FEBRUARY 1988

Mini-Micro Systems

THE MAGAZINE FOR SYSTEM INTEGRATION

A CAHNERS PUBLICATION

THE YEAR OF COLOR
A new generation for color hard copy

Color brightens desktop publishing

Hot to plot

Oracle eyes OLTP

a pen plotter.

VERSATEC
A XEROX COMPANY

CIRCLE NO. 1 ON INQUIRY CARD

See Us at Spring National Design Engineering and NCGA

KEEPING AMERICA
COMPETITIVE
Roundup
A buyer's guide
to non-impact printers
Technology Forum
How to quadruple
modem throughput

It only looks like

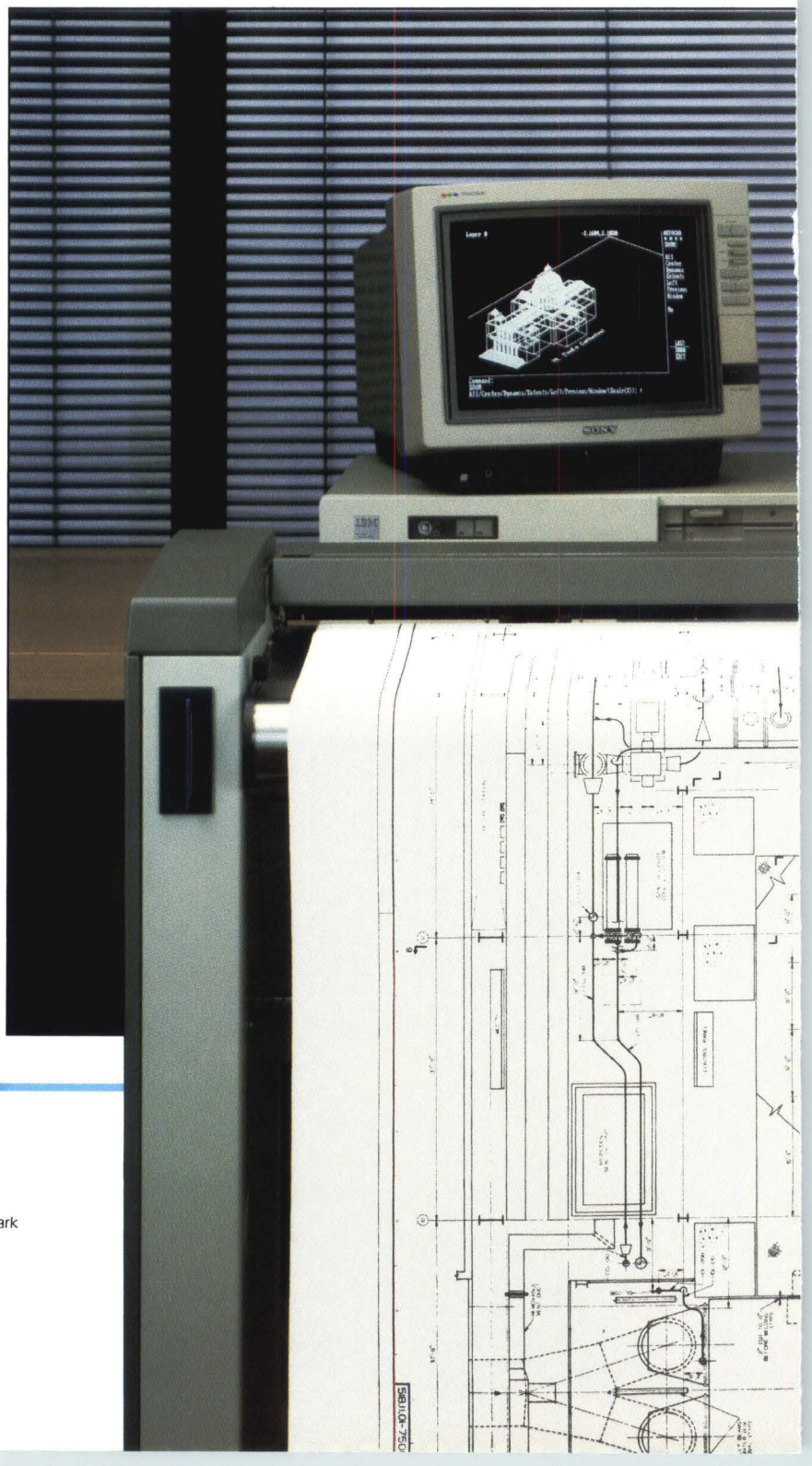
But look again. It emulates pen plotters, reading popular 906/907 and HPGL data formats. It comes in pen plotter widths – 24 and 36 inches. And you can use it with your favorite CAD packages, such as AutoCAD, VersaCAD, or MICRO CADAM.

But the Versatec 8500 series is like no pen plotter made. It is more reliable, because it plots with electrons, not pens. It's faster, plotting D or E size drawings in less than a minute. It can plot an unlimited number of vectors, variable line widths (to ½ inch wide), dashed lines, or text without reducing speed.

A built-in rasterizer and full-page buffer enable fast output at a constant rate for outstanding quality. Plot an original in fifty seconds. Make copies without retransmitting data. And plot over one hundred drawings without changing paper.

So fast you can share one plotter among several users. So quiet you can run this plotter at your desk. So reliable you can plot unattended at remote sites. This is the revolutionary new 8500 series of electrostatic plotters. Prices start at under $20,000.

Circle our readers' service number or call toll-free 800/538-6477* for a free product application brochure.



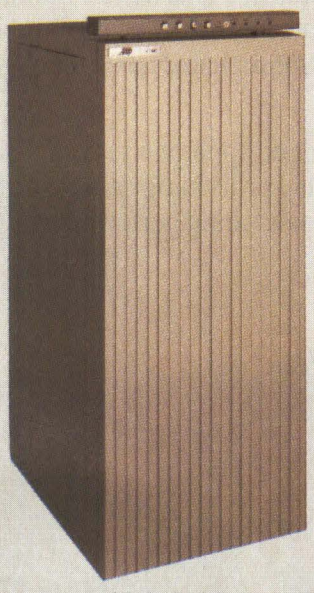
*In California, call toll-free 800/341-6060

HPGL is a trademark of Hewlett-Packard. 906/907 is a trademark of CalComp. AutoCAD is a trademark of Autodesk. MICRO CADAM is a trademark of CADAM Inc. VersaCAD is a trademark of Versacad Corporation. Versatec is a trademark of Versatec, Inc. Xerox is a trademark of Xerox Corporation.

Plot data courtesy of Autodesk.

Concurrent Computer/Perkin-Elmer users

Concurrent Solutions



Your computer deserves better.

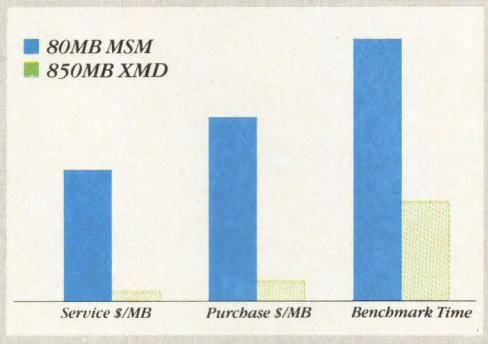
Your old disk drives are strangling your CPU. And costing you money. You pay more every month for maintenance, and more every second in reduced performance. Adding a new disk to your OS/32 or XELOS system couldn't be easier with Macrolink disk controllers.

Today's disks give higher performance, cost less and are smaller than ever before. Install 4 Gigabytes of disk in the same space as your old MSM 80. You'll get 2.5 times faster transfers, 50% faster seeks and less total power consumption.

New disks need new generation controllers to realize their full potential. Our MACRO 3+ has unmatched flexibility that supports any mix of SMD drives available today. Including the full range from Fujitsu and CDC, like the Eagle XP and the 3MB/second 9772 XMD. We don't limit your options, so you can add the capacity you need today and tomorrow. No other controller can match its performance, error free formatting and diagnostics.

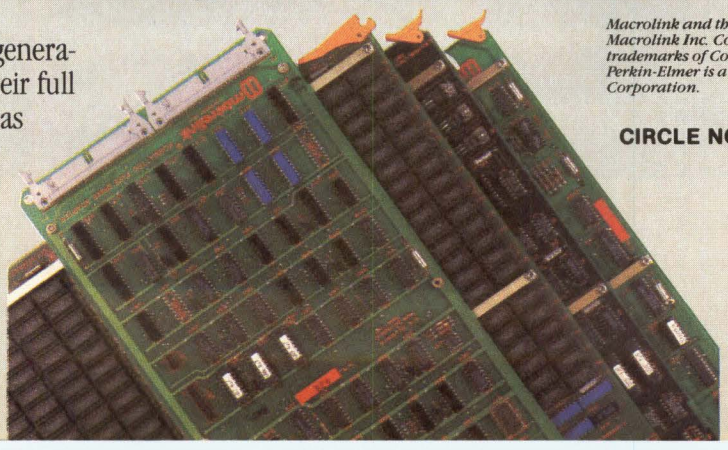
For ultimate speed, use our Solid State Disk. With 8MB to 256MB of storage, it's up to 20 times faster than conventional disks, and it can be dual ported. Error scrubbing and error logging are standard features and it uses our 3200 series compatible memory modules.

Our SCSI Disk Controller opens new opportunities for small systems. Low cost 5.25 inch disks with ST-506, ESDI and SCSI compatibility. From 20MB to over 700MB.

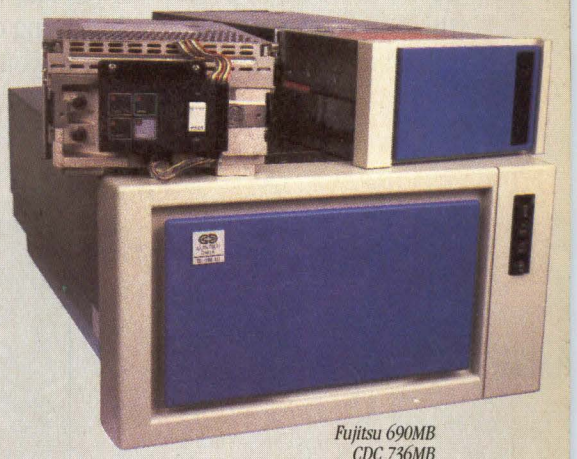


A new disk drive can save you money, and improve your performance.

Interested in Laser Disks? Our SCSI/Laser disk interface gives you 1 Gigabyte of removable media on-line. We've made Write-Once-Read-Many (WORM) technology available for your 3200 today.



Macrolink has more compatible products for your computer than anyone. More Tape Controllers,



Fujitsu 690MB
CDC 736MB
CDC 1.2GB

Memory, Communications, Disks, and just about anything else you might need. Call today for our catalog, and find out why OEMs and End Users make us their first choice. Service and installation is available world-wide, and from Concurrent Computer Corp.

Macrolink Inc., 1500 North Kellogg Drive, Anaheim, California 92807. Phone (714) 777-8800, TWX 910-591-1671, FAX (714) 777-8807.

Stay Concurrent with Macrolink.

macrolink® inc.

Macrolink and the Macrolink logo are trademarks of Macrolink Inc. Concurrent Computer and XELOS are trademarks of Concurrent Computer Corporation. Perkin-Elmer is a registered trademark of Perkin-Elmer Corporation.

