>128K, rigid disk recommended</td>
<td>MacWrite, Microsoft Word</td>
<td>Postscript, ImageWriter</td>
<td>doesn't maintain formatting, type styles of imported text, package developed by Boston Software</td>
</tr>
<tr>
<td>LetraPage</td>
<td>599</td>
<td>512K</td>
<td>MacWrite, Microsoft Word, scanned images</td>
<td>Postscript, ImageWriter</td>
<td>maintains formatting, type styles of imported text: 93,000-word dictionary</td>
</tr>
<tr>
<td>Manhattan Graphics Ready.Set.Go, Version 3</td>
<td>295</td>
<td>512K</td>
<td>MacWrite, Microsoft Word</td>
<td>Postscript (inc. Linotron 100 and 300), ImageWriter</td>
<td>60,000-word spelling checker, direct Postscript programming</td>
</tr>
<tr>
<td>Orange Micro Ragtime</td>
<td>395</td>
<td>512K, plus 800K disk</td>
<td>no</td>
<td>Postscript, ImageWriter</td>
<td>integrated MacWrite-like word processor, spreadsheet, forms processor and page-layout program</td>
</tr>
</tbody>
</table>
A Complete Desktop Publishing System From Quadram and scLASERplus™

CIRCLE NO. 44 ON INQUIRY CARD
Go ahead. Make my page.

That's the challenge. And it's coming from thousands of people in business, government, and education. People who want an integrated, working solution in desktop publishing.

Intellipress™ is Cordata's response. A fully-integrated, turnkey system with pre-installed software. Optimized for ease of learning, ease of use, and high performance. Producing near-typeset quality, professional-looking documents, with integrated text and graphics, on an IBM-compatible personal computer.

With Intellipress, an ultra-resolution display ensures that "what you see is what you get". A selection of type fonts and (optional) image scanner makes sure that what you get is what you want. And a powerful 80286 processor provides the high performance that desktop publishing demands.

Intellipress is backed by Cordata's product development and dealer support organization, and the manufacturing and financial muscle of Daewoo Corporation, a multi-billion dollar conglomerate.

Go ahead. Find out about becoming an Intellipress dealer by calling Cordata at (800) 233-3602 (in CA: 800-524-2671). And make your day.

IBM is a trademark of International Business Machines Corp.

CIRCLE NO. 45 ON INQUIRY CARD
dows," explains Woodrow Vandever, executive vice president of InterConsult, a Cambridge, Mass., market-research and consulting firm, "allows third-party vendors to get up and running more quickly. Secondly, [GEM and Windows] provide the interfaces that isolate you from the specifics of printers or scanners." Another key advantage of the GEM and Windows environments for desktop publishing are their graphical interfaces. "What they all want to do is emulate MacPaint and MacDraw," adds Vandever.

Perhaps the most important advantage of Ventura Publisher, relative to other desktop publishing packages, is that the program can handle large documents. Each chapter of a

### SELECTED PC-COMPATIBLE DESKTOP PUBLISHING PACKAGES

<table>
<thead>
<tr>
<th>Company Package</th>
<th>Company Package</th>
<th>Price ($)</th>
<th>Memory requirements</th>
<th>Import characteristics</th>
<th>Graphics</th>
<th>Printer support</th>
<th>Notes,</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bestinfo Superpage II</td>
<td>7,000</td>
<td>PC/XT or /AT with 640K, plus rigid disk</td>
<td>all major word processing files, including XyWrite</td>
<td>PC Paintbrush, Lotus 1-2-3, scanned images</td>
<td>over 55 devices, inc. over 47 typesetting systems</td>
<td>multiuser system; connects to Novell Network; LAN; requires Hercules graphics card</td>
<td></td>
</tr>
<tr>
<td>IMSI PagePerfect</td>
<td>695</td>
<td>PC/AT with 640K, plus rigid disk</td>
<td>WordStar, Microsoft Word, MultiMate, WordPerfect DisplayWrite, psf:Write, Samma Word, XyWrite, others</td>
<td>scanned images, unannounced graphics programs</td>
<td>Postscript, Laserjet, HPGL</td>
<td>shipping scheduled early '87; includes nine zoom levels, automatic gray-scale averaging (seven levels); package developed by BeyondWords</td>
<td></td>
</tr>
<tr>
<td>Laser Friendly The Office Publisher, Plus</td>
<td>795</td>
<td>512K, plus rigid disk</td>
<td>WordStar, WordPerfect, Samma Word, MultiMate, Microsoft Word, DisplayWrite, XyWrite Plus, others</td>
<td>PC Paintbrush, scanned images</td>
<td>Laserjet, Xerox 4045 (Interpress), Postscript, Canon, Ricoh, Printware 7300Q, others</td>
<td>shipments scheduled December '86; Plus version allows users to build macros</td>
<td></td>
</tr>
<tr>
<td>Lexisoft Spellbinder Desktop Publisher</td>
<td>695</td>
<td>256K; recommended rigid disk</td>
<td>no</td>
<td>PC Paintbrush, 1-2-3, scanned images</td>
<td>Laserjet, OASYS LaserPro, others</td>
<td>combination word-processing, page-composition package; doesn't require outside text editor</td>
<td></td>
</tr>
<tr>
<td>Megahaus First Impression</td>
<td>695</td>
<td>640K, plus rigid disk</td>
<td>WordStar, Multimate, WordPerfect, others</td>
<td>Lotus 1-2-3, AutoCAD, Symphony, scanned images</td>
<td>Postscript, Laserjet, PagePrinter, Interpress</td>
<td>scheduled for January '87 release; DIT support early '87; users can create graphics on-screen</td>
<td></td>
</tr>
<tr>
<td>SofTest SofType</td>
<td>1,000</td>
<td>1,500</td>
<td>varies</td>
<td>WordStar, WordPerfect, Microsoft Word, MultiMate, Samma Word, DCA, DisplayWrite 3, others</td>
<td>scanned images</td>
<td>Postscript, Laserjet, Quadrant, Xerox 4045 and 2700, Canon, Imagen</td>
<td>single-user version: $1,000; multiuser: $1,500; runs on MS-DOS, UNIX or XENIX machines</td>
</tr>
<tr>
<td>Software Publishing ClickArt Personal Publisher</td>
<td>185</td>
<td>512K, plus two flexible drives</td>
<td>no</td>
<td>no</td>
<td>Laserjet, Postscript, dot-matrix printers</td>
<td>package developed by TMaker; laser printer drivers available for $150 based on Bestinfo's Superpage; uses interactive and batch pagination</td>
<td></td>
</tr>
<tr>
<td>Harvard Professional Publisher</td>
<td>695</td>
<td>PC/XT or /AT with 640K, plus rigid disk</td>
<td>DCA</td>
<td>Harvard Presentation Graphics, Lotus 1-2-3, PC Paintbrush, Dr. Halo MS Windows Paint, PC Paint Plus, scanned images</td>
<td>Laserjet, Postscript, scanned images</td>
<td>drives phototypesetters in native language; requires math coprocessor chip; replaces DO-IT page-layout program</td>
<td></td>
</tr>
<tr>
<td>Studio Software FrontPage</td>
<td>695</td>
<td>512K, plus rigid disk; 640K recommended</td>
<td>most popular word-processing packages</td>
<td>Lotus 1-2, Freelance, AutoCAD, ChartMaster, HPGL</td>
<td>Laserjet, Postscript, DIT</td>
<td>drives phototypesetters in native language; requires math coprocessor chip; replaces DO-IT page-layout program</td>
<td></td>
</tr>
<tr>
<td>White Sciences PageBuilder</td>
<td>495</td>
<td>PC/XT or /AT with 384K, plus rigid disk</td>
<td>no</td>
<td>Lotus 1-2-3, DF, AutoCAD, scanned images</td>
<td>all Canon-based, most Ricoh-based</td>
<td>fully programmable user interface; supports on-screen drawing; drives Canon printers directly via Tall Tree JLaser controller card</td>
<td></td>
</tr>
<tr>
<td>Xerox Ventura Publisher</td>
<td>895</td>
<td>PC/XT or /AT with 512K, plus rigid disk</td>
<td>WordStar, Multimate, WordPerfect, Microsoft Word, others</td>
<td>Lotus 1-2-3, AutoCAD, GEM Draw, GEM Graph, PC Paintbrush, Mentor Graphics PC CAD, others</td>
<td>Laserjet, Postscript, Xerox 4045 (Interpress), Epson dot matrix, ProPrinter, Xerox 4020 color ink jet</td>
<td>price includes printer driver, font package, 20 predefined style sheets; runs under GEM, interactive or batch pagination</td>
<td></td>
</tr>
</tbody>
</table>
Last October, the formidable triumvirate of Aldus, HP and Microsoft announced plans to jointly offer complete desktop publishing solutions.

Last October, the formidable triumvirate of Aldus, Microsoft and Hewlett-Packard Co. announced plans to jointly offer complete desktop publishing solutions. The alliance’s first offering includes Aldus’ PC-compatible version of PageMaker ($695); Microsoft’s Windows and Microsoft Word; and HP’s Laserjet printers, Vectra AT computers and Laserjet Publisher kit—an under-$2,500 PC board that enhances the capabilities of Laserjet printers with Imagen Corp.’s document description language (DDL).

Shipment of the Laserjet Publisher kit are scheduled for this quarter. The kit includes a Motorola Inc. MC68000 processor with 2M bytes of RAM and 16 built-in fonts that can be scaled and transformed. In addition, the board incorporates algorithmic character generation, which allows users to vary point sizes.

Arguably, Aldus kicked off the desktop publishing rage about one and a half years ago when it introduced PageMaker for the Macintosh, which is still the leading page-makeup program for the Apple environment, followed by Manhattan Graphics’ Ready, Set, Go. Shipments of the PC version of PageMaker were scheduled for last month. The recommended configuration includes an IBM PC/AT or compatible, at least 512K bytes of RAM and a 10M-byte rigid disk, an IBM EGA (enhanced graphics adapter) or Hercules Computer Technology graphics card and a Windows-compatible mouse.

At least in the early market, the battle for the lion’s share of the desktop publishing market will likely be waged by two companies. “Unfortunately, people will go where the publicity is, and that’s with two companies [Aldus and Xerox],” says InterConsult’s Vandever.

If page-composition packages are the heart of desktop publishing systems, page-description languages provide the muscle. PDLs link the application program and the laser printer. Although you can’t squeeze phototypesetting quality (1,200 dots per inch) out of your laser printer, you can maximize its capabilities by using powerful PDLs.

There are currently three major PDLs: Adobe Systems’ Postscript, Imagen’s DDL and Interpress from Xerox. Just when the industry was about to adopt Postscript as the sole standard, HP last September threw a wrench into the works by announcing adoption of DDL. The relative merits of the three competing languages are hotly contested; the real job for system integrators is to match the power of a particular language to the requirements of the application while, of course, meeting cost requirements.

With the recent flurry of page-composition packages, and the arrival of heavyweights such as Xerox, HP and Microsoft, more and more packages are sure to follow. To get an idea of

Companies mentioned in this article

Adobe Systems Inc. 1670 Embarcadero Road Palo Alto, Calif. 94303 (415) 852-0271 Circle 320
Aldus Corp. 411 1st Ave. S. Seattle, Wash. 98104 (206) 622-5500 Circle 321
Apple Computer Inc. 20525 Mariani Ave. Cupertino, Calif. 95014 (408) 996-1010 Circle 327
Bestinfo Inc. 130 S. State Road Springfield, Pa. 19064 (215) 328-2900 Circle 323
FTL Systems Inc. 234 Eglinton Ave. E. Toronto, Ontario M4P 1K5, Canada (416) 457-2142 Circle 324
Hewlett-Packard Co. 11515 Chinden Blvd. Boise, Idaho 83714 (208) 323-3869 Circle 325
IBM Corp. 900 King St. Rye Brook, N.Y. 10573 (914) 304-4822 Circle 326
Imagen Corp. 2650 San Tomas Expressway Santa Clara, Calif. 95051 (408) 986-9400 Circle 327
Interleaf Inc. 10 Canal Park Cambridge, Mass. 02141 (617) 577-9900 Circle 328
International Microcomputer Software Inc. (IMSI) 1299 Fourth St. San Rafael, Calif. 94901 (415) 454-7101 Circle 329
Laser Friendly Inc. 493 Ravendale Drive Mountain View, Calif. 94043 (415) 964-0395 Circle 330
Letraset USA 40 Eisenhower Drive Paramus, N.J. 07652 (201) 845-6100 Circle 331
Lexisoft Inc. P.O. Box 1950 Davis, Calif. 95617 (916) 758-3630 Circle 332
Manhattan Graphics 401 Columbus Ave. Valhalla, N.Y. 10595 (914) 789-2800 Circle 333
Megahaus Corp. 5703 Oberlin Drive San Diego, Calif. 92121 (619) 450-1230 Circle 334
Microsoft Corp. 16011 N.E. 36th Way Redmond, Wash. 98073 (206) 882-8080 Circle 335
Orange Micro Inc. 1400 N. Lakeview Ave. Anaheim, Calif. 92807 (714) 779-2772 Circle 336
Softest Inc. 555 Goffle Road Ridgewood, N.J. 07450 (201) 447-3901 Circle 337
Software Publishing Corp. 1901 Landings Drive Mountain View, Calif. 94039 (415) 962-8910 Circle 338
Univation Inc. 1231 California Circle Milpitas, Calif. 95035 (408) 263-1200 Circle 340
White Sciences Inc. P.O. Box 24756 Tempe, Ariz. 85282 (602) 967-6257 Circle 341
Xerox Corp. 101 Continental Blvd. El Segundo, Calif. 90245 (310) 822-8221 Circle 342

UNIJ 64 MINI-MICRO SYSTEMS/January 1987
Anatomy of a true WYSIWYG* monitor

Full Page Display—

High Resolution Images—
Superb detail enhanced with four shades of gray—ideal for newsletters, manual updates, etc.

Flickerless Display—
Non-interlaced 74.63 KHz scanning frequency for comfortable viewing.

Princeton Reliability, IBM Compatibility—
Operates with IBM XT/AT and compatibles (free cable included), with traditional Princeton dependability.

Crisp, Clear Text—
Superior high resolution and four shades of gray emulate 300 dots per inch (dpi). Fonts designed for 300 dpi. Laser printers can be displayed in actual size.

Well Defined Graphics—
1220 x 1664 pixel resolution at 160 MHz video bandwidth produces sharp clear graphics. Images scanned with a 300 dpi scanner can be displayed actual size.

Ergonomic Design—
Built-in tilt and swivel base, easy to reach front mounted controls plus eye pleasing design complements its IBM styling.

Introducing the Princeton LM-300 Monitor

The new Princeton LM-300 Monitor extends your PC's productivity into desktop publishing, CAE/CAD/CAM, full page text processing and other applications. It's a "What You See Is What You Get" (WYSIWYG) monitor with a true full page display which allows you to view an entire page without scrolling. Now you can view your working documents in final form, BEFORE you print. When utilized with the LM-300A controller and software interface, you can perform cut and paste functions, image reduction and enlargement, image rotation up to 360 degrees and a whole lot more. And its built to last—each LM-300 is backed by a full one year warranty.

For more information about the LM-300 Monitor, call or write: Princeton Graphic Systems 800-221-1490 (Ext. 76), 609-683-1660 (NJ only), Telex: 821402 PGS PRIN. 601 Ewing Street, Bldg. A, Princeton, NJ 08540.

*What You See Is What You Get

IBM is a registered trademark of International Business Machines Corp.

CIRCLE NO. 46 ON INQUIRY CARD
StorageTek’s Model 2925 gives you the speed you need, and the features your customers demand. The 2925’s Accelerator (Cache) feature dynamically adapts to system requirements and the host’s capability ... at transfer rates ranging from 100 kilobytes per second up to 1.25 megabytes per second. The 2925 goes with speed indeed; but what it comes with is even more remarkable.

Error correction codes are built into the cache’s 256k of multi-record memory; so your data is checked both as it enters cache and as it is written onto tape. Data can be retrieved directly from cache—should defective media be encountered.

The 2925 allows OEM systems integrators to attach ANSI-compatible 1600/6250 bpi capability to systems ranging from micros to minis ... without software modification. For ease of integration, the 2925 is available with either StorageTek- or Pertec-compatible interfaces.

That’s still only the beginning—be sure to read the accompanying list of features. You’ll understand at a glance that 2925 performance is not only speed... but reliability, flexibility and ease of operation.

StorageTek’s experience with GCR 6250 bpi technology includes a full 11 years of pioneering, proving and perfecting. Our 2920 Series includes the 2921 (50 ips start/stop), the 2922 (50 ips start/stop with 100 ips streaming) in addition to the 2925 subsystem.

Take a drive in our 2920 Series... and experience performance you’ll be proud to call your own.

Storage Technology. It’s More Than Our Name... It’s Our Commitment.

CIRCLE NO. 47 ON INQUIRY CARD
the importance of desktop publishing, it's more revealing to look at recent moves into the market by influential companies, rather than relying on the staggering, somewhat suspect, market projections. For example, IBM last July formed a Publishing Systems Business Unit, presaging a strong entry into the electronic publishing market. Big Blue announced that it would bundle third-party software with its hardware, and analysts expect products for PC-level machines, as well as for larger machines such as the System/36 and possibly mainframes.

IBM last October announced a desktop publishing application program for its RT PC. Developed by Interleaf Inc., the leading supplier of workstation-level publishing systems, the package includes all the functions you would expect from a desktop publishing program, as well as sophisticated graphics capabilities. And, true to its newfound charter of trying to provide connectivity between its various levels of processors, IBM's publishing package allows users to size, rotate and annotate computer aided design drawings created on the RT PC and on larger IBM hosts. In addition, the system accepts text from programs such as IBM's DisplayWrite 3, as well as Document Composition Facility (DCF) and Document Content Architecture (DCA) files and a variety of other standard word-processing packages. However, IBM charges a hefty $8,200 one-time license fee for the program.

Regardless of what the major players do, desktop publishing is an ideal application for system integrators and VARs. Dataquest Inc., a San Jose, Calif., market-research company, expects desktop publishing sales—including those for personal computers, composition software, scanners and laser printer—to surge from $147 million in 1985 to almost $5 billion in 1990.

However, optimistic market projections tend to obscure some fundamental shortcomings in desktop publishing, such as the fact that none of the systems—with the possible exception of Bestinfo's Superpage II—can even approach the quality of true typeset printing. And, voicing an often overlooked point, Gene Talsky, president of Professional Marketing Management Inc., Old Lyme, Conn., adds that, “All the software in the world won't make you a graphics designer.”

TO:
OEM Systems Integrators of
Computer Peripherals
SUBJECT:
SYSCON: The Sub-Systems Conference & Exposition

FEATURING:
A concentrated, technical conference, with focused papers and seminars on Storage Devices, Disk and Tape Drives, File Servers, Modems, Printers, Plotters, Keyboards, Industrial I/O Drives, Power Conditioning/UPS Systems, and Systems Software...

PLUS: Relevant tutorial exhibits displaying and demonstrating these peripherals...

PLUS: New techniques, products, applications, selection and evaluation criteria, performance features, and other technical information to help systems integrators decide which sub-systems and peripherals to use in OEM computer systems.

LOS ANGELES AIRPORT HILTON HOTEL
JANUARY 20 and 21, 1987
(To be held in conjunction with BUSCON/87 West, the Bus/Board Users' Conference at the same location)

For complete program, and registration details call Edward Grazda at (213) 402-1610, or write SYSCON, 17/00 Norwalk Blvd., #116 Cerritos, CA 90701-2750

MINI-MICRO SYSTEMS/January 1987
CIRCLE NO. 48 ON INQUIRY CARD

‘Unfortunately, people will go where the publicity is, and that's with two companies.’
WIN WITH THE WORLD'S FASTEST 300 PPI THERMAL PLOTTER...

VERSATEC VERSACOLOR.

The winning thermal color plotter, Versatec Versacolor, gives you better hard copy faster. You get 300 point-per-inch resolution A-size color plots in 45 seconds; B-size in 60 seconds. International users can plot on A3 or A4 media.

Simplify operation with exclusive donor cartridge and cut sheet media. Plot on paper or clear film. Versatec Versacolor is the easiest to use thermal plotter available.

Save space. Just 21" wide, 19.7" deep and 9.5" high, the typewriter-size Versatec Versacolor is the perfect desktop companion for your computer, workstation, or display.

Plot sooner. Capture data directly from the CRT screen with Versatec's low-cost video controller. Or simplify plot processing with Versatec's low-cost rasterizer controllers. Plug right into standard Versatec hardware interfaces.

Gain higher resolution, more speed, and exclusive convenience features. All at a price that meets or beats other thermal color plotter competitors. And protect that investment with single-source service and supplies for both electrostatic and thermal plotting.

To learn more about the Versatec Versacolor thermal plotter, circle the readers' service number, call toll-free 800/538-6477*, or visit your nearby Versatec sales office.

CIRCLE NO. 49 ON INQUIRY CARD

See Versatec electrostatic and thermal plotters at NCGA.

VERSATEC
A XEROX COMPANY

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

Versatec and Versacolor are trademarks of Versatec, Inc.
Xerox is a trademark of Xerox Corporation.

*In California, call toll-free 800/341-6060.

Win with Versatec

Thermal & Electrostatic

Pilot data courtesy of Zeh Engineering
Car courtesy of Mike Caufield
WIN WITH THE WORLD'S MOST VERSATILE PLOTTER/PRINTER...

VERSATEC SPECTRUM.

The winning electrostatic plotter/printer, Versatec Spectrum, plots, prints, and makes color hard copy direct from display (with optional video controller). Choose from 200 or 400 point-per-inch resolution. Get A-size plots in 58 to 75 seconds; B-size in 90 seconds. International users can plot A3 and A4 drawings.

Enjoy the lowest cost per copy of any technology. An A-size color copy costs as little as seven cents.


Plug in. Versatec interfaces and software are available for most popular computers. Low-cost video and rasterizer interfaces support electrostatic and thermal plotting.

Achieve more versatility, the highest image quality, and lowest cost per color copy. With uptime assured by Versatec worldwide service and supplies.

For more information about the Versatec Spectrum electrostatic plotter/printer, circle the readers' service number, call toll-free 800/538-6477; or visit your nearby Versatec sales office.

CIRCLE NO. 50 ON INQUIRY CARD

See Versatec electrostatic and thermal plotters at NCGA.
RISE UP TO THE FALCO 5500. $495.

It’s a jungle out there in the ASCII terminal market. Don’t get stuck in the quagmire of ordinary video display terminals. Wise up to Falco, and stay on top, with the FALCO 5500 video display terminal.

The FALCO 5500 is the newest member of the FALCO 500 Family of Computer Terminals. The same industry leading features that have made Falco a leader in the ANSI terminal market are now available to the ASCII terminal market.

Screen display features like a 10 x 16 character cell; 40 lines of data by 132 columns; green, white or amber phosphor at no additional cost; and a flat profile, non-glare CRT make the 5500 a guiding light through the terminal jungle.

There is no reason to get bogged down in terminal decisions, as the FALCO 5500 meets all your terminal requirements: compatible with ASCII protocols, a choice of keyboards (ASCII or PC/AT layout), Falco’s Multi-Host Windowing, dual Online communication ports, 40 lines by 132 columns of data, two pages of memory, and 5000 bytes of programmable memory.

And there’s no sinking feeling when you see the price for this terminal either. Call now for more information, and the name of your local Falco Distributor.

1294 Hammerwood Ave., Sunnyvale, CA 94089 • In California: (800) 538-5383 • Outside California: (800) 835-8765

CIRCLE NO. 75 ON INQUIRY CARD
SCANNERS PRESENT MAZE OF OPTIONS

Driven by desktop publishing requirements, scanners are rapidly overcoming previous limitations, but the pathway to the right equipment still demands careful navigation.

Linda Helgerson
Diversified Data Resources Inc.

Acquiring text and graphics electronically; storing, accessing and manipulating it; and then producing a document defines the process of desktop publishing. As such, complete desktop publishing requires scanners, personal computers, page-composition packages, high-resolution monitors, disk drives and laser printers. Obviously, integrating these disparate components can become a nightmare.

Desktop publishing is a desirable and necessary application, but getting there is far from automatic. Just finding the right device drivers for an integrated, operable system is sometimes difficult, sometimes impossible.

Including the scanning function in an integrated system compounds the problems. The difficulty no longer centers on whether scanners can meet the rigorous demands of desktop publishing applications. They can. Within the last year, data-capture products and software have surfaced that provide increased functionality. Furthermore, new scanners are smaller, sturdier, cheaper and easier to install and use.

The problem is that no single scanner can perform all possible functions or work within all systems. Although options abound, the goal is to determine what is required, and that can be difficult. Users do not necessarily consider system-integration problems, and those who know about configuring peripherals are probably not the ones who will be using the system.

The range of scanning options fall essentially into five categories: optical character recognition (OCR) machines, image scanners, image scanners with text-conversion software, generic software that performs image editing and/or text conversion and, most recently, scanners in fully configured desktop publishing systems.

Integrators configuring systems with scanning capabilities must keep two things in mind: what is required of the scanning mechanism and secondly, which scanner will work within an existing or planned system.

Text converters, or OCR scanners, detect an alphanumeric character, recognize it and convert the character to machine-readable form (see "How OCR works," Page 72).

If the requirement for the scanner is to capture only text, there are many products available in different price ranges and with different capabilities. Determining which system to purchase involves knowing what types of documents will be typically scanned plus the capabilities of other peripherals within the system. Analysis should begin with the source documents.

- Paper: Some roll-feed scanners will only accept bond paper. Onion skin, glossy paper, or paper of varying thicknesses may be rejected or get jammed in the roll-feed mechanism. If the source documents vary in weight and consistency, then a flat-bed scanner is recommended. No single OCR device offers both options.

- Microform: If the source materials are microfilm or aperture cards, OCR technology is not yet able to digitize negative images (white characters on a dark field). A black-on-white paper copy of each film image must be made.

Incorporating the TurboScan optical page scanner, AST Research's Premium Publisher is a complete desktop publishing system. The 300-dpi scanner merges text and graphics and allows for data compression and DMA transfer.
for use with an OCR scanner. The alternative is to scan the image with an image scanner and convert the characters to ASCII with software.

- Document size: Scanners vary in the size of source documents they accept. All accept 8½ by 11 inches; most also accept 8½ by 14 inches as well. Smaller source documents may dictate scanner selection.

- Double-sided documents: To date, unlike high-end photocopying equipment, there are no scanners that automatically scan both sides of a page. Users must feed in a sheet, flip it and feed it in again. If the application requires a large number of copies, the user should photocopy one of the two sides and place both sides in a feeding mechanism. However, not all scanners have large-capacity feeder mechanisms.

- Volume to be scanned: The quantity of source documents limits the OCR scanner selected. If the application calls for batch conversion on a fairly regular basis, an appropriate feeder mechanism is desirable. In addition, different scanners use different techniques and options for error correction. If there is a consistent volume of source documents, then the option of automatic error highlighting or correcting using dictionaries and context checkers may be critical. If the scanner requires operator intervention with each detected error or each page scanned, the device would be inappropriate for high-volume situations, even with a large-capacity feeder mechanism.

- Books and magazines: Documents other than single flat sheets of paper require particular attention. A flat-bed scanner is one alternative, but there are also a few specialized scanners that are configured specifically for books as source documents.

- Images: If it's necessary to scan images—such as line art and halftones—as well as text,
then an OCR scanner is inappropriate. Such jobs require image scanners with text-conversion software.

- Output resolution: Although character resolution may not seem to be as important for OCR scanners as with image scanners, it becomes essential in fully integrated systems. If the scanned data is to be transmitted via a facsimile device at some later time, then the CCITT Group 3 standard calls for 300 dots per inch (dpi). Most laser printers output 300 dpi, but not all. Converting 300-dpi input resolution from a scanner to a different output resolution for another peripheral, such as a dot-matrix or laser printer, is sometimes impossible. The display device may also require a certain scanning resolution. In short, resolution becomes a key factor in system integration.

- Use of the scanned text: The ultimate use of the converted textual information is most important. The data may be needed as a resource only. The ASCII data can be stored and accessed by full-text retrieval software or database management software later. Or, the text may require direct formatting in a word-processing program for editing and manipulation prior to printing. OCR scanners have different capabilities, which should be analyzed thoroughly based on system requirements. Only a few OCR machines, for example, will scan forms, extracting and converting data from certain preprinted areas.

- Fonts and font sizes: Possibly the most discussed consideration—and most severe limitation of OCR devices—is the type and size of recognizable fonts. Some text converters handle only designated typewritten fonts. The difficulty here is one font may have the same name but vary in appearance between brands. Recognizable fonts are limited only to designated typewritten fonts. The display device may also require a certain scanning resolution. In short, resolution becomes a key factor in system integration.

works

between the two digital signals. Consequently, the assignment of a character is made on the basis of a previously determined level of matching. Typically, this level of matching, which is known as a confidence level, is set by the software developer.

Note that Fig. A identifies a step in the process in which questionable characters are highlighted for verification, and unrecognizable characters are highlighted for correction. The "best guess," which really is an unambiguous recognition, occurs when the match meets the previously determined high-probability level. A low-probability response, however, leads to a "second best guess" option in which a previously determined high-probability level can result in alerting the operator to verify the character or send an error code.

The logic of matrix matching can be seen in identifying the character "D" as shown in Fig. B. In this example, the pixel matrix for character "D" is compared with pixel matrices for character"A," "C," "D," and "O," which are stored in the OCR software. The character for a particular type font with the least number of discrepancies is selected. In this instance, the character "D" has no discrepancies and therefore a match is identified. It should be noted that this example is greatly simplified because OCR systems generally would use many more pixels in a matrix match.

The second method used in conventional OCR is called feature analysis. Although this technique utilizes the same pixel pattern that matrix matching employs, there is, nevertheless, a substantial difference between the two. In feature analysis the black pixels in a pixel matrix are analyzed in terms of vertical, horizontal and diagonal lines, loops and ending lines. Feature analysis, therefore, focuses upon discrete dimensions of an "unknown" character by breaking it down into a set of distinctive strokes or lines and comparing the strokes or lines in this matrix with the stroke or line image matrices of a character set for a particular type font. Again, because of the imperfections of paper, typewriters and typists, the assignment of a character to a given set of strokes or lines is not always a perfect match. Fig. C illustrates how feature analysis works in identifying an "unknown" character as a "D." Note that there are no discrepancies between the number of vertical lines and loops in the "D" line image matrix and the "unknown" character. It is on this basis, therefore, that the "unknown" character is read as a "D."
dition of proportionally spaced letters, a later enhancement with word-processing systems, is not possible with all OCR machines. For scanners that utilize the matrix-matching technique, system memory may limit the number of recognizable fonts. Generally, only the higher priced systems can recognize an unlimited number of fonts, various printer outputs, proportional spacing and highly stylized characters. Some vendors sell add-on font packages. Some accompanying scanner software enables an operator to "train" the system to recognize additional fonts. Both options increase either the cost of the system or operation time. Although some OCR devices are claimed to be able to recognize handwriting, these scanners utilize context and feature analysis as well as additional spelling checkers, all of which increase the processing requirements and the purchase price.

- Time: The purpose of scanning text to machine-readable data is to cut the time required to key in the alphanumerics. Correcting questionable or unrecognizable characters, formatting the data once converted, and feeding in source documents one sheet at a time, can all be time-consuming. There may also be hidden costs in the initial set-up phase. Some OCR scanners have no or limited conversion programs. Training the scanner to recognize each new font can also increase time requirements.

On the surface, converting stacks of manuscripts to machine-readable form via an OCR device seems to be an easy task. However, without considerable analysis of requirements, product specifications and actual operation, the task becomes almost impossible. There are many excellent OCR systems available, but matching them to applications is complex.