CIRCLE NO. 2 ON INQUIRY CARD

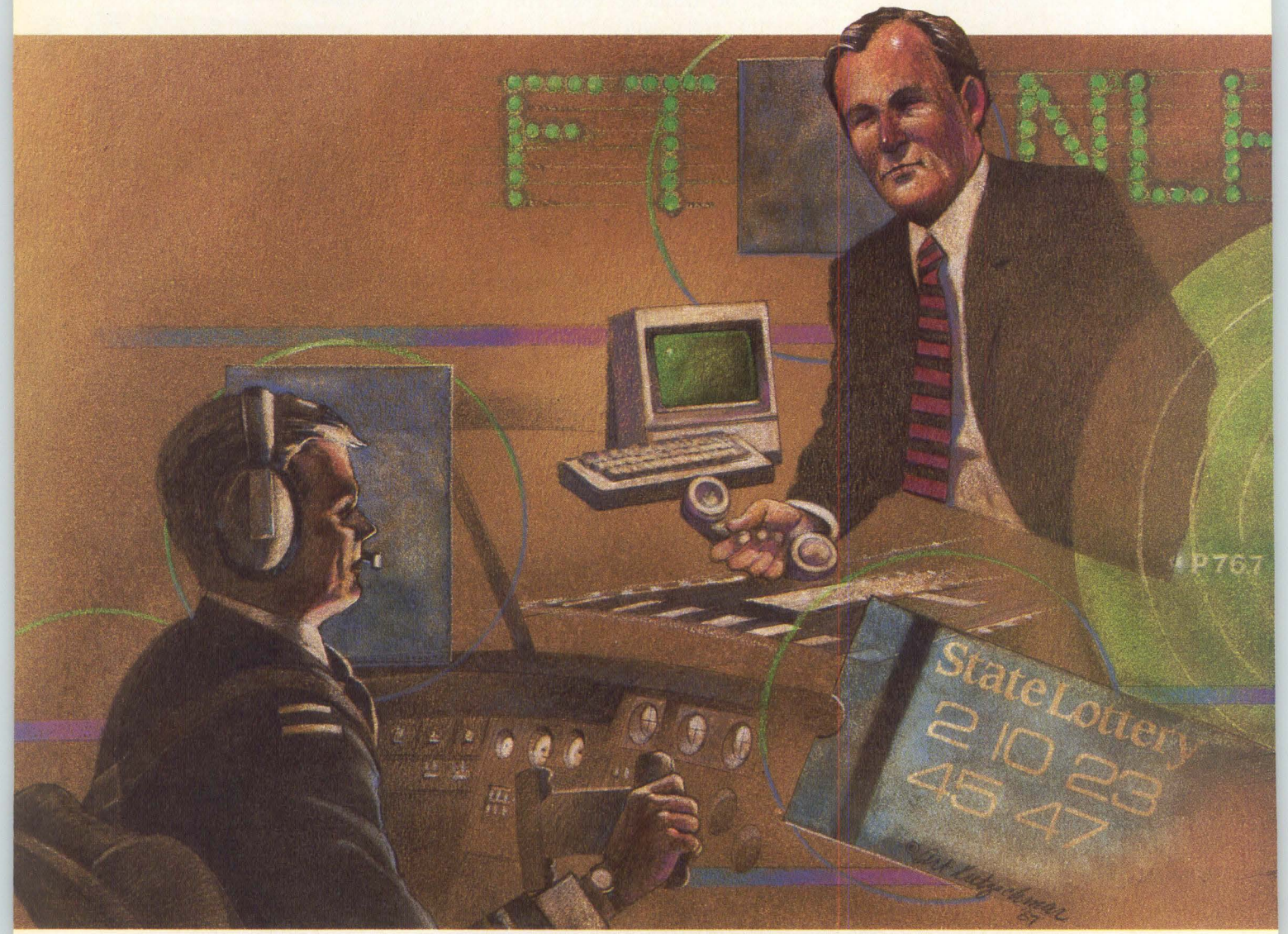
WE MAKE COMPUTERS FOR PEOP

Real world applications require real-time computer solutions. And a company that understands the need for fast, reliable response to time critical events.

Concurrent Computer Corporation has the answer for your demanding applications, like power plant control, aircraft simulation, on-line stock quotations or state lotteries, to name just a few. They're vastly different applications, yet they all have one thing in common: the people relying on them can't afford to wait . . . and neither can you.

At Concurrent Computer Corporation, we've specialized in creating computer systems for the real-time and on-line commercial markets for more than 20 years. We have almost a quarter of a billion dollars in sales and operate in over 30 countries with an installed base of more than 26,000 computer systems.

We've evolved a unique approach to complex problem solving - a parallel processing architecture that not only provides outstanding performance,



LE WHO CAN'T AFFORD TO WAIT.

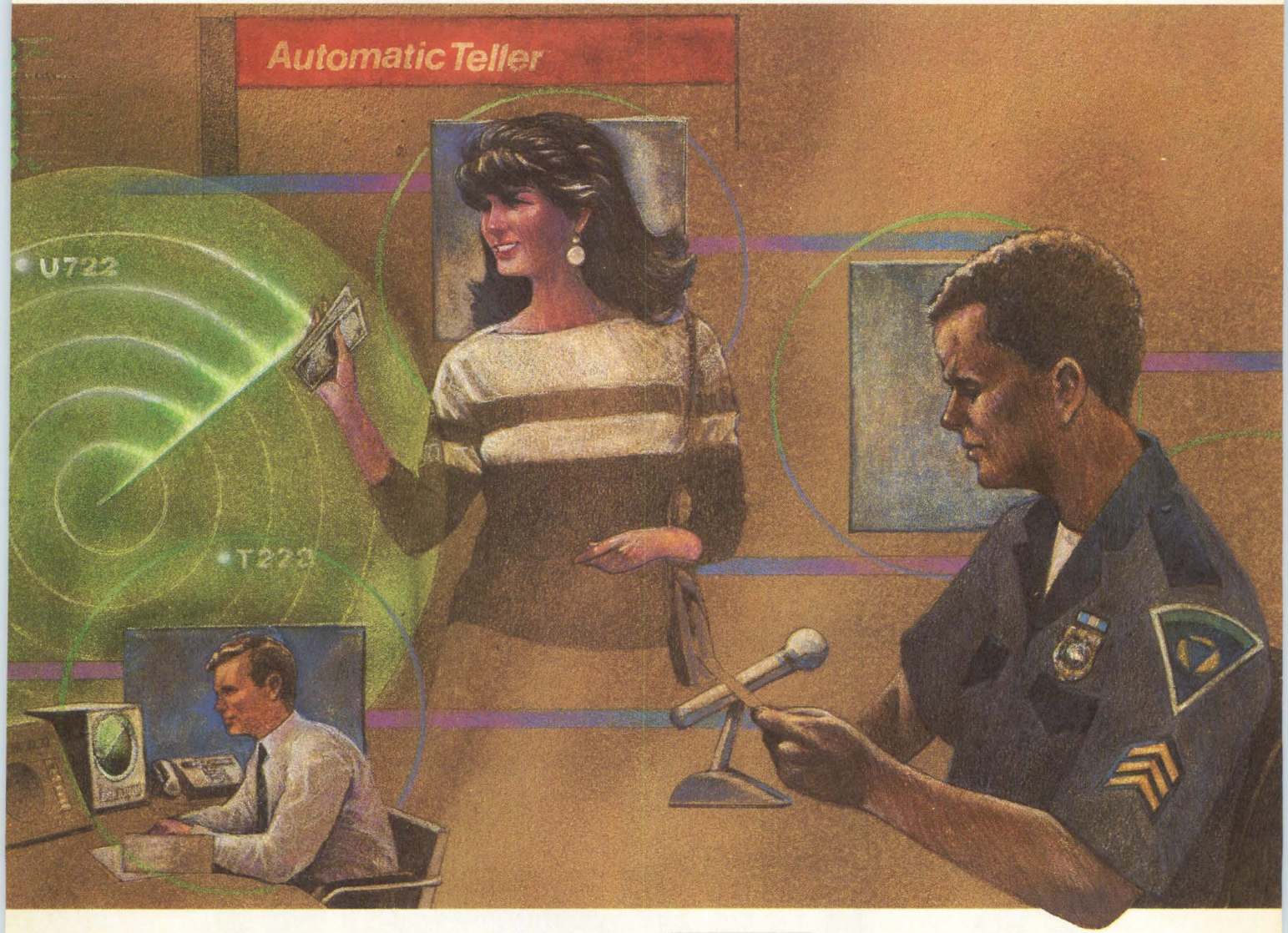
and inherent reliability, but offers you a modular approach to system expandability that protects your hardware and software investments as your application grows.

And the real-time story doesn't stop there. To ensure that your system lives up to your expectations, there's a broad range of flexible service and support programs, consulting services, configuration management and an immediate response Technical Assistance Center.

Today's fast paced competitive atmosphere requires high speed solutions from a company that understands the realities of real-time computing.

Don't wait.

Call 1-800-631-2154
or write to us at:
Concurrent Computer Corporation
106 Apple Street
Tinton Falls, NJ 07724



Concurrent
Computer Corporation

CIRCLE NO. 3 ON INQUIRY CARD

MOVE UP TO A NEW LINE

FROM HOUSTON INSTRUMENT

Prepare to be impressed. Meet the new line of high-performance plotters from Houston Instrument.™ HI's sleek new DMP-60 series is designed to impress even the most demanding CAD professional.

Discover unprecedented flexibility—blended with ultra-fine resolution, speed, and software compatibility. Benefit from HI's rigorous standards for quality, reliability, and service. All at prices starting from $4,695.*

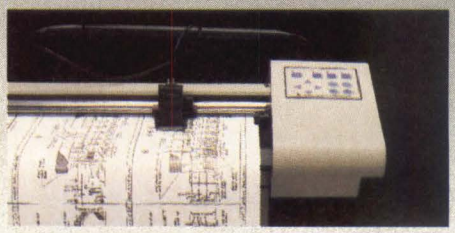
Watch the DMP-60 series double as a scanner with HI's unique SCAN-CAD™ option. Quickly produce multicolored drawings when you use the Multi-Pen adaptor. Plot several originals—without tying up your PC when you add HI's buffer expansion board.

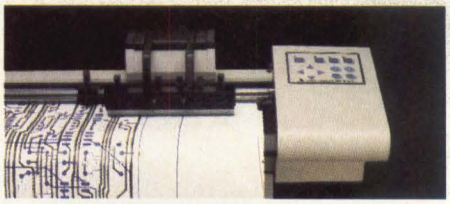
Select media as small as 8½″×11″ or as large as 36″×48″. Load either DM/PL™ or HP-GL 758X-compatible software. Then watch as your plotter quickly produces a drawing polished to a precise resolution of 5 ten-thousandths of an inch. Smile when you see smoothly formed circles, curves, and lettering.

Explore HI's host of support programs including an overnight plotter-replacement service. And then relax, knowing that HI's new plotters rest on 27 years of engineering excellence.

Move up. To a fine, new line. From Houston Instrument. Begin by calling 1-800-444-3425 or 512-835-0900 or writing Houston Instrument, 8500 Cameron Road, Austin, TX 78753.