Image scanners capture graphics

Image scanners, also called raster or bit-mapped scanners, convert an image, such as a photograph, map or line art—or a complete document—to an array of picture elements, or pixels. First, the image is detected and converted to electronic form. Next, the raw data is converted to a simple bit array, where each pixel is characterized as either black or white; as an array of gray-scale values, in which each pixel is characterized as having one of several shades of gray; or to full-color raster with each pixel defined in terms of its intensity of three primary colors. All image scanners conduct the

**REPRESENTATIVE OCR SCANNERS**

<table>
<thead>
<tr>
<th>Company</th>
<th>Model</th>
<th>Price ($)</th>
<th>Pages/ sheet-fed</th>
<th>Automatic document feeder</th>
<th>Document size (inches)</th>
<th>Scan time (seconds/page)</th>
<th>Typewritten</th>
<th>Lined or dot-matrix fonts</th>
<th>Serial interface</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CompuScan</td>
<td>PCS 220,</td>
<td>6,495; 5,695; 3,150</td>
<td>50 sheets</td>
<td>5x3 to 8.5x14: text 8.5x11: image</td>
<td>25: text &lt;30: image</td>
<td>cartridge, 20 type styles</td>
<td>10, 12 pitch</td>
<td>both RS232 serial or parallel; asynch or bisynch</td>
<td>opt. DMA interface card: $195</td>
<td>312K min., 640K recommended; model 235 compatible with IBM PC only</td>
</tr>
<tr>
<td></td>
<td>230; 235</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEST PC Scan</td>
<td>2,785</td>
<td></td>
<td>sheet-fed</td>
<td>no</td>
<td>3.5x3.5 to 8.5x14</td>
<td>30 to 45</td>
<td>20 typewritten and some dot-matrix fonts</td>
<td>10, 12 pitch</td>
<td>both SCSI</td>
<td></td>
</tr>
<tr>
<td>Hendrix TR100</td>
<td>10,500</td>
<td>250 cps</td>
<td>sheet-fed</td>
<td>100 sheets</td>
<td></td>
<td></td>
<td>six fonts std., $5,000 each additional interface matching PROM</td>
<td>10, 12 pitch</td>
<td>both asynch serial, bisynch opt.</td>
<td></td>
</tr>
<tr>
<td>Kurzweil</td>
<td>4000 Intelligant Scanning System</td>
<td>36,000 base</td>
<td>flat-bed</td>
<td>opt. 50 sheets</td>
<td>3.5x5 to 8.5x14</td>
<td>25 to 55 cps</td>
<td>unlimited typewritten and typeset fonts</td>
<td>six to 24 points</td>
<td>both interfaces to virtually any system</td>
<td>two-day operator training required; handles magazines, books</td>
</tr>
<tr>
<td>Oberon OMNI-READER</td>
<td>199</td>
<td>flat-bed</td>
<td>manual only</td>
<td>7.2x11.8</td>
<td>33 to 160 cps</td>
<td>Courier; Letter Gothic; Prestige Elite</td>
<td>10, 12 pitch</td>
<td>mono RS232C</td>
<td>data handshake opt.; RTS, X-onX-off</td>
<td></td>
</tr>
<tr>
<td>Totec TO-5000B</td>
<td>7,461</td>
<td>75 sheets</td>
<td>8.5x4 to 9x14</td>
<td>15 to 20</td>
<td>15 available; one included; may install up to six PROMS</td>
<td>10, 12 pitch</td>
<td>both RS232C</td>
<td>tempested version: $17,705</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Tandy® 3000 HD Has What It Takes to Give VARs The Competitive Edge.

The powerful Tandy 3000 HD computer is the affordable alternative to the IBM® PC/AT. It features an Intel 80286 microprocessor operating at 8MHz clock speed, 640K RAM, expandable to 1 megabyte on the main board, 10 expansion slots, enhanced keyboard and a built-in 40 megabyte hard drive with an average access speed of 28 ms.

The 3000 HD's power makes it ideal in a networking or multiuser environment. As the hub of our ViaNet Local Area Network (LAN), the 3000 HD establishes a standard of fast throughput. Or, with XENIX® System V, our multiuser solution, up to six users can access programs and data on the 3000 HD at the same time using low-cost display terminals.

Best of all . . .

The 3000 HD is available through the Tandy VAR Program. A program that features one-contract coverage for all products, special discounts for development systems, strong technical support and fast service through more than 150 Tandy-owned facilities nationwide. There's even a "turnkey" leasing program* available exclusively to Tandy VARs. To learn more about Tandy's VAR Program, give us a call or return the coupon today!

---

Tandy Corporation
Value-Added Resale
Telephone (817) 390-3099

*Candy VAR Leasing Program administered by Dana Commercial Credit, IBM/Registered TM International Business Machines Corp. XENIX/Registered TM Microsoft Corp.

CIRCLE NO. 51 ON INQUIRY CARD
Here's the best resolution to your terminal needs.

The Wyse WY-60.
It's everything we know you want in a terminal, and then some.

Higher resolution. Hidden attributes. Multiple personalities, including ASCII, ANSI, and PC Terminal emulation. Multiple display formats, with up to 132 columns and 44 lines of information on one screen. And soft fonts, so it can be crisp, clean and easily readable in any language. And we've added WYSEWORKS, a nifty clock/calendar/calculator combination for extra productivity.

You choose the screen color, and the keyboard layout that suits your application: Wyse WY-60 ASCII; WY-60 ANSI; IBM PC AT; IBM ENHANCED PC; or IBM 316X. The adjustable arm option lets you choose the perfect height and screen position. You can even choose the service plan that works best for you.

When it comes to terminals, we ship more than anybody but IBM. So it's natural we'd come up with a terminal with a lot of years of wisdom behind its good looks.

Call toll-free today, for more information.

Call 1-800-GET-WYSE

YOU NEVER REGRET A WYSE DECISION.
first step, but capabilities vary widely in converting images to pixels that are other than just black or white.

There is further differentiation among image scanners. They may have limited, extensive or no image-enhancement capabilities. Enhancements may occur automatically or require operator intervention. The capability may be included in the firmware or require additional software at an additional price. Because manipulations, such as removing extraneous marks and filling lines or dark areas, are critical to the finished publication, image enhancement is an important consideration.

Another difference among image scanners deals with compression. Compression ratios vary as does the degree of sophistication among raster scanners. Compressing raster data into a more compact form is necessary in the microcomputer environment. Raster data requires large amounts of storage and, therefore, processing capabilities.

Because of the important differences among image scanners on the market, selection should consider system and user requirements as well as integration concerns.

- Resolution: The desired resolution of the scanned image is dependent upon how the

---

### REPRESENTATIVE IMAGE SCANNERS WITH OCR CONVERSION SOFTWARE

<table>
<thead>
<tr>
<th>Company/Model</th>
<th>Price ($)</th>
<th>First Step</th>
<th>Automatic Document Reader</th>
<th>Document size (inches)</th>
<th>Scan rate (seconds per page)</th>
<th>Resolution (dpi)</th>
<th>Typewritten Recognized</th>
<th>Signature Recognized</th>
<th>Memo/Periodic Recognition</th>
<th>Gray scale</th>
<th>Interface</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canon U.S.A.</td>
<td>IX-12</td>
<td>1,190</td>
<td>5 sheets</td>
<td>3x5 to 10x24</td>
<td>30 at 200 dpi</td>
<td>75, 150, 200, 300</td>
<td>8 fonts</td>
<td>8-20 points</td>
<td>both</td>
<td>32 shades</td>
<td>serial, high-speed video</td>
<td>OCR software: $595</td>
</tr>
<tr>
<td>CompuScan</td>
<td>PCS 240;</td>
<td>5,995;</td>
<td>50 sheets</td>
<td>5x3 to 8.5x11</td>
<td>25: text &lt;30: image</td>
<td>100, 150, 200</td>
<td>20</td>
<td>10, 12 pitch</td>
<td>both</td>
<td>no</td>
<td>RS232 serial or parallel</td>
<td>min. 312K, 640K recommended; model 245 compatible with PC, /AT, /XT only</td>
</tr>
<tr>
<td>PCs 245</td>
<td></td>
<td>3,995</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Datacopy</td>
<td>JetReader</td>
<td>2,990;</td>
<td>10 sheets</td>
<td>5.8x4.1 to 8.5x14</td>
<td>43 at 300 dpi</td>
<td>200, 300</td>
<td>12</td>
<td>10, 12 pitch</td>
<td>mono</td>
<td>two halftone patterns</td>
<td>IBM PC requires 640K RAM, dual flexibles or hard disk; compatible with Apple Mac</td>
<td></td>
</tr>
<tr>
<td>Plus</td>
<td>JetReader Plus</td>
<td>3,250</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEST</td>
<td>PC Scan</td>
<td>2,495</td>
<td>no</td>
<td>3.5x3.5 to 8.5x14</td>
<td>9ine max.</td>
<td>200, 240, 300</td>
<td>12</td>
<td>10, 12 pitch</td>
<td>both</td>
<td>32 shades, dithering</td>
<td>DMA, SCSI; opt. IBM PC includes 750K; Mac Plus version available; supports TIFF (Tag Image File Format)</td>
<td></td>
</tr>
<tr>
<td>Plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intelligent Optics</td>
<td>Reader</td>
<td>4,295</td>
<td>30 sheets</td>
<td>5x5 to 8.5x14</td>
<td>18: text or 150 cps</td>
<td>200 to 400</td>
<td>up to 60 fonts</td>
<td>10, 12 pitch</td>
<td>both</td>
<td>64 shades</td>
<td>RS232C asynchronous or bisynch automatic thresholding for paper color and density</td>
<td></td>
</tr>
<tr>
<td>IOC Reader</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microtek</td>
<td>Smart-Reader</td>
<td>1,795</td>
<td>opt. ($295), 50 sheets</td>
<td>8.5x24: text 8.5x11: image</td>
<td>20</td>
<td>200</td>
<td>52</td>
<td>10, 12 pitch</td>
<td>both</td>
<td>52 shades</td>
<td>parallel (TTL compatible), serial (RS232C) includes OCR System Inc. software</td>
<td></td>
</tr>
<tr>
<td>Palantir</td>
<td>CDP</td>
<td>39,500</td>
<td>50 sheets</td>
<td>3x5 to 8.5x14</td>
<td>20</td>
<td>300</td>
<td>all</td>
<td>six to 28 points</td>
<td>both</td>
<td>line art, graphics</td>
<td>RS232 serial; 1.2K to 19.2K TTL up to 256 user-definable zones per page; includes graphics tablet, automatic thresholding; five MC68000s on board</td>
<td></td>
</tr>
<tr>
<td>(Compound</td>
<td>Document Processor)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tecmar</td>
<td>eSCAN</td>
<td>2,495</td>
<td>drum</td>
<td>8.5x14</td>
<td>60</td>
<td>100, 200, 240, 300</td>
<td>12</td>
<td>both</td>
<td>mono</td>
<td>no</td>
<td>DMA, IBM PC, /XT, /AT</td>
<td>requires 10M-byte hard disk</td>
</tr>
</tbody>
</table>

MINI-MICRO SYSTEMS/January 1987
image will be used. If data is for normal CRT display, resolutions up to 200 dpi are sufficient. High-resolution monitors and graphics plotters could require up to 1,000 dpi. For most laser printers accompanying most desktop publishing systems, 300 dpi is sufficient. Generally, the price of the scanner is directly proportionate to image resolution.

- **Storage:** The higher the resolution, the greater the storage requirements. The higher the storage requirements, the greater the system's processing requirements. Gray scale, halftones and, particularly, color images increase storage requirements considerably, even with the most sophisticated compression techniques. The price of capturing and converting high-resolution images is increased storage and processing requirements. Adding an image scanner to an existing configuration may require enhancements to the system as well, which costs.

- **Speed:** Given deadlines, speed may be important. The faster the scanner, the higher the cost, but saving dollars may increase time consumption beyond the cost effectiveness of initial savings.

- **Image enhancement:** Improving the image, such as by blackening gray areas, adding hatch lines, completing lines and modifying the gray-scale or color shades is certainly available, but the options among scanners vary. Some systems provide it all for a price; some have software with different enhancements. Some capabilities are in the firmware, some in the software, but all are system-dependent. Integration can be backwards—installing the scanner to fit the system—or forwards by adding more memory, resident software, new drivers.

- **Output devices:** Laser printers usually require 300 dpi. Plotter requirements vary widely. Digital transmission of images requires 300 dpi. As with OCR scanners, the resolution required for the output device may dictate the resolution of the scanned image.

Raster scanners differ in photodetection technologies, document-handling systems and interfaces. And again, integration concerns arise. The advantages of adding graphics to a
In a business climate this competitive, you've got to look for every advantage you can. That's why before you buy an XT or AT compatible, Tandon suggests you screen us against the competition.

From top to bottom, our full line of compatible systems give you precisely what you're looking for in a business computer. And something you've never seen before. Prices that average around 40% less than comparable models from IBM®.

But that's where all comparisons end. Because in the most significant areas Tandon comes out on top. For sheer storage capacity and fast access time few measure up to our PCA™-40, a 40 megabyte AT®-compatible micro. And our monitor is bigger, by a wide margin.

And because our selection is one of the most complete in the industry, we can meet the needs of your business, large or small. All of which proves that for the personal computer line that combines reliability, compatibility and affordability, no one stacks up to Tandon.

To find the name of a dealer near you call us toll free now on:

800/556-1234 Ext. 171
In California:
800/441-2345 Ext. 171

Tandon
Less money. More micros.
405 Science Drive, Moorpark, CA 93021 805/378-6081

PCX® and PCA™ are trademarks of Tandon Corporation. IBM® and IBM PC AT® are registered trademarks; IBM PC XT® is a registered trademark of International Business Machines Corporation. Prices displayed are manufacturer's suggested prices and do not include monitor.

CIRCLE NO. 11 ON INQUIRY CARD
27 milliwatts. That's all it takes for standby mode on our FD-35 Series 3.5 inch floppy disk drives with the Power Saver option. And, in operation, they consume a mere 1.72 watts average at read/write, and 2.90 watts average at seek. These just happen to be the lowest numbers for any 3.5 inch drive.

This remarkable feat is made possible by the use of new custom LSI chips with CMOS technology for more efficient control over all the drive functions.

For added reliability and accuracy we shortened the gap between the band actuator and the head and included a more precise head position mechanism. This means stable reading and writing, even at high track densities.

And, as if all that weren't enough, we've thrown in special aluminum RF shielding to keep out noise pollution.

With the growing need for more portable systems, 27 milliwatts is a load anybody can carry.
report, combined with the decrease in time or skill necessary to create the graphic, justifies confronting the maze in figuring out what scanner is both useful and workable.

**Combine text and graphics**

Scanners that convert both text and images simultaneously are recent arrivals on the market in response to typical desktop publishing requirements. These scanners are a combination of the two types discussed so far. Essentially, they are image or raster scanners with additional software for differentiating between text and images on a single page and then converting one to raster data and the other to ASCII.

Although the combination offers a much broader range of options for desktop publishers, there are obvious costs. Typically, the unit is larger and contains its own storage and processing capabilities. Many considerations mentioned before for OCR and image scanners still apply here. The units are priced far higher than units with separate capabilities, but, in most instances, the increased capabilities and flexibility are worth the added expense.

Image scanners with text-conversion software are useful in specialized publishing environments. In technical publishing, for instance, it is desirable to take an existing page of text with graphics and revise a drawing or add text revisions. Given the large storage capacities now able to be distributed widely at relatively low cost, such as with compact disk ROM technology, some industries are combining photographs with supporting documentation.

Another recent arrival on the market is software for use with many different OCR or image scanners that perform many functions that follow the scanning process, such as character recognition or image enhancement. Some editing programs go further, to include page-composition capabilities. Again, the functions vary, the integration with various operating systems differs, and few are directly comparable to one another.

Application-software packages that integrate the scanner with page-composition functions are relatively new. Some are sold for image enhancement, cutting and pasting, etc. Others are bundled with desktop publishing systems or coupled with a specific scanner. The more expensive packages also provide for text conversion and the merging of text and images in a document.

Although the packages vary, all allow for immediate operation of the scanner, some for image enhancement and a few for text conversion. Other possible functions include compression of raster data, formatting of textual data into word-processing programs and incorporation of page-composition protocols.

**Put it all together**

Given the wide range of peripherals, the need for fully integrated systems becomes paramount. Estimating the range of uses for a scanning device and the myriad integration concerns is indeed confusing. Many users forego the headache and purchase an integrated, off-the-shelf system. This is fine, but the user can get only what is available, not necessarily what is wanted.