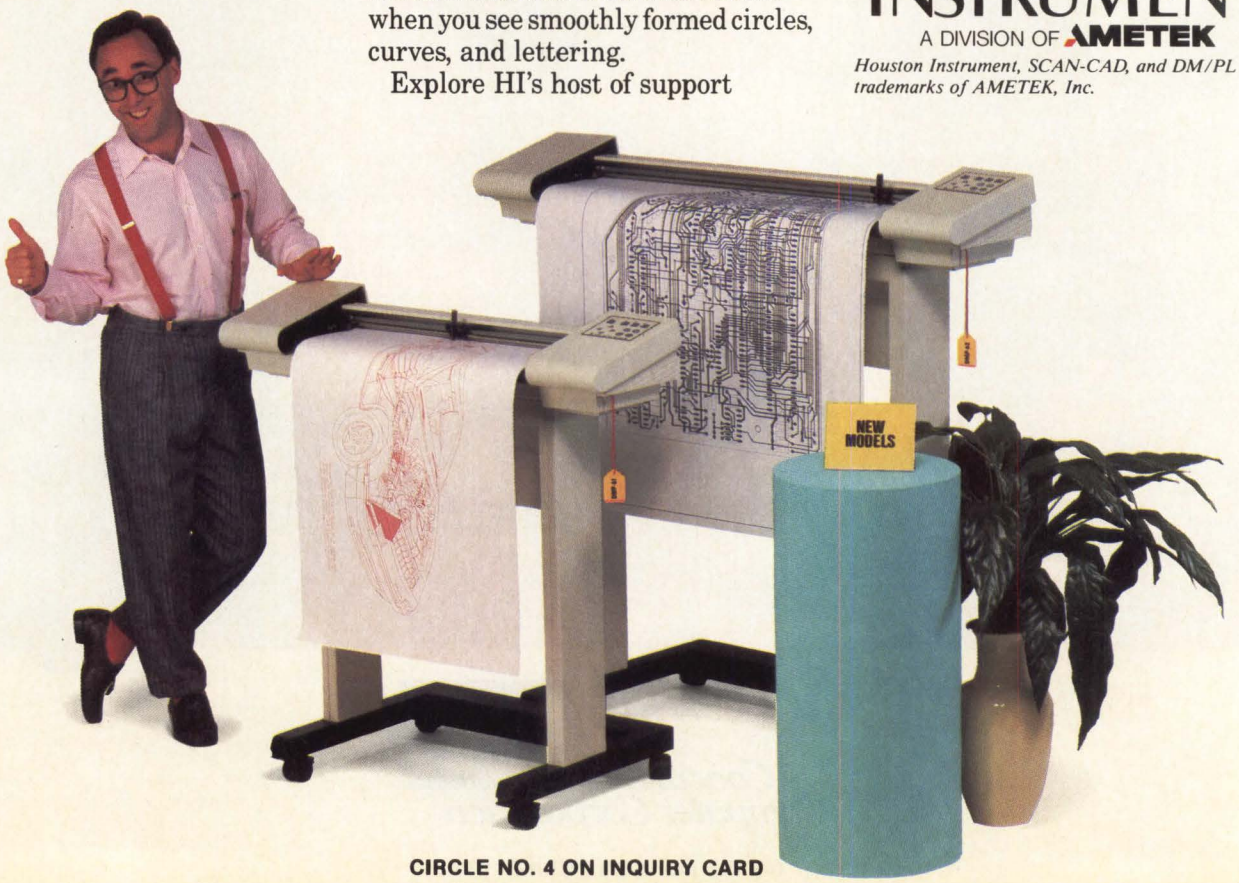
**U.S. suggested retail price.*





HOUSTON INSTRUMENT
A DIVISION OF AMETEK

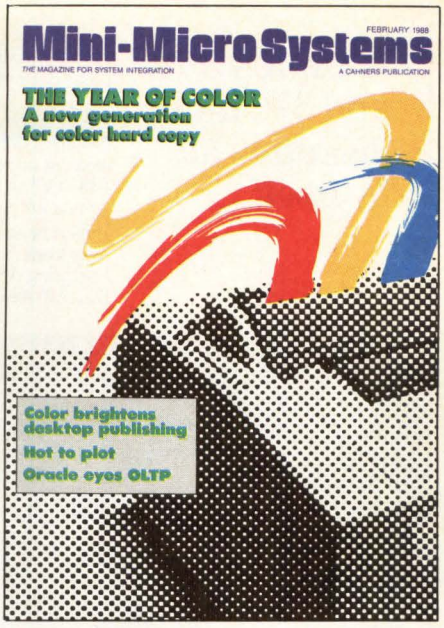
Houston Instrument, SCAN-CAD, and DM/PL are trademarks of AMETEK, Inc.



CIRCLE NO. 4 ON INQUIRY CARD

Mini-Micro Systems®

A CAHNERS PUBLICATION VOL. XXI NO. 2 FEBRUARY 1988



p. 30. . .Color picture brightens. Art direction and design by Mary Anne Ganley.

INTERPRETER

Oracle extends DBMS reach into on-line processing 15
TPSS option initially targets DEC and UNIX systems

Freeform DBMS the "object" of startup company's affection 16
Two-part system at ease with disparate data

Graphics tool kit: a cart before a minisuper horse 22
Software developers will pave way for 3-D computer

DG walks on the VAR side to regain lost momentum 25
For DG, success is spelled with three letters: VAR

X Window standard wins support, not products 29
Developers slow to write for new interface

FEATURES

Setting the table for color 32
User demand for, and technology developments in, color hard copy create new opportunities

Color brightens desktop publishing 43
What's expensive and slow, but saves money and time? For some applications, the answer might be PostScript-based color desktop publishing.

Smart plotters get faster 51
With local intelligence, pen plotters overcome the slow mechanical limitations of motors, pens and moving parts.

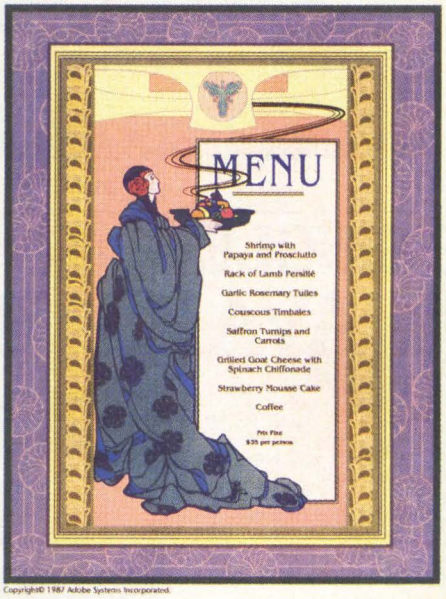
Ion depostion comes of age 59
VARs, OEMs and system integrators take note: Improved reliability and attractive prices are getting the attention of end users

TECHNOLOGY FORUM

Telcor on compression . . . How to quadruple dial-up communications efficiency 77
by **Francis Bacon,** Telcor Systems Corp.

DEPARTMENTS

Editorial Staff 6
Breakpoints 9
New Products 83
Index to Advertisers 86
Mini-Micro Marketplace 87



p. 43. . .A brighter day for desktop publishing.

KEEPING AMERICA COMPETITIVE

p. 25. . .Profiling Data General.

Cahners Publishing Company, A Division of Reed Publishing USA | Specialized Business and Consumer Magazines for Building & Construction | Foodservice & Lodging | Electronics & Computers | Interior Design | Book Publishing & Libraries | Printing | Medical/Health Care | Manufacturing | Industrial/Research Technology | Child Care & Development.
MINI-MICRO SYSTEMS® (ISSN 0364-9342) is published monthly by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington Street, Newton, MA 02158-1630. Terrence M. McDermott, President; Frank Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Circulation records are maintained at Cahners Publishing Company, 44 Cook Street, Denver, CO 80206-5191. Telephone: (303)388-4511. Second-class postage paid at Denver, CO 80206-5191 and additional mailing offices. POSTMASTER: Send address corrections to MINI-MICRO SYSTEMS® at the Denver address.

MINI-MICRO SYSTEMS® copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President/C.E.O.; Robert L. Krakoff, Executive Vice President; William M. Platt, Senior Vice President.

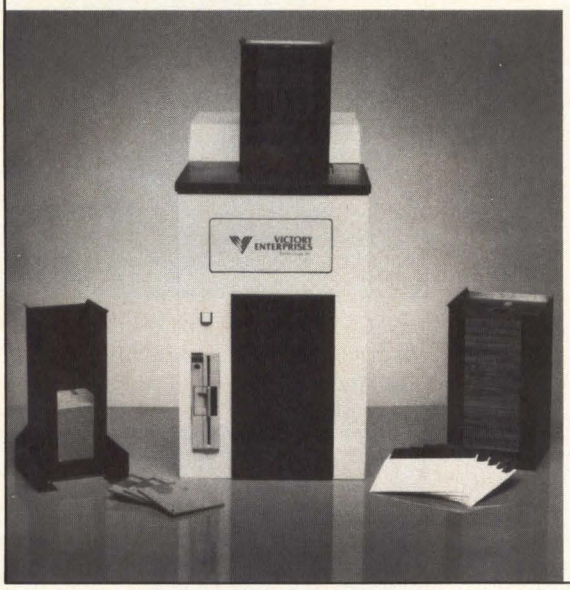
Annual subscription rates for non-qualified people: USA, $65 per year; Canada/Mexico, $80; other countries, $105 per year for surface mail. Single copies of issues are $10. Please address all subscription mail to Sherri Gronli, 44 Cook Street, Denver, CO 80206-5191.

© 1988 by Cahners Publishing Company, Division of Reed Publishing USA. All rights reserved.

It copies 5¼ and 3½ inch diskettes all by itself.

Just load your diskettes, press one button, and walk away. The Victory Autoloader automatically copies diskettes operating standalone or attached to an IBM/PC* or Mountain® compatible system.

Bulk cannisters allow fast, easy loading and unloading. Switching drives takes less than five minutes.



Copy Different Formats, Flawlessly.
Our Auto-Format-Analysis™ feature lets you copy different formats, including PS/2*. The system tests for quality and accuracy, sorting disks into one of two output cannisters.

***No* User-Required Adjustments.**
The Autoloader's self-calibration and simple diagnostics for checking drive alignment allow you to maintain the system without outside service.

Call 1-800-421-0103.
And ask about the Victory family of affordable duplication systems—with serialization, copy protection and custom label printing.

VICTORY ENTERPRISES
Technology, Inc.

8910 Research Blvd., B2
Austin, Texas 78758
512-450-0801

In Europe call BFI: Paris (33-1) 45330137, Frankfurt (49-6074) 27051, London (44-1) 941-4066, Milan (39-2) 316716.

*IBM PC and PS/2 are trademarks of International Business Machines Corporation. Mountain is a registered trademark of Mountain Computer, Inc.

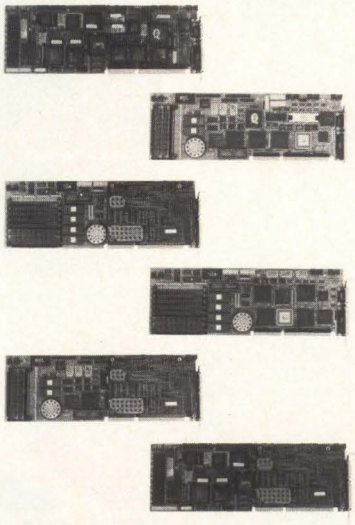
CIRCLE NO. 5 ON INQUIRY CARD

SINGLE-SLOT /AT SOLUTIONS AVAILABLE NOW!

CAT902
10 MHz, 1 wait: Up to 1 meg RAM. 128K PROM: Dual floppy controller: SCSI hard disk interface: 1 parallel and 2 serial ports: EGA and 80287 optional: Keyboard port, speaker, reset / key lock / turbo ports

CAT910
CAT900 Features plus: EGA extended resolution (1280 x 800): CGA and monochrome modes: 1280 x 800, 640 x 480, 640 x 350, and 640 x 200 resolutions

CAT911
CAT 901 Features plus: EGA extended resolution (1280 x 800): CGA and monochrome modes: 1280 x 800, 640 x 480, 640 x 350, 640 x 200 resolutions



CAT901
12 MHz, 0 Wait: Dynamic clock speed change: Up to 4 meg RAM. 64K PROM: PROM set-up routines: Dual floppy controller: ST506 hard disk interface: 1 parallel and 2 serial ports: EGA and 80287 optional: Keyboard port, speaker, reset / keylock / turbo ports

CAT900
12 MHz, 0 wait: Up to 8 meg RAM. 64K PROM: 1 parallel and 2 serial ports: EGA and 80287 optional: Keyboard port, speaker, reset, keylock, turbo port

CAT912
CAT902 features plus: EGA extended resolution (1280 x 800): CGA and monochrome modes: 1280 x 800, 640 x 480, 640 x 350, and 640 x 200 resolutions

QUANTITY CUSTOM DERIVATIVES AVAILABLE

PACKAGING SUPPORT

• Backplanes • Card Cages • Fans • Plug-In Power Supplies • Low Profile Enclosure • Small Footprint Enclosure • Industrial Chassis • Rack Mount Chassis Design

Diversified Technology

CALL 1-800-443-2667
IN MS 601-856-4121
P.O. BOX 748 • Ridgeland, MS 39158

CIRCLE NO. 6 ON INQUIRY CARD

STAFF

Vice President/Publisher
Donald Fagan

Chief Editor
George V. Kotelly

Managing Editor
James F. Donohue

Senior Editor: **David Simpson**
Irvine, (714) 851-9422
Senior Editor: **Mike Seither**
San Jose, (408) 296-0868

Senior Editor: **Doug Pryor**
Senior Editor: **Tim Scannell**
Senior Editor: **Joseph P. Lerro Jr.**
Senior Editor: **Dennis Livingston**

Associate Editor/Research: **Frances Michalski**
Staff Editor/New Products: **Megan Nields**
Editorial Assistant: **Petina Doddy**

Contributing Editors

Andrew Allison
Mini/Micro Computer
Product and Market Consultant
Raymond C. Freeman Jr.
Freeman Associates
Charles LeCompte
Datek Information Services
(617) 893-9130
Special Features Editor: **Wendy Rauch-Hindin**
Dix Hills, N.Y.
(516) 667-7278
Gene R. Talsky
Professional Marketing Management Inc.
Edward Teja
Freehold Corp.

Editorial Production

Chief Production Editor: **Arsene C. Davignon**
Staff Editor/Production: **Mary Anne Weeks**

Editorial Services

Terri Gellegos

Assistant to the Publisher: **Sharon M. O'Connell**

Art Staff

Senior Art Director: **Mary Anne Ganley**
Assistant Art Director: **William B. Reilly**
Artist: **Amy Finger**

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

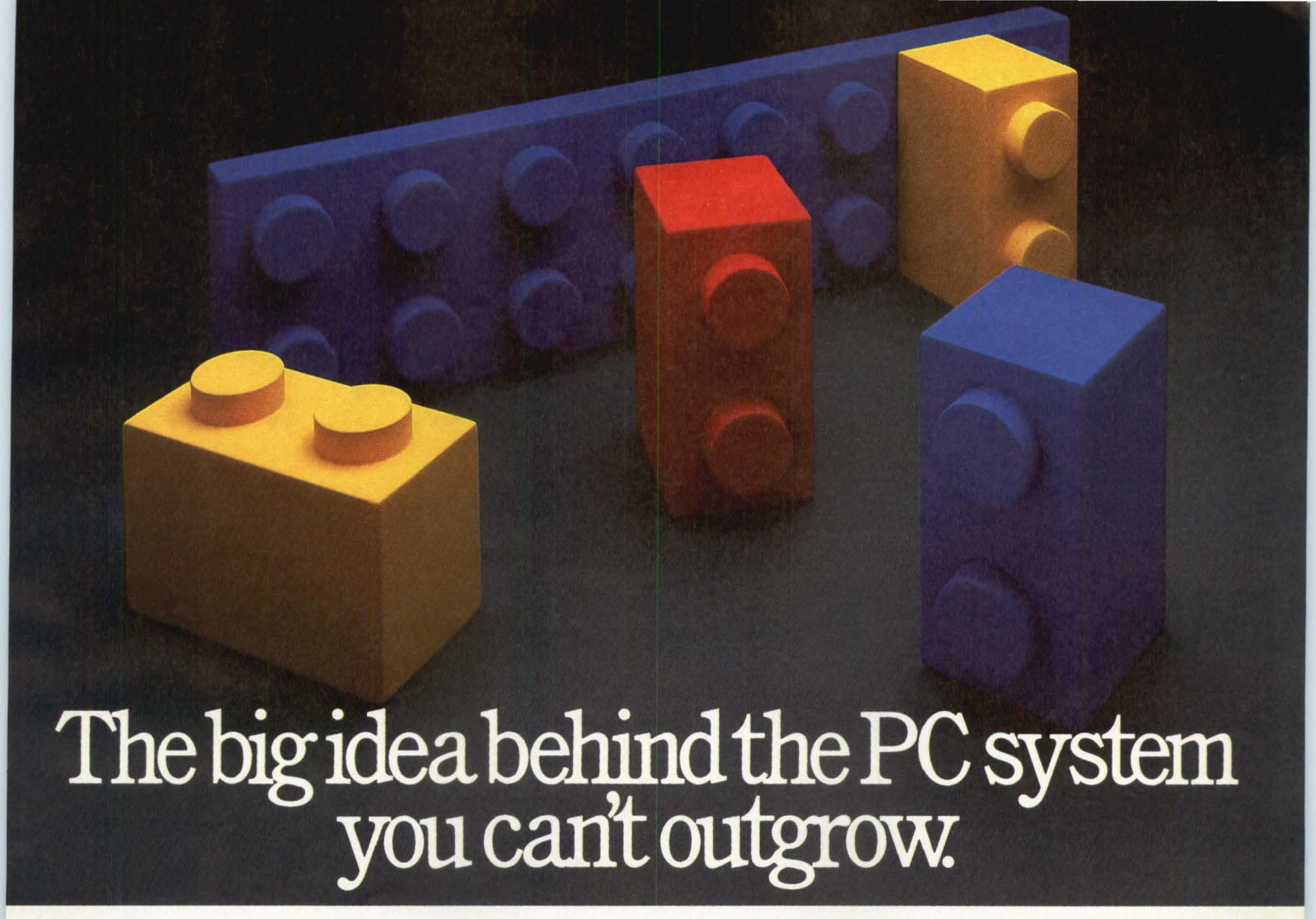
Production Staff

VP Production: **Wayne Hulitzky**
Director/Production: **John Sanders**
Supervisor: **William Tomaselli**
Production Manager: **Joshua Levin-Epstein**
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.



The big idea behind the PC system you can't outgrow.

We call it Modular Systems Architecture™: a building block approach that protects your PC investment against obsolescence. It makes upgrading Wyse PCs a snap—literally. Because we've put all computing functions, even the CPU and its microprocessor, on plug-in boards. So as your needs grow, you can easily upgrade our 8 MHz AT compatible to a 12.5 MHz high performance 286, or even a 16 MHz 386. When more powerful microprocessors are available, you'll even be able to upgrade our top-of-the-line 16MHz WYSEpc 386.

The WYSEpc 386: exceptional memory speed plus processing speed make it one of the most powerful PCs made.

Introducing SystemWyse.™ Wyse PCs are themselves building blocks in a comprehensive system for creating solutions. They link effortlessly with our terminals, monitors, and expansion boards in integrated solutions of exceptional quality and value, using industry standard software. And SystemWyse is backed by the company that sells more terminals than anyone but IBM.

It's this easy to upgrade the CPU and boost the power of a SystemWyse PC.

The big idea, above all, is to adapt more readily to change than any other PC system. Because survival belongs not merely to the fittest, but to those who remain fittest, longest.

Call for more information. **1-800-GET-WYSE**

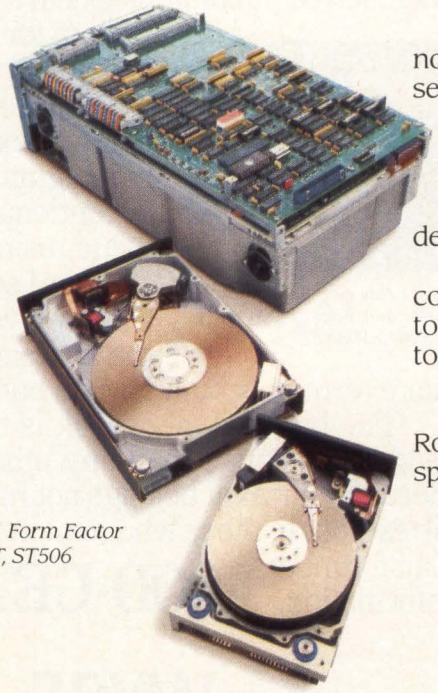
WYSE

We make it better, or we just don't make it.

WYSE® is a registered trademark of Wyse Technology. SystemWyse, WYSEpc 386, and Modular Systems Architecture are trademarks of Wyse Technology. IBM is a trademark of International Business Machines. Screen: Boeing Graph.

CIRCLE NO. 7 ON INQUIRY CARD

WHO DRIVES THE BIG BOYS TO WORK?



8000 Series* *8" Form Factor*
740MB, SMDE

5000 Series* *5¼" Half-Height*
90-180MB,
SCSI, ESDI, ST506

3000 Series* *3½" Form Factor*
55-130MB, SCSI, AT, ST506

Rodime. The driving force behind the leaders. And it's no wonder. Rodime has been giving driving lessons and setting the pace year after year.

With the first 3.5" disk drive.

With the first 3.5" with an embedded SCSI controller.

With the first 90 and 180 megabyte 5.25" half heights.

With a high performance 8" SMDE drive for demanding storage needs.

No line of drives is more reliably engineered and more complete than Rodime. That's why the big boys take them to work for every driving need. You can take them to work too. And you don't have to wait.

Because Rodime is shipping right now.

So if you want to drive like the best, get the best. Rodime drives. The largest capacities and the fastest speeds.

The real drive behind the leaders.

RODIME

Moving towards the speed of mind.

Rodime, Inc.
29525 Chagrin Blvd., Pepper Pike, Oh 44122, 216-765-8414
Rodime PLC,
Nasmyth Road, Southfield Industrial Estates, Glenrothes KY6 2SD, Fife, Scotland

*All drive capacities are unformatted.

CIRCLE NO. 8 ON INQUIRY CARD

BREAKPOINTS

APPLE FINALLY GETS ITS UNIX ACT TOGETHER—ALL ON A DISK

Apple Computer Inc., Cupertino, Calif., chose the Uniforum show in Dallas this month to introduce A/UX, its version of AT&T Co.'s UNIX System V.2 operating system. A/UX is designed for Apple's high-end Macintosh II and comes preconfigured on either an internal ($4,879) or an external ($5,549) 80M-byte rigid-disk drive upgrade package for current users. Apple is also selling A/UX bundled with Mac II or development systems. A/UX contains the Berkeley UNIX extensions, Network File System, Streams and the Macintosh Toolbox, plus functions for automatic booting and recovery. That leaves users with 10M bytes of free disk space. By preconfiguring the disk, Apple hopes to spare users from hiring UNIX gurus.—*Mike Seither*

CONFUSION SERVED UP IN THE SQL DATABASE RACE

Everyone knows when Ashton-Tate's SQL Server database environment will be available, but from whom is another story. The relational database software, which is designed to run across a local area network, was developed by three companies: Ashton-Tate, Microsoft Corp. and Sybase Inc. It will also be marketed by the three companies, with Ashton-Tate holding up the retail end and Microsoft and Sybase selling to OEM hardware manufacturers. This may cause some confusion as software developers seek to write programs to run with SQL Server's open architecture. From a user's standpoint, it may also cause problems when something goes bump in the LAN and fingers start to point as to which vendor to blame. Shipments start the second half of this year in an effort to beat IBM Corp. and the database facilities of its OS/2 Extended Edition to the punch. The price: from $1,500 to $3,000 per license.—*Tim Scannell*