Desktop publishing, when first introduced, was considered principally for small publication operations. Now, the concept is moving away from that environment toward others, and as new application requirements surface, new capabilities are needed. Scanners are no exception. Prior to 1986, no one considered scanning technology marketable enough to create supportive application programs. Now, even some operating systems include scanning functions.
That's right... Hitachi has 1500 design engineers who work on nothing but disk drives. We design, build, and qualify all key components ourselves, to our famous ultra-high specifications. We don't simply assemble stock items. Since we build our own motors, heads, microprocessors and custom LSI, we subject these parts to the most stringent Quality Assurance program in the industry.

This may seem like an awful lot of work, but during the 15 years of producing disk drives, we've learned that this is the only way to make drives good enough to use in our own systems... the only way to get the peace of mind that comes from knowing that the drives work.

Your peace of mind can come easy too. Use the most reliable disk drives available: Hitachi disk drives.

*A serious, historic commitment to the disk drive business.*

Hitachi's involvement with memory peripherals goes back to the earliest days of mag tape. We still produce mag tape equipment. And, today we have one of the broadest lines of disk drives you'll ever find — including 3.5", 5.25", 8", and 8.8" Winchesters. We've even made the enormous R & D expenditures necessary to be one of the pioneers in optical storage technology.

You don't make these kinds of commitments to a product line unless you're serious about its long-term success. Hitachi is serious. Very serious. We believe in forging long-lasting relationships supported by highly reliable products that can stand the test of time.

When you decide to use Hitachi disk products, you'll have a business partner who will be here to work with you, today and tomorrow... helping you to satisfy your customers... giving you peace of mind.

*Fast Action:*
To obtain product literature immediately, CALL TOLL FREE, 1-800/842-9000, Ext. 6901. Ask for literature number PB-001.
Graphic excelleration. Turbograph™ processors.

Accelerated performance. Excellent graphics. At an exceptionally low price. That's Turbograph—the innovative line of high performance graphics processors from AMF Logic Sciences.

Turbograph responds to the soaring demand for improving and streamlining computer-generated graphics in all sectors of the market. From IBM PCs creating business graphics to VAX-type systems in CAD/CAM environments.

Turbograph accelerates the time it normally takes to process and convert graphics from vector to raster form. It relieves the host computer from the costly overhead of vector-to-raster conversion. And by eliminating the VRC bottleneck, Turbograph also unleashes the full graphics capabilities and performance potential of today's sophisticated printers and plotters.

Available in a compact desktop unit or as a board which fits inside the chassis of your plotter, printer, or host computer, Turbograph processors are priced as low as $1995.*

Discover graphic "excelleration" with Turbograph. Contact the company that has specialized in raster graphics since 1972—AMF Logic Sciences.

*U.S. list price for one Turbograph 300, IBM PC version; OEM discounts available.

LOGIC SCIENCES, INC.
10808 Fallstone Road
Houston, TX 77099
713/879-0536; telex 706691
IMPROVED COLOR ENHANCES NONIMPACTS

Color output joins better resolution and quiet operation to make ink-jet and thermal printers formidable contenders for high-quality, low-cost printing.

Jesse Victor, Associate Editor

Color has come of age for ink-jet and thermal printers. Low-end machines give business users the fill-in colors needed for highlighting increasingly complex charts and graphs. Better resolution, combined with near-letter-quality (NLQ)—and in some cases, letter-quality—text, produces the high-quality color output required for presentations on transparencies or paper approaching bond quality. High-end color ink-jet printers serve demanding color proofing and computer aided design/computer aided engineering applications. And advances in ink technology and color registration are resulting in hard copy that can rival offset-printing quality.

Four computer-industry and office-automation trends are fueling demand for color ink-jet and thermal printers. For one, color monitors are gaining market share from monochrome units, and users want a hard-copy version of their screen displays. Computer-industry researcher CAP International Inc., Marshfield, Mass., sees color monitor sales of more than $10 million by 1990, topping monochrome shipments by more than $4 million.

Better quality mandated

In addition, more personal computer application packages are appearing that can utilize ink-jet and thermal printers' color capability. And the increasingly modular, open design of today's work environments necessitates quieter peripherals that sit on a desk next to a personal computer without disturbing a whole office. Nonimpact printers can be as quiet as 45 dB(a), a far cry from the clatter of impact units' 55 dB(a) or higher.

Finally, the proliferation of desktop publishing systems and internally generated hard copy is mandating better quality printing. Business users are demanding copy that approaches as near as possible offset printing, with fully formed characters and more persuasive and vivid combinations of text and graphics.

All these factors mean healthy growth for nonimpact printers. Users will increasingly turn to ink-jet and thermal technology, if they want to upgrade from older dot-matrix technology and combine color, text and graphics without incurring the higher cost of laser printers. Indeed, CAP International foresees nonimpact printers taking a widening bite out of total electronic printer sales, compared to impact devices. From approximately 12 percent of U.S. end-user placements in 1985, nonimpact units (including laser and electrostatic printers) will capture approximately 28 percent in 1990, according to CAP. In terms of estimated value, nonimpact printers will gain approximately 55 percent of the same market by 1990.

Color thermals need three passes

Thermal printers utilize one of two different print mechanisms. The older, direct thermal types form characters and images by burning a special, chemically impregnated heat-sensitive paper with heated pins. Thermal-transfer printers, on the other hand, employ thin-film or thick-film printheads to melt and deposit on
Supplying a built-in rasterizer, CalComp's ColorMaster thermal printer combines with Zenographics' Mirage color-graphics software to generate a 203-by-200-dpi graphic of Fleischer Studios' cartoon characters. (Copyright: Fleischer Studios Inc.; Courtesy: Zenographics Corp.)

Paper a wax-based ink contained on a mylar ribbon. (IBM's Quietwriter printer uses resistive elements in its ribbon to place ink on the paper.)

Color thermal printers divide the thermal-transfer ribbon into the three process-ink colors: yellow, magenta and cyan. Three separate passes of the printhead are required to register color output. Most printers can overprint the three colors to produce at least three secondary colors—green, orange and purple.

The TPX-80 from C. Itoh Electronics Inc. is typical of low-end color thermal printers. Connecting to IBM Corp. PCs and compatibles with a Centronics parallel interface, it prints 80-column, 12-by-15-dot-matrix draft output at 80 characters per second (cps) and 24-by-15-dot-matrix NLQ output at 50 cps. Supporting the IBM and Epson America Inc. character and graphics sets, the 24-element head has a resolution of 144 dots per inch (dpi) for graphics. The 12-pound, 15.3-by-11.4-by-3.4-inch unit uses friction feed for cut-sheet paper and optional tractor feed for fanfold paper. Noise is rated at below 50 dB(a).

The TPX-80, like many color thermal printers, handles only 8-1/2-by-11-inch, A size (or 297-by-210-mm A4) paper. If you want to print a spreadsheet or CAD/CAM (computer aided manufacturing) output, you might need the B size (A3) or the 11-by-17-inch capability of Mitsubishi Electronics America Inc.'s G650. Producing seven colors (yellow, cyan, magenta, green, blue, red and black) on cut-sheet paper or transparency film, it provides 300-by-300-dpi resolution in four display formats: 1 by 1, 2 by 2, 3 by 3 or 2 by 4 dots, for dot-density variation. The G650 can churn out B size pages in 60 seconds; A size, in 30 seconds.

Four-color or three-color ink film cassettes produce 125 B size or 210 A size images per cassette. The standard Centronics interface can be expanded by custom interface circuits that fit into three empty slots on the printer.

Mitsubishi's 240-dpi G500 color thermal printer-plotter affords A size output, emulates Hewlett-Packard Co. and Houston Instrument plotters and is supported by over 100 IBM PC-compatible graphics software packages including Autodesk Inc.'s AutoCAD and Lotus Development Corp.'s 1-2-3.

Versatec's Versacolor thermal-transfer plotter produces B/A3 size or A/A4 size, high-resolution, 300-dpi four-color output on cut sheets and transparencies in 80 or 60 seconds, respectively. With the Versatec parallel interface, color data protocol and Versaplot software, it can reproduce over 2 million colors. A Centronics interface is optional for OEMs. Fast FORTRAN callable subroutines are compatible with basic pen-plotter routines.

Used with the company's Model 250 red-green-blue (RGB) video controller, the unit can take a fast screen dump directly from a personal computer or workstation to reproduce the CRT's output.
FIRST WE INVENTED MATRIX LINE PRINTING.

Our original P-Series printers became the best selling matrix line printers in the world. With the best print quality. Outstanding reliability. And the lowest cost of ownership in the industry.

YOU THINK WE'D LEAVE WELL ENOUGH ALONE.

Introducing the P6000 Series Printers.

Our new P6000's are tough as always. And faster than ever, with speeds up to 800 lines per minute. Add our Intelligent Graphics Processor* (IGP) option, and you'll raise your printing capabilities to an art. Create forms, logos, bar codes, even custom typefaces.

You'll get superior print quality in three modes: high speed, data processing, and letter quality. Print up to 12 six-part forms per minute, at less than a penny per page. And mix type styles and character sizes on the same line for dynamic, expressive business communications.

The 32-character plain-English message display provides status, selection and diagnostics for easy operation. And the built-in Epson® protocol makes it the logical choice for networking your PC's.

Find out why our newest line is destined to become a legend in its own time.

*IGP option available with QMS® or Printronix compatibility.

CALL NOW: 1-800-826-3874
IN CALIFORNIA, 1-800-826-7559
I'D LIKE TO LIVE WITH A LEGEND.
Send me more information on the new P6000 Series.

Name __________________________

Company ________________________

City/State/Zip ___________ Phone ______

Printronix is a registered trademark of Printronix, Inc. QMS is a registered trademark of Quality Micro Systems, Inc. Epson is a registered trademark of Epson America.

The new generation Facit B-line matrix printers not only provide all the printout options your office requires. They also give you extraordinarily easy access to these features.

Such as when you want to change from high throughput draft to perfect NLQ - just flick the rotary switch on the front panel. When you want to change font style - just plug in a new font card. When you need to change from continuous forms to cut sheets - the printer loads the paper for you.

And while the beauty of the B-line concept improves the impression made by your PC, the attractive design and low noise level make the printers perfect for every office environment, too.

Check out the facts below and go for a test drive at your nearest Facit representative.

- B3100: 80 columns, 128 lines/minute* (250 cps)
- B3150: 136 columns, 128 lines/minute* (250 cps)
- B3350: 136 columns, 109 lines/minute* (200 cps), 18-needle printhead for 100 cps NLQ
- Rotary switch for fast print quality selection
- Easy operation with soft set-up in national language
- Extensive paper handling - push/pull tractor, tear-off, automatic loading of single sheets. Optional single or double bin sheetfeeder
- Low noise key
- Facit, IBM Proprinter and Epson FX/JX emulations
- Parallel and serial interfaces
- 4-color option
- Extra fonts by means of plug-in card
* 80 col. 10 cpi.

IBM and Epson are reg. trademarks
Color thermal printers are raster devices and require conversion of application packages' vectors and primitives to a bit-map format. Having the host computer perform this operation trades off the savings from dispensing with a standalone rasterizing computer for slower output. However, the rasterizer allows you to interface minicomputer-mainframe graphics packages, such as Integrated Software Systems Corp.'s (ISSCO) TELL-A-GRAF and DIS-SPLA, as well as share the printer in IBM SNA-SDLC (Systems Network Architecture-synchronous data link control) environments.

For example, if you want to generate graphics on the G500 at its full speed of less than 3 minutes per page (at 240 dpi), you can utilize Lasergraphics Inc.'s UI-100M24 rasterizing microcomputer. It accepts high-level graphics commands from the host computer over an RS232 serial ASCII line in Lasergraphics Language (LL) and/or HP Graphics Language (HPGL). Multiple copies can be produced without further host intervention, and six software-selectable fonts are standard. Rasterizers are also available for the Seiko Instruments U.S.A. Inc. CH-5301 and CH-5312 color thermal-transfer printers as well as color ink-jet printers.

If you want C size (17 by 22 inches) or larger output, you'll have to go to high-end flatbed plotters or Panatech Semiconductor, which supplies both thermal heads and printer modules on an OEM basis.

"Most heads supplied by Japanese vendors stop at about 10¾ inches, which is not quite B size," asserts Richard Bartlett, Panatech's thermal-printhead marketing manager. "We can make heads from 1 inch to 20 inches wide. We are supplying an oil industry client now with one 20 inches wide for seismic-analysis applications."

Thermal printers can integrate high-quality text and color graphics with the quiet operation required for today's open business environments. Disadvantages for color printing center on the slower speed required by the three passes of the printhead, the high accuracy needed for proper registration of the colored dots and the relatively high cost of the ribbons and the smooth, somewhat glossy paper required for high-quality images.

Hitachi America Ltd. claims to overcome the latter problem with its new PT-10E color thermal-transfer printer. Accommodating paper up to 10 inches wide (cut sheets and fanfold), it affords 180-by-180-dpi graphics on paper closer to photocopier quality than traditional thermal stock. A half-shift mode overlaps dot placement for better quality color. A wide carriage version, PT-12E, prints a line of 96 characters and handles 12-inch-wide paper. Both have Centronics parallel interfaces.

A host of color ink-jet printers can produce integrated text and graphics with quality (and

---

**Solid-ink ink-jet printers promise a 'quantum jump' advance in freedom from clogging and print quality.**

Dr. C. Hellmuth Hertz, who for the past 20 years has pioneered in the development of electrically controlled continuous-stream ink jets as well as the use of ultrasound in medical diagnosis, is not resting on his laurels. Chairman of the Department of Electrical Measurements at Lund University, Lund, Sweden, he is now tackling two problems that have, so far, stumped ink-jet technology: full-color printing competitive with photographs and color printing on textiles.

"Half-tones obtained by random dither," the conventional technique for color ink jets, Hertz explains, "have a grainy appearance to the eye. It is far from a photographic image." His solution is to vary, by a factor of 30, the number of dots allocated to each pixel, with the smallest dot measuring 30 microns. Hertz expects to license the technique some time this year.

Hertz's device for large-array printing of textiles or wallpaper is now in prototype form. The problem, says Hertz, is that the "pigmented inks required for such printing will not pass through the very fine nozzles on conventional ink jets."

Hertz's solution? A "compound" continuous ink jet that utilizes a cylinder of pigmented ink surrounding a 10-micron-diameter nozzle a short distance below the ink's surface. When a liquid, like water, is shot from the nozzle at high velocity, it picks up a sheath of ink, which breaks up into the fine ink droplets required for color printing.

Hertz emphasizes the problems entailed by the development of high-resolution (500 or 600 dots per inch) ink jets. "You'll need much smaller nozzles, say, 5 micron, rather than the 10 micron we use." But the main problem for color printing, he stresses, is not higher resolution but better control of such factors as low-intensity variations between two similar colors.

Although Hertz cautions that, "Engineering is a major barrier to the future development of ink jets," he predicts wider applications of the technology and the appearance of more "ink-jet enthusiasts."

Ink-jet enthusiasts are easily recognized, Hertz notes. "They have messy fingers and look continually at the bottom of beer cans to check the ink-jet printing. God has exempted them from Murphy's Law. They will try to convince you that ink-jet technology is simple. But be sure one is a good engineer before you take his advice."
Full-color graphics with 240-by-240- or 240-by-480-dpi resolution and an embossed feel are provided by Howtek's Pixelmaster solid-ink ink-jet printer. (Source: Howtek)

low noise level) comparable to thermal units. For example, Quadram Corp.'s Quadjet delivers 640 dots per 80-character line as well as bit-mapped graphics in up to seven colors at 40 cps. It's bundled with software for the IBM PC (which requires a parallel interface card) and a color graphics tablet for the Apple Computer Inc. II or Ile.

"It's very effective to see full-color presentations on paper or transparencies. For the presentation market today you need color," says Quadram's general manager for graphics and storage, James Rush. "But I don't think the typical user needs more than seven colors. Most screens have CGA (color graphics adapter) type graphics. The Quadjet produces good fill colors and it's easy to use."

Rush claims that the clogging problems that have plagued some ink jets is a thing of the past. "For the most part, clogging problems are history. We have not had significant problems with our device," he says. "The biggest problem we have had is with distributors who test the unit and then forget to lock the cap that protects the nozzles."