ENTERPRISE CHARTS COURSE FOR OPEN SYSTEMS INTEGRATION

Captain's log, star date 1988. Forming a consortium called ENTERPRISE, the following organizations have banded together to bolster multivendor computer integration based on open systems networking: Alcoa, Boeing, the British Department of Trade & Industry, the Corporation for Open Systems, Deere & Co., the European Commission, General Motors Corp., TRW and the U.S. Air Force. The ENTERPRISE Networking Event '88 International will be held at the Baltimore Convention Center June 6-8. The group will collectively manufacture a product, with all networking based on open systems: the Manufacturing Automation Protocol (MAP), Technical and Office Protocol (TOP) and various standards promoted by the Corporation for Open Systems.—*Dave Simpson*

ADAPTEC, C&T TEAM UP FOR PS/2 CLONES

Missionary teams from Chips & Technologies Inc. and Adaptec Inc. are on the road to spread this gospel to OEMs: The pieces are in place for OEMs to begin building clones of IBM Corp.'s PS/2 models 50, 60 and 80. Adaptec, Milpitas, Calif., says it has controllers for rigid disk drives, plus a host bus adapter that will connect SCSI disks to IBM's Micro Channel. San Jose-based C&T says it has chips for a lookalike Micro Channel for models 50 and 60, plus silicon that mimics IBM's Video Graphics Array (VGA) for standard monitors as well as flat-panel screens. Silicon to clone PS/2 Model 80 is slated to be out in the third quarter, according to C&T. The upshot: Look for the first PS/2 clones by mid-1988.—*Mike Seither*

ADOBE SHAKES HANDS WITH FUJITSU

Adobe Systems Inc., Mountain View, Calif., announced the signing of a contract with Fujitsu Ltd. of Japan. Under the terms of the agreement, Fujitsu will license Adobe's PostScript interpreter for both Japanese and Western languages. Dr. John Warnock, president and CEO of Adobe, says, "We have attempted in the Japanese version of the PostScript interpreter to provide a high degree of flexibility in the way non-roman alphabets are handled." Major computer, printer and typesetter manufacturers who have announced PostScript interpreter licensing agreements with Adobe include Agfa-Gavaert, Apollo Computer, Apple Computer, AST Research, Dataproducts, Diconix, Digital Equipment, IBM, Linotype Co., NBI, NEC Information Systems, NexT, QMS, Quadram, Qume, Texas Instruments, Varityper and Wang Laboratories.—*Joseph P. Lerro Jr.*

DEC TARGETS IBM WITH FASTEST IMPACT PRINTER

The LP29, the highest speed impact printer ever offered by Digital Equipment Corp., Maynard, Mass., targets the financial and transaction processing markets where IBM Corp. is king. The 2,000-lpm band printer ($38,500) competes with IBM's popular 2,000-lpm 4245. Previously, the 1,200-lpm LP27 was the top of DEC's impact line. The printer is compatible with DEC's mid- to high-end VAX 8000 series and with its MicroVAX 3500 and 3600 products. The printer has a 64-character band and a double-buffering interface to assure performance at full capacity.—*Charles LeCompte*

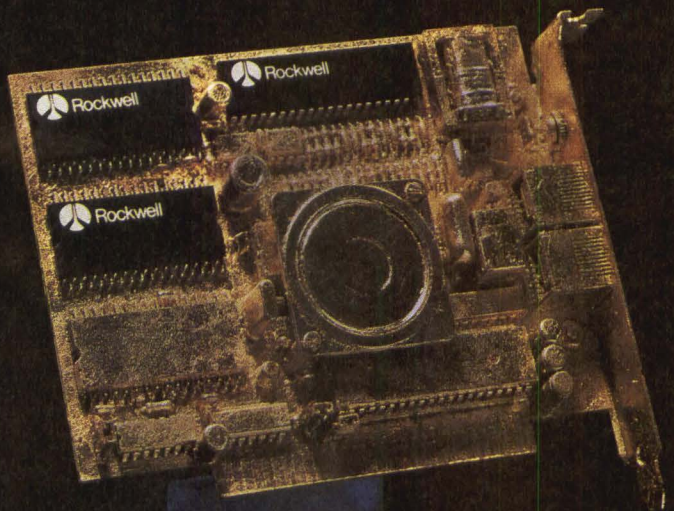
MEGAGRAPHICS BOOSTS MAC GRAPHICS

Megagraphics Inc., Canoga Park, Calif., this month begins shipping two products that boost the graphics capabilities of Apple Computer Inc. Macintoshes: the MegaShot video frame grabber and the MegaScreen 2008 Color Video System. MegaShot allows users to capture images from a video camera or VCR for on-screen manipulation in 256 levels of gray. The MegaScreen 2008 includes a Nu-Bus card that pumps resolution up to 1,024 by 896 and allows users to switch beween 1-, 2-, 4- or 8-bit modes. As many as 256 colors from a palette of 16.8 million can be displayed in 8-bit mode. The MegaScreen 2008 with a 19-inch color monitor costs $4,995; pricing for the MegaShot has not been established.—*Dave Simpson*

COUNTERPOINT ROUNDS OUT UNIX-BASED MULTIUSER LINE

The $7,000 two-user Intel Corp. 80386-based System 15, which comes with a 100M-byte disk drive and 2M bytes of RAM, is now the low-end of Counterpoint Computer Inc.'s UNIX multiuser systems. The San Jose company introduced this computer, along with the 17-user System 22 ($29,900) and the 64-user System 22E ($86,825), at Uniforum in Dallas this month. System 22 and 22E use the 25-MHz Motorola Inc. M68020 processor and include Ethernet and SCSI ports, a 60M-byte tape drive and 180M-byte and 720M-byte Winchesters, respectively. Counterpoint, which merged with Taiwan-based Multitech Industrial Corp. in November, plans to market the systems to OEMs worldwide beginning in April.—*Mike Seither*

ROCKWELL 2400 bps MODEM TECHNOLOGY HAS CHAMPIONED A MILLION SUCCESSES.



Rockwell International's commitment to quality and service helps our customers get to market faster with reliable, cost-effective 2400 bps OEM modem products.

With over a million Rockwell-based V.22bis modems in use worldwide, our R2424 full-duplex 2400 bps modem has set the de facto standard for V.22bis dial-up performance and reliability.

The R2424's versatile design allows easy integration into a variety of products, and includes a standard microprocessor bus interface for terminals and box-modem applications, integral modems and PC cards. Like all of our standard OEM modems, the R2424 is backed by a 5-year warranty.

To learn how our solutions can help put you in the lead, talk to the leader in proven modem technology.

Semiconductor Products Division
Rockwell International, P.O. Box C,
M.S. 501-300, Newport Beach, CA 92658-8902
(800) 854-8099. In California, (800) 422-4230.
Or contact the Rockwell office nearest you:
Santa Clara, CA, USA (408) 980-1900
Marlton, NJ, USA (609) 596-0090
Tokyo, Japan 81-3-265-8808
Hounslow, England 44-1-577-2800

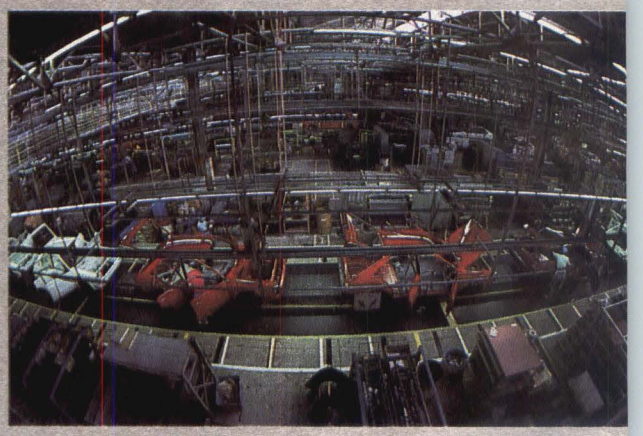
Rockwell International

...where science gets down to business

Aerospace / Electronics / Automotive
General Industries / A-B Industrial Automation

CIRCLE NO. 9 ON INQUIRY CARD

Digital has it now.



"As the world's largest privately-owned software company, Cincom develops software for Digital and IBM systems in national and international markets," states Stanley J. Sewall, vice president of R&D. "For the past four years, we've been designing all our business solutions on Digital equipment. Digital's total systems approach – the interactiveness of its hardware and software – gives us tremendous business leverage."

One significant advantage has been a dramatic drop in Cincom's software development costs. "Until we started using Digital," says Mr. Sewall, "the expense

"Computing systems so cost-effective, Cincom uses them to develop its software products – even those for the IBM market."

of developing each line of code had soared. As a conservative estimate, now we have cut our costs in half." Mr. Sewall is equally impressed with the time savings and productivity gains Cincom has made. "With Digital systems, our software development cycle is four times faster than before. As a result, we're beating our competitors to market with our products. And that's the kind of edge everyone can appreciate."

To find out how your company can gain a competitive advantage now, write to: Digital Equipment Corporation, 200 Baker Avenue, West Concord, Massachusetts 01742. Or call your local sales office.

digital™

© Digital Equipment Corporation 1987. The Digital logo is a trademark of Digital Equipment Corporation. Cincom is a registered trademark of Cincom Systems, Inc. IBM is a registered trademark of International Business Machines Corporation.

COLORSCAN®/2 Workstation

VAX access and PC applications. Hmmm!

One big idea in one small space.

The COLORSCAN/2 color graphics workstation "is an idea whose time has come," reported *Digital Review*. It fits two capabilities - VAX™ access and the ability to run PC applications - into one very small, low-profile enclosure with quiet, diskless operation.

It's a built-in plug-compatible VT™200 text/color graphics terminal for all your VMS™ and UNIX® information access. And it's a high-performance MS-DOS® personal computer for today's business applications. All in one sleek ergonomically-designed desktop workstation.

There's more, too. Parallel VT200 and MS-DOS operations. ReGIS™, Sixel, Tektronix™ and EGA plus-compatible color graphics (640 × 480 × 16 resolution). Built-in cut and paste. Full 132-column display.

In other words, "The COLORSCAN/2," according to Frank J. Derfler, Jr., editor of *PC Magazine*, "is an excellent solution to desktop clutter for any combination of PC, LAN-based and host-based applications."

To find out more, call Datamedia at 1-800-DMC-INFO.

Unretouched screen
10 × 15 × 2.5-inch base unit

DMC
DATAMEDIA CORPORATION
The Positive Response™

11 Trafalgar Square, Nashua, NH 03063

COLORSCAN is a registered trademark of Datamedia Corporation. VAX, VT, VMS and ReGIS are trademarks of Digital Equipment Corporation. UNIX is a registered trademark of AT&T Bell Laboratories. MS-DOS is a registered trademark of Microsoft Corporation. Tektronix is a trademark of Tektronix, Inc.

CIRCLE NO. 10 ON INQUIRY CARD

TRANSACTION PROCESSING SOFTWARE

Oracle extends DBMS reach into on-line processing

Mike Seither, Senior Editor

In the world of relational database management systems, Oracle Corp. clearly reigns as one of the superpowers.

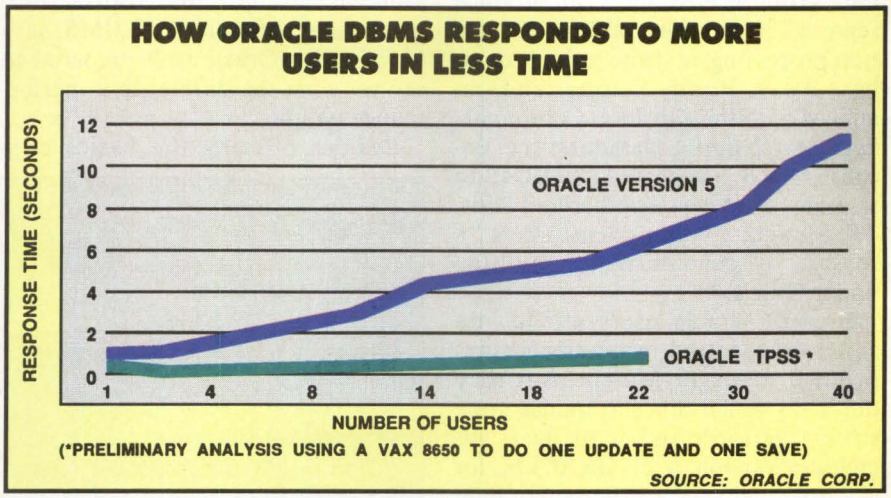
Since its founding some 10 years ago, the Belmont, Calif., company has quickly taken ground by marketing a relational database management system that is portable over a wide range of hardware platforms. These range from IBM Corp. mainframes and Digital Equipment Corp. minicomputers to a number of UNIX-based systems and personal computers. In the past five years sales have climbed from $5 million to more than $130 million.

Oracle's recipe for success has been decision support—letting big corporate users get to and manipulate information from a single, or distributed, database. Rather than sit back and enjoy the ride on top, however, the software company is gearing up for changes. These include plans to combine the power of its decision support software with the flexibility of on-line transaction processing.

The result: In March, Oracle will begin beta tests of its latest DBMS product, ORACLE Version 6.0, that includes the Transaction Processing Subsystem (TPSS) option. Oracle will release TPSS this summer for DEC minicomputers and for UNIX computers like those made by Sun Microsystems Inc. and Sequent Computer Systems. By the third quarter, Oracle expects TPSS to be ready for large IBM systems.

Bet on the buffer

TPSS culminates more than a two-year effort involving a rewrite of about half the ORACLE code, according to Oracle product manager David Martin. The system is built around a large memory buffer to increase throughput and a "redo log" to ensure the integrity of database information.



The idea behind the memory buffer is to cut down on disk I/O, the bottleneck of any transaction processing system. Under TPSS, chunks of the database are read into memory. An algorithm keeps the most recently used data inside memory, while older, less frequently used information moves back out to disk. Users processing transactions work on data in memory and make changes there, not on disk. Then, entire database pages are read back to disk at once. "In effect," says Martin, "TPSS piggybacks multiple transactions into a single [disk] write."

Peter Burris, a systems software analyst with International Data Corp., Framingham, Mass., says this piggybacking scheme is unique and should differentiate Oracle from other relational database vendors.

Meanwhile, changes made to database records in memory simultaneously go to a "redo log" on tape. The redo log is the cornerstone of TPSS and provides what Oracle calls "real-time back up" that runs as a continual background process. That is, any change made to a database record is mirrored on tape. Should a disk fail, or even the processor, the latest change is still available on tape.

Under TPSS, users can configure the redo logs to whatever size they want. For example, small logs might be necessary for applications requiring a quick recovery after failure. On the other hand, users who don't want to mount tape all the time might go for longer logs.

A move to new markets

Oracle hopes TPSS will allow it to move into a number of markets that require on-line transaction processing. These include Wall Street brokerages, mail-order houses, credit-reporting services and banks. Oracle also hopes to woo manufacturers who are eyeing cost-saving techniques such as just-in-time inventory control.

Although a final price list is not yet available, the TPSS option will cost

TRANSACTION PROCESSING SOFTWARE

25 to 30 percent more than the current ORACLE DBMS. For example, ORACLE Version 5.0 for a VAX 8978 now costs about $144,000. ORACLE Version 6.0 with TPSS will be priced around $200,000 for the same VAX machine.

Some industry observers believe Oracle may be on to a good thing with TPSS. "If they come through with their promise, customers can produce reports . . . and have on-line transaction processing, all from a single database," says Randy Southerland, an analyst with the San Jose, Calif., market research outfit, Dataquest Inc. Because Oracle has ported its DBMS to so many machines, Southerland adds, TPSS might give those customers "a reason to consolidate everything under Oracle."

Present Oracle users already do some transaction processing, says product manager Martin. But they don't do much since response time suffers as the number of users increases. Version 5 of ORACLE, for example, delivers a little better than two-second response time when eight users are on the system (see "How Oracle DBMS responds to more users in less time"). But response time increases to nearly 12 seconds when 40 users are on-line. Under benchmarks on a VAX 8650, TPSS delivered a one-second response time with 22 users on-line, and nearly instantaneous response with eight users. In fact, Oracle expects final versions for VAX systems to run a consistent 30 transactions per second (tps) for a large number of users.

When TPSS is ported to IBM mainframes, however, it is expected to really shine. In fact, it will probably outperform Big Blue's own hierarchical database and transaction-processing software, DB2/IMS, says Martin. But Oracle isn't prepared to say yet what the difference in performance will be.

Besides offering the basics of a transaction processing system, Oracle also plans to come out with procedural language (PL/SQL) that will allow the new TPSS software to do what Oracle is known for best—manipulate data. PL/SQL, which will be integrated with the TPSS library, is capable of grouping a number of SQL (structured query language) statements and executing them as a single statement, rather than doing each individually.

Database managers can build and store a library of such procedures that manipulate all manner of variables, including cursors and records. Pricing of PL/SQL was still pending at press time.

Oracle isn't the first relational database company to eye the on-line transaction processing market. Sybase Inc., Berkeley, Calif., got the ball rolling last year and has made some early inroads into the Wall Street brokerages. IDC's Burris says TPSS is Oracle's way of "protecting its flank from Sybase"while trying to push forward against IBM, the clear-cut leader in transaction processing.

Dataquest's Southerland agrees that Sybase got the jump on Oracle with transaction processing and that the start-up has been "attracting attention out of proportion to its size. But now that Oracle is in step, they could feed off each other." □

FACT FILE

ORACLE Version 6.0, with the Transaction Processing Subsystem.

Oracle Corp.
20 Davis St.
Belmont, Calif. 94002
(415) 598-8000
Circle 487

**Offers tenfold improvement over ORACLE version 5.0, either in the number of simultaneous users or in transaction throughput.
**On-line backup system ensures database integrity in case of disk or processor failure.
**Available for DEC and UNIX-based systems by mid-1988; for IBM systems in third quarter.

DATABASE MANAGEMENT

Freeform DBMS the 'object' of startup company's affection

Tim Scannell, Senior Editor

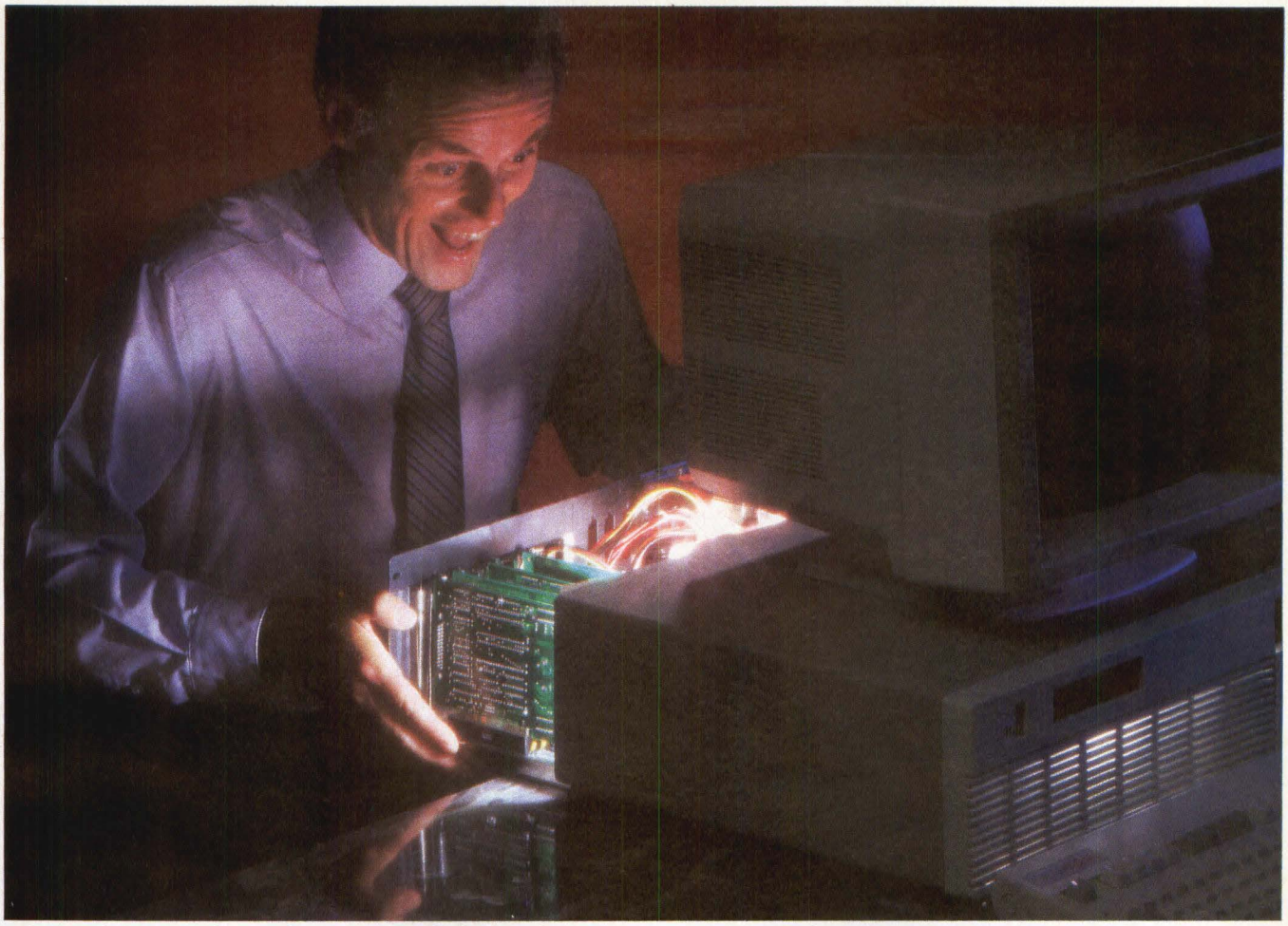
While software developers and others talk about object-oriented applications programs and environments, at least one company has taken the initiative to do something about it.

Last month, newcomer Servio Logic Corp., Beaverton, Ore., unveiled an object-oriented data management system based on Digital Equipment Corp.'s VAX minicomputer running the VMS operating system and compatible with IBM Corp.'s PCs and Sun Microsystems Inc.'s workstations.

Called GemStone, the information management system consists of two parts: first, an object-oriented manager that resides on the DEC VAX and maintains all of the system's programming commands and calls; second, a programming environment, called OPAL, which is based on a personal computer or workstation front-end.

Together, they form a system that accommodates all types of data, and stores and recalls the data in a variety of loosely structured formats.

GemStone targets scientific and data intensive applications where large amounts of often unlike data must be quickly handled and catalogued, says senior product manager Michael Connell.



LOOKING FOR HIGH PERFORMANCE? CHECK UNDER OUR HOOD.

Open up our new 386, and you'll see the difference. Every major component has our name on it. So you're getting the kind of quality and performance throughout that you'd be proud to put your name on.

For years, we've been designing and manufacturing high performance components for the most respected names in computing. Now, all the refinements we've achieved for other manufacturers are available under one hood, under our own name. Or yours.

Because we design and manufacture the engine right here, stateside, in our own 45,000 square foot facility, we don't have to compromise on quality or performance. That means you don't, either.

And because we do everything right here, ourselves, you always know exactly who to call for any kind of support you need. The people who will answer your call aren't "support" people. They're the people who designed and built your machine.

We offer a full line of 386 and 286 systems off the shelf, or configured to your private label specs. Pick up the phone right now, and check us out.

FORTRON

Outside California, call toll-free, 800-821-9771.

In California, (408) 432-1191.