Other color ink-jet printers are available from HP, IBM, Canon U.S.A. Inc., Tektronix Inc. and other vendors. HP's QuietJet, for example, offers 19-by-32-dot NLQ printing and up to 192-by-192-dpi graphics in seven colors at 40 cps (10 characters per inch) or 48 cps. It supports eight international character sets and operates at less than 48 dB(a). The company's new version of its battery-powered ThinkJet ink-jet printer connects to portable computers via a Centronics parallel interface.

CalComp's ColorMaster prints at 1 minute per A size color page and furnishes a horizontal resolution of 203 dpi, vertical resolution of 200 dpi and a built-in rasterizer with 512K buffer that can store up to 100 pages of text. Compati-

ble with popular graphics packages such as Zenographics Corp.'s Mirage and Autumn and Decision Resources Chart-Master, plus Lotus 1-2-3 and Symphony, the printer incorporates a native implementation of the Graphic Software Systems Inc.'s (GSS) virtual device interface (VDI) driver. An EGA screen-dump facility is also available.

Software packages with advanced color capability can produce output on a color thermal printer that far surpasses what basic seven-color capacity would indicate. For example, Zenographics' Version 5.0 of Mirage and Autumn color-graphics software allows users to choose from a 98-color palette, a superset of Genographics Corp. 's slide-making systems' color palette. Additional colors can be "mixed" from a range of 360 million values, with hue values ranging from zero to 360, lightness from zero (black) to 1,000 (white) and saturation from zero to 1,000.

Moving up to top-quality output

Most of the excitement in nonimpact tech-

nology focuses on mid-range and high-end color ink-jet printers that can produce full-color output with quality that rivals offset printing.

For example, Advanced Color Technology Inc.'s Chromajet 4000 uses an 18-by-36-dot matrix to handle 1,000-color printing and bit-mapped graphics up to 240 dpi. It operates at 27 cps in letter-quality mode, interfaces via RS232C or a Centronics parallel line, prints a 115-character line and can size images on the page.

Xerox Corp.'s 4020 color ink-jet printer employs 20 nozzles and drop-on-demand technology to combine seven colors into approximately 4,000 shades. In addition to a 120-by-120-dpi mode, it uses an enhanced 120-by-240-dpi mode to create denser graphic images and more-filled-in characters. A Centronics interface is standard, RS232C optional.

The 4020 has several features to prevent clogging. An automatic purge system cleans the nozzles. A removable cartridge furnishes the "maintenance" fluid in which the nozzles rest when not in use.

Ink-jet printers with new solid-ink technology from Dataproducts Corp. and Howtek Inc. promise a "quantum jump" advance in freedom from clogging and in print quality that rivals the "embossed" look of lithography.

Dataproducts' SI 480 heats the solid ink pellet, which melts down into a heated reservoir, from which it is taken up into a compres-
Get the Courier HST™
9600-bps modem.
Then watch the rest of
the world play catch-up.

USRobotics new high speed
technology delivers over 1,000
characters/second on more dial-up
phone lines. For less than $1,000.

The new Courier HST (High Speed
Technology) dial-up modem combines four
great ideas that add up to a new standard for
personal computer data communications.

It's full-duplex, with high speed (9600-
bsps) and low speed (300- bps) channels—
automatically assigning the high speed
channel direction. This asymmetrical
solution avoids the problems of echo-
cancelling technology or inefficient
half-duplex schemes.

The most powerful data signalling tech-
nique—Trellis Encoded Modulation—lets
Courier HST achieve maximum speed over
a much wider range of phone line condi-
tions than other 9600-bps modems.

A unique error- and flow-control method
allows Courier HST to send up to 1,100
characters a second over long distance
phone connections.

It's familiar as any 2400- and 1200-bps
modem. Same features, commands and,
in most cases, the same software. In fact,
Courier HST automatically falls back to
2400, 1200 and 300-bps, connecting you
with nearly all modems.

High speed. High accuracy. High value. And
a two-year parts and service warranty. Get
the USRobotics Courier HST, priced under
$1,000. And watch the rest of the world play
catch-up.

CALL 1-800-DIAL-USR
In Illinois (312) 982-5001

Yes, please send me your FREE 8-page
book explaining the new Courier HST and
today's new high speed technology.

Name
Title
Company
Address
City, State, Zip
Business Phone ( )

1/87-MM-HST

CIRCLE NO. 59 ON INQUIRY CARD
Tired of juggling three or more separate devices to meet your printing needs? Confused about which technology—daisywheel, dot-matrix, plotter, ink-jet, thermal or laser—is right for you?

The all-in-one AMT Office Printer does the job of all these devices with superb print quality, speed, and the ability to mix text with multicolor high-resolution graphics. In fact, this exciting printer has set a new standard in functional versatility.

How can one printer do so much? With an ingenious print mechanism, unrivaled font, graphic, and color flexibility, multiple resident emulations, plus widespread hardware and software compatibility.

The AMT Office Printer is applications-oriented. For word processing, there is better-than-letter and near-letter-quality text, a font library with both fixed and proportionally-spaced fonts, scientific and technical character sets, and built-in features that italicize, color, bold, shadow, superscript, subscript, underscore, expand, center, and justify text. For data processing, there is high-speed, draft-quality text with up to 264 characters per line. For business graphics, CAD/CAM/CAE plots, and other precision graphic applications, there are full-color graphic modes providing resolutions up to 240V x 480H dots per inch. And for technical applications, there is custom font generation, font download, plotter emulation, and many other printing utilities.

Most importantly, the AMT Office Printer is fully compatible with software that drives the Diablo 630™, Qume Sprint 11™, NEC Model 3550 Spinwriter™, Diablo C-150 Ink-Jet Printer™, IBM Model 5182 Color Printer™, and Epson JX-80™. So just plug the printer into your computer's serial or parallel port, load your favorite software, and begin printing.

Isn't it about time to solve all your printing problems? The all-in-one AMT Office Printer!
tion chamber. A print signal activates the piezoelectric, drop-on-demand transducer that fires the ink droplets through 2-mil orifices onto paper or transparencies.

Fitz Turner, Dataproducts director of marketing, claims several benefits from solid-ink technology, including dark, sharp-edged print quality and elimination of clogging.

"With water-based inks, if you don't print for a while, the water evaporates and the ink crusted in the orifice and blocks the holes," Turner explains. "Also, with very high-quality, high-rag-content paper, the ink wicks into the paper and spreads out, causing the characters to look rough edged."

Turner continues: "Solid ink is a major breakthrough in terms of higher reliability and print capacity. Because it has no aqueous base, it does not evaporate and cause nozzles to clog. Because it 'freezes' and does not evaporate on the page, it does not wick into the paper. The SI-480 offers executive-quality printing and is totally insensitive to paper."

The SI-480 furnishes up to 240-by-480-dpi graphics at 20 inches per second and offers high-quality printing on paper from tissue through card stock and even, claims Turner, to sandpaper "for the abrasive letters we all want to write." Two fonts (Courier like and Gothic like) come standard and others can be downloaded under software or front-panel control via a 64K buffer. The printer also offers a wide range of emulation, formatting and pitch modes and an MTBF of 24 months at a 25 percent duty cycle. An optional programmable power pedestal offers two 500-sheet bin feeders or one bin feeder and a 70-envelope feeder.

Howtek's Pixelmaster color ink-jet printer provides "embossed" quality, full-color graphics with 240-by-240-dpi resolution and "raised" text on virtually any office paper, claims Ray Roque, vice president of marketing. It can half-step horizontally for 240 by 480 dpi. The nonfriction vertical paper feed lifts the paper past the rotating printhead, which deposits the solid plastic, melted ink. Full color pages print in 3 to 4 minutes.

The unique print mechanism contributes to the unit's 20,000 page mean output between failures, says Roque. Sixteen different fonts in plug-in ROM cartridges can reside in memory at one time.

SCSI, RS232C, Ethernet and Centronics interfaces are standard as are GSS Grafstation and HP Laserjet emulation; HPGL emulation also will be offered.

Iris Graphics Inc.'s 2044 large-format (E size, 34 by 44 inches) and 2024 medium-format (24 by 24 inches) color ink-jet printers aim at nonphotographic, color prepress proofing and CAD/CAM applications. Based on continuous-stream technology developed by Dr. C. Hellmuth Hertz, the 2024 produces 1 million 15-micron droplets per second for 240-by-240-dpi resolution "on anything you can mount on the drum," contends Tad Thompson, director of communications at Iris.

Under control of an Intel Corp. 8085 processor, the printer can step, repeat and rotate images over a page, merge and delete image files and integrate text and line art in over 250,000 colors.

"Film-based color proofs can be expensive, and labor intensive," explains Thompson. "A typical 12-by-18-inch DuPont Corp. Cromalin or other photographic color proof can cost $35 or more. We can supply a color hard-copy alternative for about 35 cents. The 2044 can turn out a 16-page signature in 30 minutes; the 2024, two double-page-spread magazine proofs in 12 minutes. In addition, computer-equipment vendors are using the machines to produce low-cost posters of their ads for their retail outlets or distributors."

Color thermal and ink-jet printers will continue to refine their technologies. The color thermal printers' relatively high cost per printed page of 25 to 50 cents will come down over the next few years to 15 to 30 cents, says Greg Porell, senior consultant at CAP International.

Rohm Corp. will introduce 300-dpi heads
early this year and eventually 400-dpi units, says Bob Peckham, marketing manager for thermal-LED (light-emitting diode) printheads. But the latter may not be easy to implement.

"You need a very smooth print surface and an extremely thin transfer ribbon," Peckham cautions.

However, resolution for most units will probably not get much beyond 200 dpi, contends Dave Collier, electrical projects manager at General Scanning Inc., which makes a full line of thermal recorders.

"The thermal-printhead market is driven by the facsimile market, which uses 200-dpi heads. You can get 400-dpi heads, but they probably won't appear on thermal printers, because you can get higher resolution with laser printers."

The reliability, paper-handling features and high-quality text and images afforded by solid-ink technology will migrate down to mid- and low-end units as more color graphics packages appear that can take advantage of the precision and range of colors these units can produce.

Nonimpact technologies will not cause the complete and sudden demise of serial-impact and daisywheel units. Users who want full-letter-quality output will only gradually migrate to nonimpact printers as the price/performance, and print quality, of these units continues to improve.

However, rapidly maturing laser printers cast a big shadow over the nonimpact printer market, offering intense competition for the higher end ink-jet and thermal printers. But until the much heralded color laser printer becomes a commercial reality, nonimpact color printers will remain the only game in town for system integrators who want full color graphics and integrated text.

---

For color pre-press proofing or CAD/CAM applications, Iris Graphics' 2024 color ink-jet printer prints 24-by-24-inch, 240-by-240-dpi digitized images. (Source: Iris Graphics Inc.)

If you’re a system manager, this means freedom. Freedom from tedious, repetitive tasks like queue management, process management, system backup and restore. Freedom to concentrate on challenging, productive tasks like programming, tuning, ...

SystemMaster provides a secure, controlled environment for distributing system management. You can selectively delegate system-management responsibility and control the assigned tasks.

VAX/VMS are trademarks of Digital Equipment Corporation.

Strategic Information
80 Blanchard Road, Burlington, MA 01803
(617) 273-5500   (800) 227-1209

CIRCLE NO. 61 ON INQUIRY CARD
Until now, you expected to get what you paid for. Bruning’s new ZETADRAF 900 E-size, single sheet plotter gives you more.

How? We’ve designed and engineered a totally new E-size plotter to the point where it outperforms every other plotter of its type.

And at the same time, we reduced the price!

The drawing quality is superb. And, when you consider 6 g’s acceleration, 45 ips chart speed and 8-pen color capability, it’s unmatched.

Of course our faster plot speed means your output is higher than ever. ZETADRAF 900 could cut the plot time for your most dense design in half.

ZETADRAF 900 supports all major CAD software packages and is compatible with most computers. Interfaces include RS232, IEEE-488, GML and HPGL.

No prior plotter experience is required, even for liquid ink. ZETADRAF 900 has two levels of operation—novice and advanced. But everyone appreciates features such as the angled, LCD control panel and the ability of the plotter to store even complex user-designed configurations.

Sorry CalComp and HP. We just didn’t realize when we started out that we could produce so much plotter for so little money. But we did.

Get all the facts about ZETADRAF 900 or our other ZETA drafting plotters by calling (415) 372-PLOT or write: Bruning Computer Graphics 777 Arnold Drive Martinez, CA 94533 TWX 910-481-5951

We just raised the performance level for single sheet, E-size plotters.

We also lowered the price!
### PLOTTERS

<table>
<thead>
<tr>
<th>Company/Model</th>
<th>Plotter Type</th>
<th>Pen Type</th>
<th>Number of Color</th>
<th>Plotting Speed</th>
<th>Media Type</th>
<th>Paper Size (mm)</th>
<th>Number of Different Sizes of Media</th>
<th>Repeatability (ppm)</th>
<th>Compatibility</th>
<th>Interface</th>
<th>Hardware Interface</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALPHA MERICS CORP.</td>
<td>Alphaplot II</td>
<td>flatbed, pen plotter</td>
<td>ballpoint, fiber tip, wet ink</td>
<td>6</td>
<td>8.5</td>
<td>all media</td>
<td>24 x 34 (A-D)</td>
<td>0.001</td>
<td>0.00125</td>
<td>HPGL</td>
<td>RS232C</td>
<td>5,990</td>
</tr>
<tr>
<td></td>
<td>Customline</td>
<td>flatbed, pen plotter</td>
<td>all</td>
<td>6</td>
<td>15</td>
<td>all media</td>
<td>48 x 96 (A-E)</td>
<td>0.002</td>
<td></td>
<td>RS232C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARISTO GRAPHICS CORP.</td>
<td>Aristomat 100</td>
<td>flatbed, cutting</td>
<td>ballpoint, felt tip, ink</td>
<td>2.8</td>
<td></td>
<td>mylar, paper, ruby slip, scribefilm</td>
<td>48 x 60</td>
<td>1</td>
<td>0.0002</td>
<td>Hewlett-Packard</td>
<td>RS232C</td>
<td>55,000-75,000</td>
</tr>
<tr>
<td></td>
<td>Aristomat 200</td>
<td>flatbed, cutting</td>
<td>ballpoint, felt tip, ink</td>
<td>15</td>
<td></td>
<td>mylar, paper, ruby slip, scribefilm, vinyl</td>
<td>48 x 67</td>
<td>3</td>
<td>0.0002</td>
<td>0.0018</td>
<td>RS232C</td>
<td>65,000-92,000</td>
</tr>
<tr>
<td>BENSON INC.</td>
<td>CES-3036</td>
<td>electrostatic</td>
<td>512</td>
<td>0.3</td>
<td></td>
<td>film, paper</td>
<td>36 roll</td>
<td>1</td>
<td>254 dpi</td>
<td>CAD/CAM, CAE, IC design application</td>
<td>IBM channel</td>
<td>85,000</td>
</tr>
<tr>
<td></td>
<td>CTP-XX</td>
<td>thermal transfer</td>
<td>7</td>
<td></td>
<td></td>
<td>film; plain, clay coated paper</td>
<td>11 roll</td>
<td>(A, B)</td>
<td>1</td>
<td>300 dpi</td>
<td>HPGL</td>
<td>Centronics, IBM PC bus, RS232C, RS343</td>
</tr>
<tr>
<td>CALCUMP</td>
<td>1043GT</td>
<td>pen plotter</td>
<td>ballpoint, fiber tip, liquid ink, plastic tip</td>
<td>8</td>
<td>24</td>
<td>paper, polyester film, vellum</td>
<td>36.7 x 47 (A-E)</td>
<td>10</td>
<td>0.0005</td>
<td>0.006</td>
<td>AutoCAD, CADVANCE, VersaCAD</td>
<td>RS232C, IEEE 488</td>
</tr>
<tr>
<td></td>
<td>5735</td>
<td>electrostatic</td>
<td>1</td>
<td>0.5</td>
<td></td>
<td>clear, matte film; standard, translucent paper</td>
<td>36 roll</td>
<td>11</td>
<td>400 dpi</td>
<td></td>
<td></td>
<td>54,455</td>
</tr>
<tr>
<td>ENTER COMPUTER INC.</td>
<td>SP6000</td>
<td>pen plotter</td>
<td>fiber tip</td>
<td>10</td>
<td>14</td>
<td>bond, transparency, vellum</td>
<td>8 1/2 x 11, 11 x 17 (A, B)</td>
<td>18</td>
<td>0.004</td>
<td>0.008</td>
<td>HPGL</td>
<td>Centronics, RS232C</td>
</tr>
<tr>
<td></td>
<td>SP1000</td>
<td>pen plotter</td>
<td>fiber tip, liquid ink, roller ball</td>
<td>10</td>
<td>31</td>
<td>bond, transparency, vellum</td>
<td>all (A-D)</td>
<td>18</td>
<td>0.0025</td>
<td>0.004</td>
<td>HPGL</td>
<td>RS232C</td>
</tr>
<tr>
<td>FACIT INC.</td>
<td>4550</td>
<td>pen plotter</td>
<td>ballpoint, ceramic tip, fiber tip</td>
<td>8-12</td>
<td>6</td>
<td>paper, glossy paper, transparency</td>
<td>8 1/2 x 11 (A)</td>
<td>16</td>
<td>0.004</td>
<td>0.008</td>
<td>HPGL</td>
<td>Centronics, RS232C</td>
</tr>
<tr>
<td></td>
<td>4551</td>
<td>pen plotter</td>
<td>ballpoint, ceramic tip, fiber tip</td>
<td>8-12</td>
<td>8</td>
<td>paper, glossy paper, transparency</td>
<td>11 x 17 (A, B)</td>
<td>16</td>
<td>0.004</td>
<td>0.008</td>
<td>HPGL</td>
<td>Centronics, RS232C</td>
</tr>
<tr>
<td>GULTON INDUSTRIES INC. (GRAPHIC INSTRUMENTS DIV.)</td>
<td>Superplot-80</td>
<td>dot matrix</td>
<td>1</td>
<td></td>
<td></td>
<td>thermal paper</td>
<td>8 1/2 x 11, 8 1/2 roll</td>
<td>1</td>
<td>100 dpi</td>
<td>Centronics, IEEE 488, OEM bit parallel, RS232C</td>
<td>2,050</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gulton Industrial Park, East Greenwich, RI 02818, (401) 884-6800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HARRIS CORP. (COMPUTER SYSTEMS DIV.)</td>
<td>Harris 4765</td>
<td>electrostatic</td>
<td>dot matrix</td>
<td>1</td>
<td>1</td>
<td>electrographic paper</td>
<td>11 roll, fan fold (A-E)</td>
<td>200 dpi</td>
<td>Versatplot</td>
<td>Harris VLLI</td>
<td>parallel, DMA controller</td>
<td>12,500</td>
</tr>
<tr>
<td></td>
<td>Harris 4770</td>
<td>electrostatic</td>
<td>dot matrix</td>
<td>1</td>
<td>1.5</td>
<td>electrographic paper</td>
<td>34 roll (A-E)</td>
<td>200 dpi</td>
<td>Versatplot</td>
<td>Harris VLLI</td>
<td>parallel, DMA controller</td>
<td>49,000</td>
</tr>
</tbody>
</table>