2380 Qume Dr., Ste. F
San Jose, CA 95131

CIRCLE NO. 11 ON INQUIRY CARD

Ahh, yes indeed. The ADDS 2020, with its unique 70 Hz refresh display, is so remarkably flicker-free your operators won't get tired working with it.

You'll love our supporting cast of easy-to-read double high and double high/wide characters, viewed in a choice of 80 or 132 column format. All presented on a 14″ flat green, amber or white screen.

An outstanding performer.

But more than just great looks, the ADDS 2020 turns in a great performance, too. Our exclusive HelpNotes℠ feature lets you program assistance messages directly into the terminal. So you can actually use our hardware to simplify your software.

© 1987 W.C. Fields Productions, Inc., L.A., Calif.

The 2020 also gives you intelligent desk accessories like a clock, alarm, calendar and a calculator that can work directly with your current application.

See for yourself. Screen test our little flicker-free, the ADDS 2020. For more information, call **1-800-231-5445.** In New York, 516-231-5400. Ask for Displays Marketing.

ADDS
Applied Digital Data Systems Inc.
A Subsidiary of NCR Corporation
100 Marcus Blvd., Hauppauge, NY 11788.

CIRCLE NO. 12 ON INQUIRY CARD

Some initial beta test sites for the system include the National Oceanographic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA). But Connell says typical buyers will be volume end-users like Fortune 500 corporations, not the federal government. At least 20 percent of product shipments will be to OEMs, he adds.

Locks data in cells

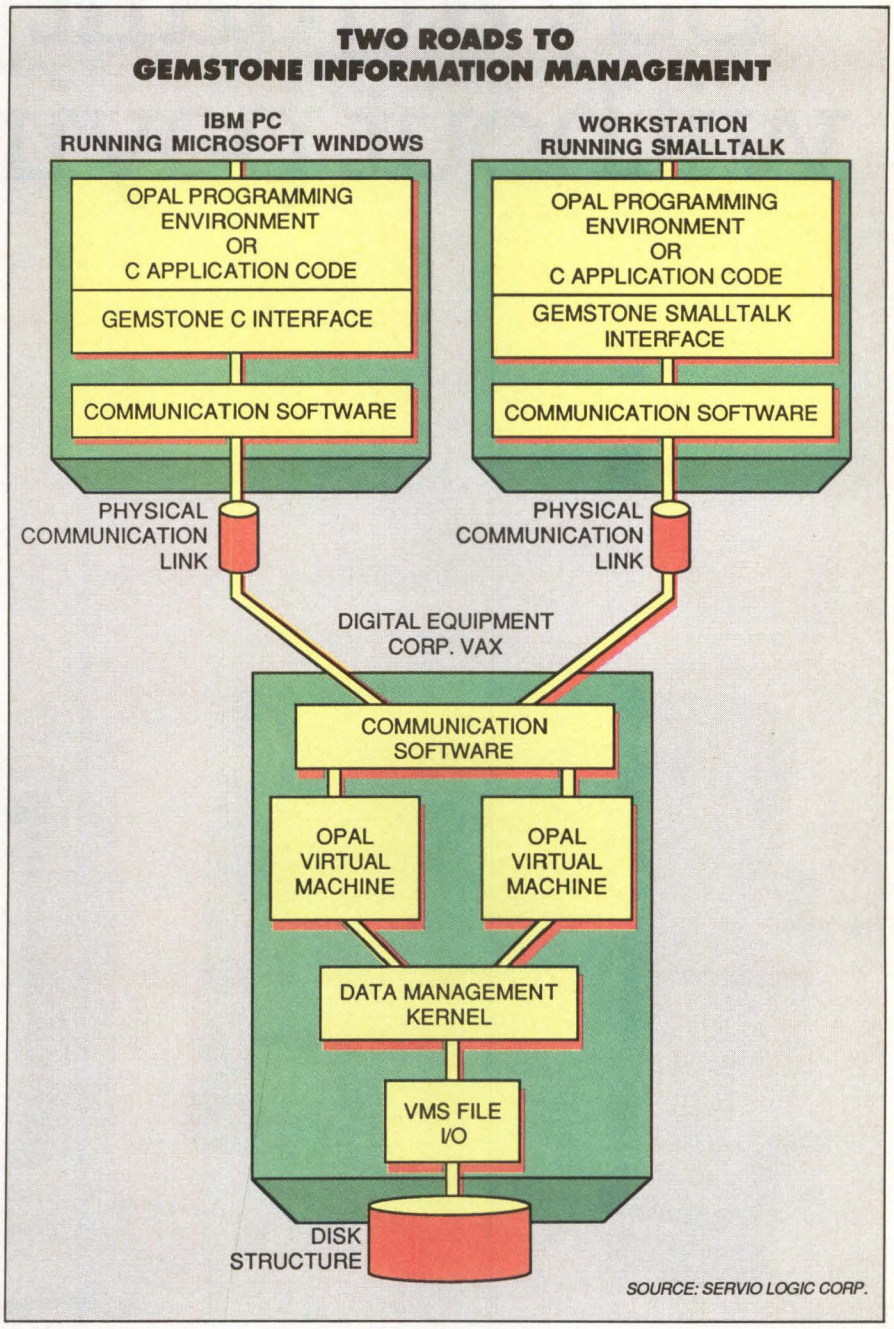
The major difference between GemStone—which is priced from $10,000 to $100,000 per license, depending on the application—and other data base management systems is the way it handles data. Traditional filing systems store data without reference to structure or behavior, while full-blown data management systems —even those with a relational capability—capture data according to a predefined structure.

In an object-oriented data management system, however, programming commands and data are stored separately in "data cells." These cells can be as small as a single byte, or as large as an extensive CAD/CAM drawing. A data cell can also comprise numerous small cells that exist independently within a larger cell.

A key benefit of data cell storing is that the data doesn't have to be stored according to a pre-defined format since each cell is a separate entity. To access data, the operators of the information management program—which are also contained in cells—point to a specific operand or data cell and basically ask it to perform a series of operations on itself.

The operators act like the conductor of an orchestra, who motions to each musician during a complicated symphony to perform a specific musical action. In the case of Servio Logic's data manager, the data-cell performers are not locked into marching to the same beat as the musicians in an orchestra, however.

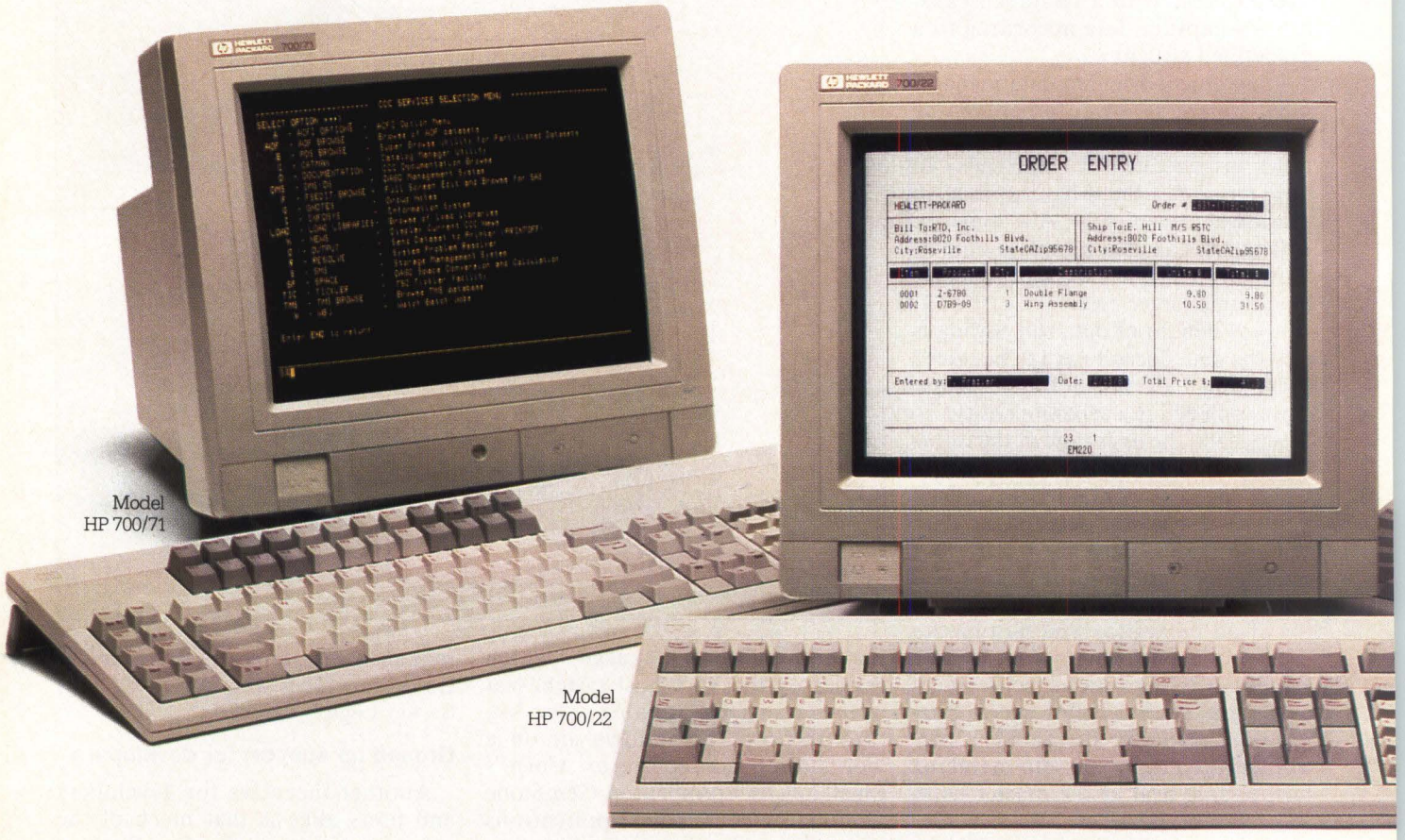
What does this mean to software developers? It means increased freedom, for one thing. Developers can build GemStone applications using either the OPAL data management and manipulation language—which resides on the VAX host system—or in the C language, running under Microsoft Corp.'s Windows, or on a workstation under Xerox Corp.'s SmallTalk environment. A GemStone C interface converts C applications code into a form compatible with OPAL, while a similar interface handles SmallTalk code. Links between the host minicomputer, an IBM PC or compatibles and workstations are managed via standard communications interfaces and software, says Servio Logic's Connell.



Ground up support for developers

Another incentive for developers and users alike is that much of the software developed for GemStone—such as development tools for vendors and applications utilities for users—is expected to turn up in the public domain. Servio Logic already

Buy a quality name without paying for it.



Model
HP 700/71

Model
HP 700/22

Terminals for your IBM, DEC or ASCII system.

© Hewlett-Packard Co. 1988 ISO2810

Now more is actually less. Because you can buy Hewlett-Packard quality terminals for your IBM, DEC or ASCII system for surprisingly modest prices.

In fact, you'll pay no more than you would for some of those general-purpose terminals that *don't* have the HP name.

And you get the design and engineering excellence evidenced by HP's top performance ratings in every Datapro terminals survey since 1982.

Which may be just what you'd expect from a top line of terminals.

But now you'll have a better bottom line as well.

For your IBM system: HP 700/71
3191 compatible with 3191 keyboard layouts; 14" diagonal display with easier-to-read characters; choice of green or amber screen colors.
$695*

For your DEC/ANSI system: HP 700/22
VT 220 compatible with VT220 keyboard layout; 4 pages of memory; choice of screen color, including soft-white; tilt/swivel.
$575*

For your ASCII system: HP 700/41
9 emulation modes; 14" diagonal display with easier-to-read characters; full-function keyboard; choice of green or amber screen colors.
$375*

Call 1 800 752-0900, Dept. 694F
or send in the coupon below.