MINI-MICRO SYSTEMS/January 1987 97
## PLOTTERS

<table>
<thead>
<tr>
<th>Company and Model</th>
<th>Plotter Type</th>
<th>Pen Tip</th>
<th>Number of Colors</th>
<th>Printing Speed (ppm)</th>
<th>Media Type</th>
<th>Number of Paper Rolls</th>
<th>Number of Operator Controls</th>
<th>Mechanical Interface (RS232C/IEEE-488)</th>
<th>Compatibility</th>
<th>Repeatability (lines/mm)</th>
<th>Hardware Interface</th>
<th>Unit Price ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEWLETT-PACKARD CO. (SAN DIEGO DIV.)</td>
<td>7550A</td>
<td>pen plotter</td>
<td>fiber tip, liquid ink, roller ball</td>
<td>10</td>
<td>31.5</td>
<td>paper, polyester film, transparency, vellum</td>
<td>11 x 17</td>
<td>(A, B)</td>
<td>20</td>
<td>0.001</td>
<td>0.004</td>
<td>major business, technical and CAD packages</td>
</tr>
<tr>
<td></td>
<td>Color Pro</td>
<td>pen plotter</td>
<td>fiber tip</td>
<td>10</td>
<td>15.7</td>
<td>paper, transparency</td>
<td>8 1/2 x 11</td>
<td>(A)</td>
<td>5</td>
<td>0.001</td>
<td>0.004</td>
<td>major business, technical and CAD packages</td>
</tr>
<tr>
<td>HOUSTON INSTRUMENT (DIV. OF AMETEK INC.)</td>
<td>DMP-51/52 MP</td>
<td>pen plotter</td>
<td>stainless steel, tungsten tip drafting; water-based hard nib</td>
<td>14</td>
<td>22</td>
<td>matte film, paper, vellum</td>
<td>(C, D)</td>
<td>0.001</td>
<td>0.002</td>
<td>350 CAD, business graphics packages</td>
<td>RS232C</td>
<td>5,295</td>
</tr>
<tr>
<td></td>
<td>DMP-56A</td>
<td>pen plotter</td>
<td>stainless steel, tungsten tip drafting; water-based hard nib</td>
<td>1</td>
<td>22</td>
<td>matte film, paper, vellum</td>
<td>8 1/2 x 11 to 36 x 48</td>
<td>(A-E)</td>
<td>0.001</td>
<td>0.004</td>
<td>350 CAD, business graphics packages</td>
<td>RS232C</td>
</tr>
<tr>
<td>IBM CORP.</td>
<td>6180 Model 1</td>
<td>pen plotter</td>
<td>fiber tip</td>
<td>8</td>
<td>20</td>
<td>paper, transparency film</td>
<td>8 1/2 x 11</td>
<td>(A)</td>
<td>19</td>
<td>0.001</td>
<td>0.004</td>
<td>ChartMaster, Lotus, SlideWrite</td>
</tr>
<tr>
<td></td>
<td>7372</td>
<td>pen plotter</td>
<td>fiber tip</td>
<td>6</td>
<td>15</td>
<td>paper, transparency film</td>
<td>11 x 17</td>
<td>(A, B)</td>
<td>20</td>
<td>0.001</td>
<td>0.004</td>
<td>ChartMaster, Lotus, SlideWrite</td>
</tr>
<tr>
<td>IOLINE CORP.</td>
<td>LP3700</td>
<td>pen plotter</td>
<td>fiber tip, liquid ink, roller ball</td>
<td>1-20</td>
<td>14</td>
<td>film, mylar, paper, vellum</td>
<td>up to 37 1/2 x 81</td>
<td>(A-E)</td>
<td>2</td>
<td>0.0025</td>
<td>0.0025</td>
<td>DM/PL</td>
</tr>
<tr>
<td></td>
<td>LP4000</td>
<td>pen plotter</td>
<td>fiber tip, liquid ink, roller ball</td>
<td>1-20</td>
<td>28</td>
<td>film, mylar, paper, vellum</td>
<td>up to 37 1/2 x 81</td>
<td>(A-E)</td>
<td>2</td>
<td>0.001</td>
<td>0.0025</td>
<td>DM/PL</td>
</tr>
<tr>
<td>NCR CORP. (MICROGRAPHIC SYSTEMS DIV.)</td>
<td>4300</td>
<td>raster plotter</td>
<td>laser imaging</td>
<td>1</td>
<td>3 min. per card</td>
<td>aperture card</td>
<td>35mm</td>
<td>200 dpi</td>
<td>Versatec</td>
<td>Centronics, Versatec</td>
<td>38,000-45,000</td>
<td></td>
</tr>
<tr>
<td>PRINTRONIX INC.</td>
<td>4160</td>
<td>printer/plotter</td>
<td>dot matrix</td>
<td>1</td>
<td>13.6</td>
<td>mylar, paper, vellum</td>
<td>3 1/2 x 16 roll, fan fold</td>
<td>2</td>
<td>160 x 168 dpi</td>
<td>Versaplot</td>
<td>Centronics, RS232C</td>
<td>5,380</td>
</tr>
<tr>
<td>ROLAND DG</td>
<td>DPX-2000</td>
<td>flatbed pen plotter</td>
<td>ballpoint, ceramic tip, fiber tip, liquid ink, oil-based</td>
<td>8</td>
<td>16</td>
<td>up to 1/4 inch thick</td>
<td>23.3 x 17</td>
<td>(A-C)</td>
<td>16</td>
<td>0.00049</td>
<td>0.001</td>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td></td>
<td>DXY-980</td>
<td>flatbed pen plotter</td>
<td>ballpoint, ceramic tip, fiber tip, liquid ink, oil-based</td>
<td>8</td>
<td>9.8</td>
<td>up to 1/4 inch thick</td>
<td>14.9 x 10.6</td>
<td>(A, B)</td>
<td>16</td>
<td>0.0019</td>
<td>0.01</td>
<td>Hewlett-Packard</td>
</tr>
<tr>
<td>SEIKO INSTRUMENTS USA INC.</td>
<td>CH-5301</td>
<td>thermal transfer</td>
<td>dot matrix</td>
<td>4,912</td>
<td>45 sec. per copy</td>
<td>paper, transparency film</td>
<td>8 1/2 x 11</td>
<td>(A)</td>
<td>152 dpi</td>
<td>parallel, video</td>
<td>from 5,995</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CH-5312</td>
<td>thermal transfer</td>
<td>dot matrix</td>
<td>4,912</td>
<td>65-115 sec. per copy</td>
<td>paper, transparency film</td>
<td>8 1/2 x 11, 11 x 17</td>
<td>(A, B)</td>
<td>203 dpi</td>
<td>parallel, video</td>
<td>from 9,995</td>
<td></td>
</tr>
</tbody>
</table>

MINI-MICRO SYSTEMS/January 1987
INTERPHASE PULLS A FAST ONE

V/SMD 4200

V/ESDI 4201

30 MBytes/s on VMEbus

INTERPHASE® shatters the old speed limits of the VMEbus with its second generation of VME disk controllers boasting 30 megabytes per second bus speeds and above. Using a new INTERPHASE technology breakthrough called the BUSpacket Interface™ ... the new V/SMD 4200 Cheetah and V/ESDI 4201 Panther triple existing VMEbus speeds and approach the VMEbus theoretical bandwidth of 40 megabytes per second!

SIMPLY THE FASTEST

The combination of the BUSpacket Interface and a large (128 KBytes) cache memory provide the V/SMD 4200 and V/ESDI 4201 with unequaled speed, and make them the fastest SMD and ESDI controllers by a factor of three. No one even comes close!

In simple terms, the new INTERPHASE technology preformats packets of data to go across the bus before acquiring it. The INTERPHASE BUSpacket approach unchains the VMEbus from slow devices through deep, high-speed bus FIFOs and an asynchronous delay line-based state machine, which controls bus transfers. Data is emptied onto the bus in packets at speeds 30 megabytes per second and above.

STICK WITH THE WINNERS

The V/SMD 4200 and V/ESDI 4201 also incorporate the proven INTERPHASE features of the multitasking Virtual Buffer Architecture™, Intelligent Caching, and zero latency operation found on other popular INTERPHASE products. The four drive V/ESDI 4201 Panther even adds an integral SCSI port for easy addition of backup devices.

Both products complement INTERPHASE's high-performance V/Tape 3209 1/2" tape controller, and are PLUG & PLAY software compatible with the industry's most successful SMD and ESDI controllers, our V/SMD 3200 and V/ESDI 3201.

THEY'RE GOING FAST

To learn more about the fastest SMD, ESDI and 1/2" tape controllers around, call or write today ... but you better move fast ... INTERPHASE certainly is.

(214) 350-9000
IPI/FDDI FORUM / SAN JOSE '87

A technical conference on the Intelligent Peripheral Interface (IPI), with complementary sessions on the Fiber Distributed Data Interface (FDDI).

WHERE
The San Jose Hyatt on 1740 North First Street in San Jose, California

WHEN
March 10 – 12, 1987

WHO
Engineering, Planning and Marketing personnel of companies who are using IPI or FDDI, or considering their use, should not miss this conference.

FEATURED SPEAKERS
I. Dal Allan
President, ENL Consulting

Bill Almon
Vice President, Storage Products, IBM

ISSUES
- IBM uses IPI-3 for disk and tape on System/36, System/38, and the 9370 — How will this affect the OEM market and other system manufacturers?
- Storage subsystems, not processor speeds, dictate systems performance — How does IPI minimize response time?
- IPI products are here — Who's using them? Are they successful?
- What are the SMD and SCSI to IPI migration issues?
- IPI is defining bandwidths above 100 Megabytes/second for high-performance applications such as graphics — What storage peripherals will be offered to keep pace?
- FDDI can support 10 Megabytes/second data transfer between 2,000 stations over 2 kilometers — How will this capability be exploited?
- FDDI has the capability to mix voice, video and other data on the same cable — What new application opportunities does this present?

IPI/FDDI TECHNICAL PROGRAM
MARCH 11-12
For the first time, the complementary high-performance IPI and FDDI Interfaces will be the subject of one conference:
- Industry Status and Activities
- IPI Market Trends and Issues
- IPI-3 Device Generic Applications
- IPI-2 Device Specific Applications
- IPI Chip Sets Update
- FDDI-1 Data Applications
- FDDI-2 Voice and Data Applications

IPI/FDDI TUTORIAL
IPI/FDDI EXHIBITORS PROGRAM
MARCH 10
Principles and Concepts will be covered on March 10 — IPI in the morning and FDDI in the afternoon.

Exhibitors Workshops will be held on March 10-11. On the evening of March 11, an Exhibitors Reception will provide delegates with the opportunity to see IPI and FDDI products.

SPONSORS
- AT&T Lightguide
- Control Data Corporation
- ENL Consulting
- Fujitsu America Inc.
- Gould CSD
- Hitachi America, Ltd.
- Mini-Micro Systems
- NEC Information Systems
- Prime Computer Inc.
- Siemens AG, Data
- Sun Microsystems
- Technology Forums
- Xylogics, Inc.

Please register me for the □ entire 3-Day Program for $995; □ 2-Day IPI/FDDI Technical Program for $795; □ 1-Day IPI/FDDI Tutorial for $395. I have printed the following information as I want it to appear on my name tag and the list of delegates.

NAME ____________________________
TITLE ____________________________
COMPANY _________________________
ADDRESS _________________________

PHONE (______) ____________________

IPI Forum registrations cannot be accepted without full payment. Please make checks payable to IPI FORUM and mail with this registration form to:
Technology Forums • 3425 Pomona Boulevard, Suite F • Pomona, CA 91768 • (714) 861-7300

CIRCLE NO. 64 ON INQUIRY CARD
## PLOTTERS

<table>
<thead>
<tr>
<th>Company</th>
<th>Model</th>
<th>Plotter Type</th>
<th>Pen Type</th>
<th>Number of colors</th>
<th>Printing Speed (ips)</th>
<th>Media Type</th>
<th>Paper, clay-coated paper, transparency</th>
<th>Resolutions (dpi)</th>
<th>Memory (K)</th>
<th>Number of characters</th>
<th>Resolution (dpi)</th>
<th>Compatibility</th>
<th>Hardware Interface</th>
<th>Unit Price ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHARP ELECTRONICS CORP.</td>
<td>JX-720</td>
<td>ink jet printer/plotter</td>
<td>dot matrix</td>
<td>7</td>
<td>2.2 min. per 1024x1024</td>
<td>paper, clay-coated paper, transparency</td>
<td>8½ roll</td>
<td>120 dpi</td>
<td>120 dpi</td>
<td>IBM Business Graphics, image, scientific; Apple applications</td>
<td>Centronics</td>
<td>1,395</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOLTEC CORP.</td>
<td>RY-5200</td>
<td>drum pen plotter</td>
<td>ballpoint, ceramic tip, fiber tip, drafting</td>
<td>8</td>
<td>20</td>
<td>film, mylar, paper, vellum</td>
<td>63x22 roll (A-D)</td>
<td>0.01</td>
<td>0.008</td>
<td>Hewlett-Packard, HPGL, IBM</td>
<td>Centronics, IEEE 488, RS232C</td>
<td>6,495</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SPL-430</td>
<td>pen plotter</td>
<td>ballpoint, ceramic tip, fiber tip, drafting</td>
<td>6</td>
<td>22.2</td>
<td>film, paper</td>
<td>11x17 (A, B)</td>
<td>0.001</td>
<td>0.008</td>
<td>HPGL, Lotus, dBASE III</td>
<td>Centronics, RS232C</td>
<td>1,595</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VERSATEC (XEROX CO.)</td>
<td>Spectrum</td>
<td>electrostatic printer/plotter</td>
<td>dot matrix</td>
<td>512</td>
<td>2.5</td>
<td>clear polyester film, matte film, opaque paper</td>
<td>8½x11, 11x17 roll</td>
<td>200, 400 dpi</td>
<td></td>
<td>Differential, parallel, TTL</td>
<td>11,950-14,950</td>
<td>8,950</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Versacolor</td>
<td>thermal transfer</td>
<td>up to 100,000 sec. per copy</td>
<td>paper, transparency film</td>
<td>8½x11, 11x17</td>
<td>300 dpi</td>
<td></td>
<td></td>
<td></td>
<td>parallel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BUSCON/87-West
The Bus/Board Users Show & Conference
January 19 – 21, 1987
Los Angeles Airport Hilton Hotel
Los Angeles, California

**DISCOVER:**
- Which vendors are winning the race
- What products are available
- New ways to solve your technical needs
- How to keep you and your company up-to-date in this rapidly changing field
- All about new—and special—Bus architectures

**SEE:** Hands-on exhibits with new Bus/Board products

**LEARN:** Through tutorial seminars and technical sessions on Emerging Bus Technologies and Features, plus new applications ideas for your current projects

For more information, write Bill Weber
BUSCON, 17100 Norwalk Blvd., Ste. 118,
Cerritos, CA 90701-2750
or call Bill at (213) 402-1610
COPY CAD.

In fact, copy anything. Faster. With higher quality. And more flexibility. For a lot less money.
That's what you get with the CH-5300 Color Hardcopier. And you get it with next to no effort at all.
Because we've already qualified over one hundred video sources. Which means no software drivers are required. And there's no host downtime during installation.
Plus, you can turn your hardcopier into a shared resource with our Multiplexor. Up to four different sources can be connected so the cost per user becomes astonishingly low.
In the end, you get beautifully sharp color copies of everything on your screen. And you get them fast. Data is downloaded into the hardcopier instantly (there's no processing to slow things down). A-size copies and presentation quality transparencies are produced in under 40 seconds. And B-size copies are delivered in moments.
So copy our phone number. Then call. We'll show you how to save money, save time and save your image with the Seiko CH-5300 Color Hardcopier.

Call Martin Nelson at (408) 943-9100 today.
QUALIFIED VIDEO SOURCES FOR THE SEIKO COLOR HARDCOPIER.

Over one hundred models from more than fifty manufacturers. It's a long list and it's growing everyday. Give us a call to make sure your hardware is a qualified source.

Qualified Manufacturers

Advanced Electronics Design
Applicon
Apollo
Aries
AT&T
Autotrol
Aydin
CalComp
Computer Aided Engineering
Calma
Chromatics
CGX
Computervision
Computer Sciences Corp.
Conographics
Control Systems
Data General
EDS (General Motors)
Genisco
Harris
Hughes
Hewlett-Packard
IBM
Ironics
Lexidata
Masscomp
Matrox
Megatek
Metheus
Moore Products
Number Nine
Omnicomp
Ramtek
Raster Technology
Raytheon
Scion
Seiko
Silicon Graphics
Sun Microsystems
Symbolics
Tektronix
Vectrix
Vermont Micro
Verticom
VG Systems
Wang

SEIKO INSTRUMENTS
© 1986 Seiko Instrument U.S.A., Inc.

CIRCLE NO. 66 ON INQUIRY CARD

NEW PRODUCTS

Megan Nields, Assistant Editor

Supermini supports up to 64 users

• 16M bytes of memory
• Eight communications ports
• 200G bytes of disk storage

The Series 3200 superminicomputer addresses up to 16M bytes of memory and over 200G bytes of disk storage. A basic configuration consists of 4M bytes of memory, eight communications ports, a line-printer interface and 1M byte of cache memory. An OEM version is available. $42,000 and higher.


Circle 413

Personal computer uses 80286 processor

• Two configurations
• 3.5M bytes of memory
• 20M-byte disk drive

Available in two configurations, the PC/microIT or PC/uIT is based on the 80286 processor. The first unit offers 512K bytes of memory expandable to 1.5M byte without an expansion slot, or 3.5M bytes via a single card. The second model supplies a 1.2M-byte flexible disk drive and a 20M-byte rigid disk drive. Features include an RS232C port, five full-expansion slots and MS-DOS 3.1. $2,345, PC/microIT; $3,590, PC/uIT. Sperry Corp., P.O. Box 500, Blue Bell, Pa. (215) 542-2240.

Circle 415

Hand-held computer packs 320K bytes

• RS232C port
• Built-in modem
• 46 keys

The MLS II hand-held computer employs 128K bytes of memory expandable to 320K bytes. It contains a built-in modem with baud rates of 300 or 1,200. Features include an 8-by-32-character LCD window, 46 keys and a bar-code reader option. An RS232C port is standard. $2,495. Michell-Lane Inc., Suite 2, 2721 Van Marter Drive, Spokane, Wash. 99206, (509) 922-2233.

Circle 416
DIGILOG 300
PROTOCOL ANALYZER
SETS THE NEW STANDARD

$3,995
INCLUDES 800K BYTE DISK

Digilog 300 sets the new standard for performance in network service applications. It sets up fast... automatically. Built-in tests and decodes speed you to a fast fix... so service engineers don't need to know all the protocol details to be effective. Think of the training savings.

Expanded use with library of applications
Digilog ready-to-use software does the job when your needs go beyond protocol monitoring, trapping, and recording. Easy-to-run analysis, test, and emulation packages are available for SNA, SDL, X.25, and the other protocols. They're easy to load, run, and understand.

Performance you want
- Full remotely-controlled operation
- 800K byte diskette storage
- Built-in automatic protocol decoding for SDL/SNA, HDLC/X.25, Bscy, etc.
- Real-time graphic display
- Six menu selectable BERTS
- RS-232 Interface Lead Breakout
- Logging printer control port
- Extensive trap/trigger facilities
- Library of test/emulation programs

3-Year Warranty
Unmatched Digilog warranty protects you.

FREE 20-page color brochure
Get full details on the Digilog 300 and all the other protocol analyzers in the Digilog family.

Digilog Inc.
1570 Welsh Road
Montgomeryville, PA 18936

Call toll free 1-800-233-3151
in Pennsylvania, call 1-215-626-4530

DIGILOG
Leading in Data Communications Test and Control

CIRCLE NO. 67 ON INQUIRY CARD
NEW PRODUCTS
DISK/TAPE

Tape drive handles 67M bytes
- Quarter-inch unit
- 57.6K bytes per second
- 67M-byte storage

The Packetape quarter-inch tape cartridge drive provides up to 67M bytes of formatted data storage. The device allows data capture for logging or archival applications from RS232C asynchronous data source without software protocol. It accepts data transfer rates of up to 57.6K bytes per second. $2,990.

Telebyte Technology Inc., 270 E. Pulaski Road, Greenlawn, N.Y. 11740, (516) 423-3232.

Winchester stores 51M bytes
- 3½-inch unit
- 40-msec access time
- 12,500 bpi

Achieving a 51M-byte storage capacity, the model M2227D is a 3½-inch Winchester disk drive. The unit provides a 40-msec average positioning time and a 625K-byte-per-second transfer rate. Data is recorded at 12,500 bpi and MTBF is 30,000 hours. $695, OEM quantity I00 pricing. Fujitsu America Inc., 3055 Orchard Drive, San Jose, Calif. 95134, (408) 946-8777.

Flexible subsystem offers 100-msec access
- 3½-inch unit
- IBM PC compatible
- 100-msec access time

A 3½-inch flexible disk drive subsystem, the MD13 is compatible with the IBM PC, PC/XT and PC/AT. The internal device furnishes a 720K-byte storage capacity, a 100-msec average access time and proprietary software. It supplies 80 tracks and two heads. MTBF is 10,000 hours. $355. Manzana Micro-Systems Inc., P.O. Box 2117, Goleta, Calif. 93118, (805) 968-1387.

Half-inch tape drive stores 630M bytes
- 120 ips
- 16,000 bpi
- 240K bytes per second

The MT-500C half-inch tape cartridge streamer offers a 630M-byte storage capacity and a 128M-byte cache with error detection. It supplies 16,000 bpi and a 240K-byte-per-second transfer rate. Tape speed is 120 ips. The unit uses a 24-track serpentine format and GCR encoding techniques. $15,500.

MegaTape Corp., 1041 Hamilton Road, P.O. Box 317, Duarte, Calif. 91010-0317, (818) 357-9921.

MINI-MICRO SYSTEMS/January 1987
Workaholics

THE GENICOM 3000 SERIES

Printers that don’t know when to quit

Business success demands hard work. That’s why more and more businesses depend on the Genicom 3000 series. Six hardworking, reliable printers that make life easier.

You name it. The 3000s can handle it.

No matter what you need in a rugged business printer—3000’s your number. Just look at these job qualifications. Data processing printing at a blazing 400 cps. Letter quality at an unmatched 180 cps. And reliable paper handling for even the most demanding applications.

Need a trained specialist? The 3000s are ready. With extra quiet printers that crank the work out at under 55 dBA. Printers with seven color capability for presentation quality business graphics. Even printers for bar codes.

Best of all, there’s a 3000 series printer built specifically for your office. For dependable printing with everything from a single PC to a multi-terminal information system.

Real team players.
The 3000 series printers make fast friends with their co-workers. Because they’re compatible with any computer worth mentioning. And software packages like Lotus 1-2-3®, Symphony™ and WordStar®.

So, don’t waste time with a clockwatching printer. Hire one of the workaholics. A Genicom 3000 series printer. For more information, contact your nearby Genicom dealer.


Lotus 1-2-3 and Symphony are registered trademarks of Lotus Development Corporation. WordStar is a registered trademark of MicroPro International.

CIRCLE NO. 78 ON INQUIRY CARD

GENICOM
The Printers That Mean Business.
Genicom Drive, Waynesboro, VA 22980
**NEW PRODUCTS**

**PRINTERS**

**Laser printer outputs 26 ppm**

- 1,500 lpm
- 60,000 pages per month
- Epson emulation

A letter quality laser printer, the LaserPRINT 2670 produces up to 26 ppm for about 1.8 cents per page. The unit runs up to 1,500 lpm and handles as many as to 60,000 pages per month. It emulates Calcomp, Diablo 630, Epson, NEC and Xerox 2700 printers. Features include a dual-input feeder and a 300-dpi resolution. $11,400. [Advanced Technologies International Inc., 2041 Mission College Blvd., Santa Clara, Calif. 95054, (408) 748-1688. Circle 421]

**Plotter handles 300 dpi**

- Thermal transfer unit
- Seven colors per dot
- Proprietary controller

A thermal transfer plotter, Versacolor achieves a 300-dot-per-inch resolution with seven colors per dot. The unit can be used as a hard-copy device with a proprietary RGB controller that captures data from a CRT screen in less than 1 second. Media support includes cut-sheet paper and polyester film transparencies. Paper size is changed via cartridges. [$8,950. Versatec, 2710 Walsh Ave., Santa Clara, Calif. 95051, (408) 988-2800. Circle 423]

**Printer offers 50, 100, 200 cps**

- 18-wire unit
- 12, 15, 20 cpi
- Cut-sheet feeder

An 18-wire dot-matrix printer, the OSP runs at speeds of 50 cps, letter quality: 100 cps, near letter quality and 200 cps, draft mode. The device produces 12, 15 or 20 cpi on 8½-inch by 11-inch paper. Data is accepted via an RS232C or Centronics interface. Features include a cut-sheet feeder and an optional color ribbon cartridge. $1,690. [Newbury Data Inc., Suite 208, 2200 Pacific Coast Highway, Hermosa Beach, Calif. 90254, (213) 372-3775. Circle 424]

**Printer produces 8 ppm**

- 300 by 300 dpi
- 19 resident fonts
- 2.5M bytes of RAM

The QMS SmartWriter 80+ furnishes 2.5M bytes of RAM and 816K bytes of download font and print buffer memory. It produces 8 ppm and a 300-by-300-dpi resolution. The unit offers Diablo 630, Epson FX-80 and Qume Sprint II emulation modes. A dual Centronics and RS232C interfaces are standard. Features include dot-addressable graphics modes and 19 resident fonts. [$4,595. QMS Inc., P.O. Box 81250, Mobile, Ala. 36689, (205) 633-4300. Circle 425]

---

**Printer emulates Diablo, Epson, IBM**

- 47, 134 lpm
- Plug-in cartridges
- Bit-map graphics

The Personal Line Printer can emulate Diablo 630, Epson LQ-1500 and IBM Proprinter printers through plug-in cartridges. The desktop unit produces 47 lpm, letter quality and 134 lpm, draft. It supplies IBM software-emulation and block-graphics characters and bit-map graphics. [$795. Printronix Inc., 17500 Cartwright Road, Irvine, Calif. 92714, (714) 863-1900. Circle 422]

---

**Apollo DN3000**

The DNXRAM memory offers 1 or 2 MB capacities on a single card. Completely hardware/software compatible with the Apollo DN3000 series of computer workstations, it supports the 32-bit data bus with byte, word, longword and unaligned transfers. Access time is 120ns, achieving identical performance to the Apollo memory. However, by using zig-zag in-line packaged 256K dynamic RAMS (ZIP DRAMS), the board delivers twice the density per slot. The DNXRAM is lifetime warranted* and is supported by a 24 hour before repair/replacement policy. Write or call for our new designer literature packages.

*All Clearpoint memory products are warranted for life.

---

**CLEARPOINT INC.**

99 South Street * Hopkinton, MA 01748

U.S.A. 1-800-CLEARPT

Telex ' 71060

Europe Steptade, Ltd. (Netherlands)

*All Clearpoint memory products are warranted for life.
REGIONAL SALES OFFICES

NEW ENGLAND
John J. Fahey
Regional Manager
Susan Rapaport
Regional Manager
275 Washington St.
Newton, MA 02158
(617) 964-3030

NEW YORK/MID-ATLANTIC
Stephen B. Donohue
Regional Manager
1873 Route 70, Suite 302
Cherry Hill, NJ 08003
(609) 761-0701
in N.Y.: (212) 972-0058

SOUTHEAST
Larry Pullman
Regional Manager
6540 Powers Ferry Rd., Suite 170
Atlanta, GA 30339
(404) 955-6500

MIDWEST
Robert D. Wentz
Regional Manager
Lynne Graham
Sales Coordinator
Cahners Plaza
1350 E. Touhy Ave.
P.O. Box 5080
Des Plaines, IL 60018
(312) 635-8800

SOUTHWEST
Don Ward, Regional Manager
13740 Midway, Suite 515
Dallas, TX 75234
(214) 982-0518

MOUNTAIN STATES
John J. Fahey
Regional Manager
270 St. Paul St.
Denver, CO 80206
(303) 388-4511

SOUTHERN CALIFORNIA/NEVADA
Len Ganz
Regional Manager
1681 Teller Ave.
Irvine, CA 92715
(714) 851-9422

NORTHERN CALIFORNIA/NORTHWEST
Frank Barbaggia
Northwestern Regional Sales Manager
Rick Jamison
Regional Manager
Sherman Building, Suite 100
3001 Tosh Way
San Jose, CA 95128
(408) 243-8838

UK/BENELUX/SCANDINAVIA
Jan Dawson
Cahners Publishing Co.
/o Computarprint
39A Bowling Green Lane
London, EC1R OBJ, England
Tel: 011-44-276-2152
Telex: 29399

ISRAEL
Elan Marketing Group
13 Haifa St. P.O. Box 33439
Tel Aviv, Israel
Tel: 972-3-252967
Telex: 341667

JAPAN
Karpu Hara
Dyynaco International Inc.
Suite 1003, Sun-Palace Shinjuku
Bldg. 12-1 Nishishinjuku, Shinjuku-ku
Tokyo, 160, Japan
03-366-6301
Telex: J2326209 DYNACO

TAINW
Donald H. Shapiro
Trade Winds, 2nd Floor
132 Hsin Yi Road, Sec. 2
Taipei, Taiwan
Tel: 992781
Telex: 24177 FC Trade

EUROPE, EXCEPT UK/BENELUX/SCANDINAVIA
Elan Marketing Group
Neutor g 2
P.O. Box 64
1013 Vienna, Austria
Tel: 43-422-663012

Mini-Micro Marketplace
Carol Flanagan
275 Washington St.
Newton, MA 02158
(617) 964-3030

Career Opportunities
Carol Flanagan
Recruitment Advertising Manager
275 Washington St.
Newton, MA 02158
(617) 964-3030

Cahners Magazine Division
William Platt, President
360 Summer St.
Newton, MA 02158
(617) 964-3030

Promotion Staff
Suzanne Rasaport
Marketing Communications Director
360 Summer St.
Newton, MA 02158
(617) 964-3030

Circulation
Mary Gregory
Promotion Manager
Beth-Anne Legane
Promotion Assistant

Denver, CO:
(303) 388-4311
Sherri Gronli
Group Manager

CIRCLE NO. 252 ON INQUIRY CARD

ADVERTISERS’ INDEX

COMPANY PAGE NO. INQUIRY NO.
ADAC Corp. 38 32
Advanced Matrix Technology Inc. 92 60
AMF Logic Sciences 84 57
Analog & Digital Peripherals 112 207
BP Microsystems 112 208
Bruning Computer Graphics 96 62
Charles River Data Systems 40 35
Chratlin Industries, Inc. 21 18
Cleaner 103 101 69 70
Clintion Digital Communications Research Group 111 201
Convergent Technologies 2-3
Cordata 62 45
Data Access 16 81
datasouth Computer Corp. 10 10
Davidge Corp. 112 215
Diab Systems Inc. 39 41
Digital 104 67
Electronic Specialists 111 203
Equinox Systems 5 4
Excicon 18-19 14 15
Faci 88 251
Falco Data Products 70 75
Florida Data 23 20
Fujitsu America Inc. Storage Division 53 41
General Electric Co. 111 208
General Power Systems 22 19
Gencimco 106 76
Gould Inc. Computer Systems Div. 47 38
Hall-Mark/Okidata 1 Cov 2
Hitachi Americia Ltd. 37 82-83 30 56
Houston Instrument Div. of Bausch & Lomb 44 33
IBM Information Systems 54-55 42
IBS 81 55
IIC 110
I1bruck/USA 28 22
Impeial Technology Inc. 104 88
IN Computer 112 213
Inmac 9 9
Intemational Micro 19 8
Interface Group 13 53
Interphase Corp. 99 63
Interline Corp. 111 202

COMPANY PAGE NO. INQUIRY NO.
JDL 56 43
Karl Leister 108 252
KNW Systems Corp. 25 16
Liberty Electronics USA 20 17
Mannesmann Tally 30-31 25
Method Systems Inc. 111 205
MicroQuest 79 13
Micro-Rem 52 40
Moya Corp. 112 214
Multi-Tech 9 73
NEC Peripherals 26-27 21
Newbury Data 33 35
Newbury Data 27 26
Output Technology 45-43 36
Princeton Graphic Systems 65 46
Printtronix Inc. 87 58 60
Quadram Corp. 61 44
Radio Shack (Tandy Corp.) 75 51
Seagate Technology 14 12
Sekio Instruments 102 103 66
Sequel Data 8 7
Sigma Design 6 5
Softronic 112 209
Storage Technology 66 47
Strategic Information 45 61
Syscon 67 101
24 68 46
System 1 2
Tandon Corp. 79 11
TEAC Corp. 80 54
Technology Forums 100 64
TouchStone 34 29
Uniforum 109 73
Unitech 32 26
Universal Data Systems Inc. 47 74
U.S. Robotics 91 59
Versatic Inc. (a Xerox Co.) 68-69 49 50
Victoria Entesses 28 23
Wall Street Computers 111 204
Western Telematic Inc. 29 24
Wyse Technology 76 52
Xylogics Inc. 48 39

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

MINI-MICRO SYSTEMS/January 1987 108
UNIX® Helps Your Computer
Do More, So You Can Do More

Want maximum performance and operational support from your computer system? Need to optimize the capabilities of your equipment and your people?

Then you must seriously consider the advantages inherent in the UNIX operating system. Advantages that include: networking, multi-user and multi-tasking capabilities, software portability, distributed processing and expandability.

Learn all about the UNIX operating system by attending UniForum 1987, the International Conference of UNIX Users.

Don’t miss the FREE UNIX introductory workshops. These sessions will give you valuable information on the basics of UNIX...its potential...and how to integrate it into your computer system.

Some 200 major vendors will display and demonstrate the full spectrum of UNIX operating system products and services at UniForum 1987...including hardware, software and services ...for mainframe, mini and microcomputers.

A complete and comprehensive conference and tutorial program also will be presented during this important event. Call 800-323-5155 for all details.

NOTE: The USENIX 1987 Winter Conference will run concurrently with UniForum. The USENIX Conference will be held at Washington’s Shoreham Hotel.

UNIX is a registered trademark of AT&T

☐ YES—Rush my copy of the informative UniForum 1987 brochure.

MAIL TO: UniForum 1987, 2400 East Devon, Suite 205, Des Plaines, Illinois 60018
If you're a computer graphics manufacturer, you can't afford to miss the opportunity to bring your latest technical information and products to the attention of a targeted audience of OEMs, system integrators and large volume end users. And, if you're a volume buyer of computer graphic products, you won't want to miss the free technical seminars and product demonstrations coming to your area—close to where you live and work.

With the one day Computer Graphic ICCs, manufacturers can time and cost efficiently demonstrate their products throughout the U.S. and Europe. Unlike national shows, the table top product displays and business hospitality setting provide a simple, yet pleasant, working environment to conduct business one-on-one.

So don't miss this computer graphic opportunity! If you are a manufacturer of workstations, image processors, graphic software, graphic displays/terminals, printers/plotters or other associated computer graphic peripherals, call us today and reserve space. If you are a volume buyer, call your local computer graphic supplier, or our offices, for a Computer Graphic ICC invitation in your area.

In the U.S., contact B. J. Johnson & Associates, Inc., 3151 Airway Avenue #C-2, Costa Mesa, CA 92626, Phone (714) 957-0171, Telex 5101002189 BJ JOHN.

In Europe, contact C. J. Nicholl & Associates, Ltd., 37 Brompton Road, London SW3 1DE, England, Phone 01-581 2326/9, Telex 888068 CJNAD G.
ATTENTION: BUYERS AND SELLERS OF PRODUCTS AND SERVICES IN THE COMPUTER SYSTEMS INTEGRATION MARKETPLACE:

READERS: For additional information on the companies in this section, please circle reader service numbers on the Reader Inquiry card

CREATE A BETTER IMAGE
InLine Corporation introduces the LP3700 large format line plotter: the high performance, professional quality instrument that maximizes value...with a price that draws conclusions: $4,995.

The LP3700 offers:
- Versatility - Lets you plot on any media at any size up through E (37" x 81")
- Precision - 0.025" Resolution & Repeatability
- Buffering - 14x to 512k
- Speed - Up to 10 ips (axial)
- Reliability - Rugged all metal frame - Endurance tested at over 60 million cycles

- Value - At $4,995, the LP3700 is in a class all by itself

19417 36th Avenue West, Suite D1
Lynnwood, WA 98086
(206) 775-7861

IOLINE CORPORATION

AVOID COMPUTER DOWNTIME!

- 11-25 MINUTES BLACKOUT POWER
- FRONT PANEL TEST SWITCH

FREE CATALOG

Brushless DC and Digital Encoder Motors

GE has teamed up with one of the world’s leading precision motor manufacturers to offer brushless DC and digital encoder motors. We supply custom engineered precision motors to many major Business Equipment manufacturers for spindles and head actuators for magnetic and optical drives, printers and plotters. We can also furnish brushless DC motors for air moving applications.

Call or write with specifications about your motor needs.

Rod Everett, Market Specialist
General Electric Co.
Motor Venture Operation
1635 Broadway, P.O. Box 2204
Fort Wayne, IN 46801-2204
(219) 426-3189

GENERAL ELECTRIC

EPROM PROGRAMMER

$349

IBM ANALOG

The EP-1 is a great value, here's why:
- IBM PC Software Included or RS-232 to any computer
- ASCII Command driven operation, All commands in unit
- Reads, Programs, Copies over 150 types from 2716 to 2764
- Optional 16 microcontroller programming head
- Menu driven Chip Selection: No Personality Module
- Fast, Quick-Rule Programming Algorithms
- 10/100/1000 Motorola, Texas Instrument Hex Keys
- SPI/PS/PS Chips by Base Address and Odd/Even (16 bit system)
- Gold Tinted DIP IC socket, Full-Year Warranty
- General Set Checkouts
- Over-Current Protection
- 8 Baud Rates 300 to 38400
- Same Day Shipmen

CIRCLE NO. 208 ON INQUIRY CARD

TERMINAL EMULATIONS

NEW RELEASE!

SOFTERM PC 2.0

* OVER 30 EXACT EMULATIONS
* KEYBOARD MACRON • HOTKEY
* VIRTUAL DISK CAPABLE • SCRIPTEX
* KEYBOARD TRANSLATE • MULTITASKING
* FILE TRANSFER WITH 7 PROTOCOLS
(i.e. KERMIT, SERVER, HAYES, XMODEM, etc.)
* CONCURRENT AND BACKGROUND COMMUNICATIONS

SOFTRONICS

THE LEADER IN EXACT EMULATIONS

800/225-8590

CIRCLE NO. 209 ON INQUIRY CARD

IBM PC COMPATIBLE RS232 EASl-DISK

5 1/4" FLOPPY DATA STORAGE & TRANSFER SYSTEM

- Reads & Writes IBM PC DOS 5 1/4" Disks
- RS-232C I/O
- Rugged Portable Package
- Host and/or Manual Controls
- ASCII or Full Binary Operation
- Baud Rates 110 to 19.2 K Baud
- Automatic Data Verification
- Price $1,095 in Singles - OEM Qty's Less

28 other systems with storage from 100K to 35 megabytes

ANALOG & DIGITAL PERIPHERALS INC

815 Diana Drive
Troy, Ohio 45373
513/339-2241
TWX 810-450-2685
Branch Off Oklahoma City OK - Factory Yuca Valley CA

CIRCLE NO. 207 ON INQUIRY CARD

We Buy & Sell

NEW & USED

DEC*

EQUIPMENT

Call Today for Price & Delivery Quotes.

CLINTON DIGITAL INC.

776 WATER STREET
FRAMINGHAM, MA 01701

TELEPHONE:

(617) 877-9564

CIRCLE NO. 210 ON INQUIRY CARD

Moya's Reliable Tape and Microcomputer Products

OEM Devices to Complete Systems

- DC15000 and DC52000 Tape
- Cartridge Transports
- Complete Tape Systems
- Smart Tape Interfaces
- STD Bus Modules

Moya Corporation

6900 Oeno St. Unit B
Chatsworth, CA 91311
818-700-1200

CIRCLE NO. 214 ON INQUIRY CARD

PROCESS CONTROL STORE & FORWARD COMPUTER

Features:
- Z80A CPU
- 4 RS-232 serial ports supported by DART's
- Centronics parallel port
- 8 Sentrywide memory sockets accept any combination of static RAM, EPROM or EEPROM
- Integral power supply operates on 100, 120, 200 or 240 VAC
- LED's indicate POWER ON and activity on serial lines

Options:
- Battery backed RAM
- Non-interrupting clock calendar
- Custom paint & silk-screen
- MTBASIC in ROM

CIRCLE NO. 215 ON INQUIRY CARD
Error-Correcting
2400 bps Modems from Multi-Tech Systems:

When it has to be as good as it is fast

● Dial-up 2400 bps modems have arrived. More datacomm users are upgrading from 1200 to 2400 than ever before. But there can be a flip side to increased speed: more transmission errors.

● That's why our MultiModem224E™ offers MNP™ error correction. Available in our 2400 bps desktop, internal and rack-mounted modems, MNP gives you 100% error-free transmissions, no matter how bad the phone line. MNP does it without the speed degradation of less efficient, software-based protocols.

● Another important point: MNP Class 3 has emerged as an industry standard. It's now in the public domain, and has been implemented in virtually all 2400 bps modems that offer error-correction.

● So, why buy error-correcting modems from Multi-Tech? There are many good reasons, including:
1. Multi-Tech modems are 100% Hayes-compatible (more so than Hayes' own 2400 bps modems*), and our MultiModem224E with error-correction costs less than a Hayes Smartmodem 2400™ without this feature.
2. Bonus features, like speed conversion, both synch and async operation, battery-backed option settings and phone number memory.
3. Versatility: the auto-dial/auto-answer MultiModem224E runs at 2400, 1200 or 300 bps, with or without error-correction, automatically!
4. Our two year warranty means something. Since Multi-Tech modems are designed and manufactured at our Minnesota headquarters (as they have been for the last sixteen years), you can be sure we'll be here when you need us.

● Please call us toll-free at 1-800-328-9717, for additional information... get a modem that's as good as it is fast!

*InfoWorld: 8/5/85 - reprints available

Multi-Tech Systems
The right answer every time.

Multi-Tech Systems, Inc. • 82 Second Avenue S.E. • New Brighton, Minnesota 55112 U.S.A.
1-800-328-9717 • 1-612-631-3050 • TWX 910-563-3610 (Domestic) • Telex 4998372 MLTT TC (International)
CIRCLE NO. 73 ON INQUIRY CARD
Three Keys to Successful TDM or Statistical Multiplexing

Three keys! They're all you need to configure Universal Data Systems' new multiport V.33 modem/multiplexer combination. Separate versions offer either six-channel TDM or eight-channel statistical multiplexing capability.

In either configuration, the device is trellis coded at its basic 14.4 kbps operating speed and has alternate data rates of 12 or 9.6 kbps. If your system utilizes TDM, you may also choose between asynchronous and synchronous operation and you can have V.29 operation at 9.6 kbps.

The three-pushbutton/LCD control panel allows configuration choices (with different data rates for each channel if you desire), "soft strap" settings and easy review of both multiplexer and modem status.

Three Keys to Successful TDM or Statistical Multiplexing

The entire set-up and review process is menu-driven; the user need only answer a series of questions by pressing the appropriate YES or NO switch. When the process is complete, a push on the HOME switch returns the device to the communications mode.

Diagnostics on both versions of the V.33 multiplexer/modem include local and remote digital loopback on each channel as well as local and remote analog loopback. All test features are compatible with CCITT V.52 and V.54 recommendations.

YES, you can now have TDM or statistical multiplexing capability in a single package with a 14.4 kbps trellis coded modem. NO, these devices are not expensive to buy or difficult to apply.

HOME of the new V.33 multiplexer/modem is Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35805. Telephone 205/721-8000; Telex 752602 UDS HTV. Ask for detailed specs and quantity prices.

UDS modems are offered nationally by leading distributors. Call the nearest UDS office for distributor listings in your area.

DISTRICT OFFICES: Apple Valley, MN 612/432-2344 • Atlanta, GA 404/998-2715 • Aurora, CO 303/368-9000 • Blue Bell, PA 215/643-2336 • Boston, MA 617/875-8868 • Columbus, OH 614/995-3055 • East Brunswick, NJ 201/238-1515 • Glenview, IL 312/686-8185 • Houston, TX 713/687-6500 • Huntsville, AL 205/721-8000 • Issaquah, WA 206/992-6600 • Livonia, MI 313/522-4750 • Mesa, AZ 602/920-6611 • Milwaukee, WI 414/273-8743 • Mission Viejo, CA 714/770-4555 • Mountain View, CA 415/969-3323 • Richardson, TX 214/690-0002 • St. Louis, MO 314/434-4919 • Silver Spring, MD 301/942-8556 • Tampa, FL 813/684-0615 • Uniondale, NY 516/222-0918 • Van Nuys, CA 818/891-3282 • Willowdale, Ont, Can. 416/495-0008

CIRCLE NO. 74 ON INQUIRY CARD

Created by Dayner/Hall, Inc., Winter Park, Florida