*All prices U.S. list.

DEC VT220 product of Digital Equipment Corporation.

IBM 3191 Display Station product of International Business Machines Corp.

we never stop asking "What if...

HEWLETT PACKARD

Model
HP 700/41

For more information, check the HP terminal that's right for your system.

☐ HP 700/71 for your IBM system
☐ HP 700/22 for your DEC/ANSI system
☐ HP 700/41 for your ASCII system

Name

Company name Title

Street

City State Zip

MAIL TO: HEWLETT-PACKARD, Inquiries Manager, 19310 Pruneridge Ave., Dept. 694F, Cupertino, CA 95014.
Or call 1 800 752-0900, Dept. 694F.

MMS 2/88

CIRCLE NO. 13 ON INQUIRY CARD

DATABASE MANAGEMENT

has pulled together a GemStone user group to assist developers and users. Plans are to freely distribute public domain software to members of this group, and to offer support and service.

"We're not really selling into an object-oriented community," cautions Connell. "Initially, we will be much more concerned with education than promotion."

Selling an object-oriented data base —or any new type of data base for that matter—into what is considered a mature market may be Servio Logic's toughest challenge. Not only are developers and users unfamiliar with object-oriented environments at this point, but they also may hold off committing to one vendor before they hear the siren calls from other, more established, vendors. These include Microsoft and Lotus Development Corp., both of which are planning to enter the object-oriented world with a passion once IBM begins shipping the OS/2 operating system equipped with Microsoft's Presentation Manager software toward the end of this year.

Lotus has already announced a new object-oriented version of its 1-2-3 spreadsheet program called 1-2-3G, which will debut soon after the Presentation Manager hits the streets.

Inexperience a negative factor

Another factor working against Servio Logic is its background and relative inexperience in the computer software industry. The company presently has about 25 people on staff, most of them in research and development. It is also an offshoot of a Singapore-based company that has its roots in the agricultural business, not in the bits and bytes of the computer industry.

The one thing working in Servio Logic's favor is that it has a product. Others are still talking about what they might be doing sometime toward the beginning of next year. This situation is both a blessing and a curse. Being there first does establish a beachhead, but it also mandates commitment to a specific course to follow.

Fortunately, Servio Logic plans to adhere to established standards like DEC's DecNet and the federal government's Transaction Control Protocol/Interconnect Protocol (TCP/IP), and to continue developing the product as feedback flows in from its 13 or more beta test sites.

The company is flirting with expanding its information management system into other environments besides DEC's VAX VMS. For now, however, it is concerned with ironing out present problems and making a small splash in new applications waters.

"We're the first company started from scratch in this marketplace," says Connell. "We're not taking the world by storm, but we continue to grow strongly." □

GRAPHICS SYSTEMS

Graphics tool kit: a cart before a minisuper horse

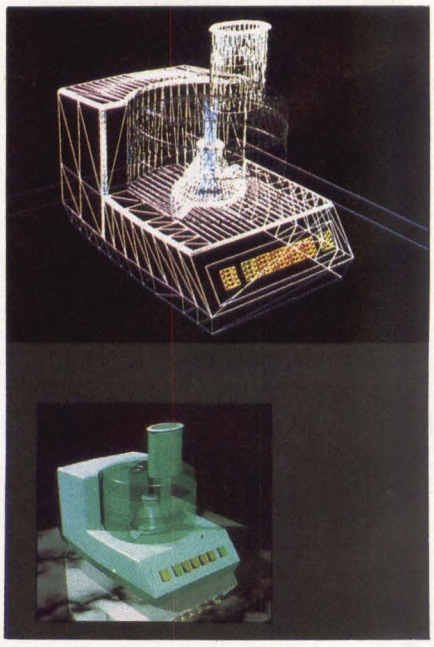
Mike Seither, Senior Editor

As microcomputers give way to supermicros, and minicomputers step aside for superminis and minisupers, software is having a difficult time keeping up.

So, in an effort to tip the scales a bit in its favor, a young Sunnyvale, Calif., company has unveiled a software tool kit that will make it easier for developers to create standardized programs for its soon-to-debut minisupercomputer. The tool kit might also smooth the entry of a 3-D graphics minisupercomputer system the company plans for later this year.

Ardent Computer Corp.'s (formerly Dana Computer Inc.) "visualization tool kit" will allow software developers to call on a library of high-level commands to do the dirty work of creating, rendering and highlighting complex objects like molecular models or moving fluids. This kit would be a boon to high-end 3-D graphics users like scientists and engineers.

The key to Ardent's tool kit is a graphics database called Doré, short for Dynamic Object-Rendering Environment. With it, developers will no longer have to write algorithms for such things as hidden surfaces or shading, says Bruce Borden, director of graphics software at Ardent. In-



Ardent's graphics software *tool kit allows users to specify the attributes of an object's image, such as wire frame, flat or smooth surfaces. Here, identical data is used to present two different views of a food processor, without recoding the application. The first (A), is a 2-D wire-frame view, while the second, (B) is a 3-D image with shading and enhanced features. When run in real time on the upcoming Titan minisupercomputer, the blades in B will be able to be depicted as spinning.*

CHINON: Scanning the future.

Chinon's design engineers have a serious commitment to produce the most technologically advanced products that the mind of man can imagine.

That commitment has created subsystems, peripherals and components that could change the way we think about computers–and change the way computers are used.

The Scanner and the CD-ROM units pictured here are the types of products that continually move the leading edge forward. The Scanner could change the way business works by making true OCR technology more affordable and easier to use than ever before. The unique scanning head design means that the document to be scanned remains fixed, unlike other scanners that can only accept a single sheet fed through the unit. It is also extremely compact and lightweight, and is designed to set new standards of cost-effectiveness.

CD-ROMS can provide users with access to databases that, only a few years ago, were possible only with a mainframe system.

Technology is still moving as fast as the best minds can advance it. At Chinon, our commitment to that progress keeps our products at the very forefront of the leading edge. We're bringing the future of computing to the needs of today.

CHINON

Chinon America, Inc., 6374 Arizona Circle
Los Angeles, CA 90045 (213) 216-7611 FAX: (213) 216-7646

CIRCLE NO. 14 ON INQUIRY CARD

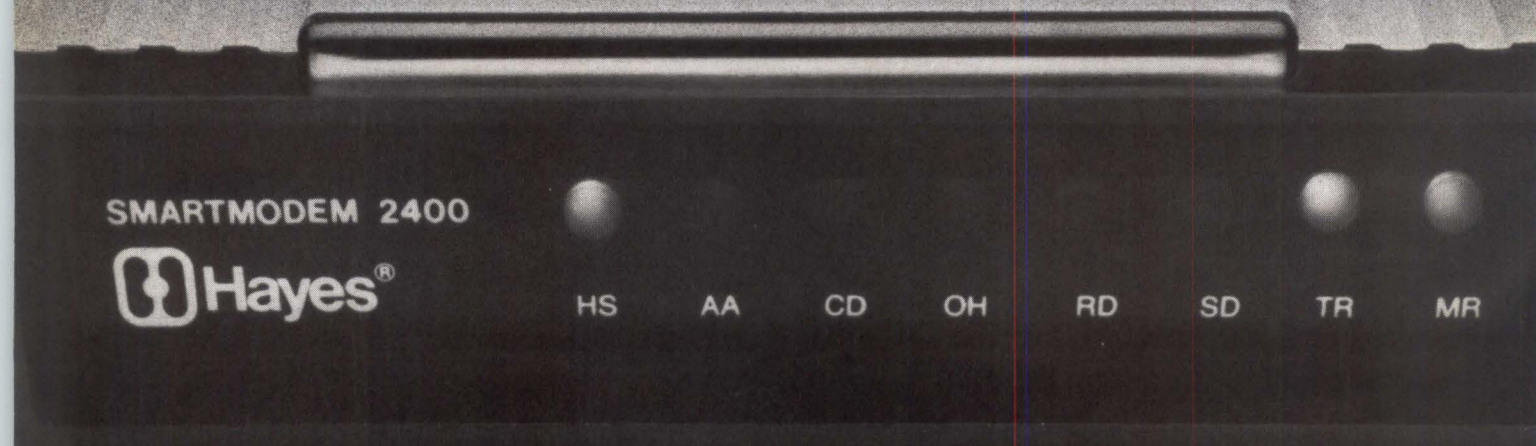
NOW YOU CAN HAVE THE MODEM YOU'VE ALWAYS WANTED AT A PRICE YOU NEVER DREAMED YOU COULD GET.

At Hayes we just found a way to make the best-selling PC modems in the world even better. We lowered their price. From now on our Smartmodem 2400,™ Smartmodem 2400B,™ Smartmodem 1200,™ Smartmodem 1200B,™ Smartmodem 1200C™ and our new Smartmodem 1200A™ will cost considerably less. Up to one-third less.*

So if you've always wanted a Hayes modem, external or internal, for an IBM® PC or compatible, IBM PC Convertible, Apple® Macintosh,** Apple II, or almost any other PC, now you don't have to settle for less. Just pay less.

Hayes®

CIRCLE NO. 15 ON INQUIRY CARD



© 1987 Hayes Microcomputer Products, Inc. P.O. Box 105203, Atlanta, GA 30348, 404-441-1617

*Based on estimated retail prices. **Requires external modem.

stead, they will be able to concentrate on what they do best—model, analyze and interpret scientific and engineering data.

Whether or not the kit will catch on, however, is still up in the air since success is riding on the as yet unannounced 3-D minisupercomputer, code-named "Titan." Titan reportedly uses a 64-bit proprietary processor capable of doing 16 million floating point operations (MFLOPS) a second. The system, about the size of a three-drawer file cabinet, also uses a number of reduced instruction set computer (RISC) chips running in parallel to do integer calculations. Initially, Ardent is expected to market a two-processor version for between $75,000 and $100,000. Company officials indicate a four-processor model is feasible.

Ardent has been working on Titan for more than two years since the company was founded in 1985 by ex-Convergent Technologies Inc. president Allen Michels. The chief architect is C. Gordon Bell, a 23-year engineering veteran of Digital Equipment Corp., who pioneered the idea of the minicomputer. However, Ardent isn't the only company interested in pushing single-user 3-D graphics systems. Arch-rival Stellar Computer Inc. of Newton, Mass., reportedly has a similar graphics-based supercomputer under wraps that it also intends to debut sometime this year.

Doing what they do best

In an effort to create steam for a new standard, the company intends to keep Doré "open" much like Sun Microsystems Inc. did with the Network File System (NFS) and AT&T Co. did with the UNIX operating system. In that way, Doré will be able to run on hardware platforms other than Ardent's. Ardent will license the Doré source code for $250 to universities and research laboratories. Commercial users will have to pay $15,000, plus additional support fees, to get the code and learn how it works. Binary copies will cost $200.

Doré actually builds on existing graphics interface standards. It implements the ANSI standard for 2-D graphics—Computer Graphics Interface (CGI)—by providing 2-D primitives like arcs, bars, circles and filled areas. In addition, Doré features Ardent's enhanced port of Massachusetts Institute of Technology's X Window System. Ardent's version will support full color and allow moving images to be produced inside screen windows, without loss of performance, according to Borden.

On top of all this, Doré adds an expanded library of 3-D primitives, such as cones, spheres and cubic solids and polygonal meshes. Users can add their own solids, as well as data, to this collection to illustrate the results of analysis.

Likewise, Doré's command set can change the appearance or geometric shape of an object once it's invoked on the screen. For example, a user can specify to make a cube transparent, solid or wire frame, then scale or rotate the image. A "virtual" studio allows objects to be viewed from different "camera" angles and with several sources of light. □

FACT FILE

3-D Graphics tool kit
Ardent Computer Corp.
550 Del Rey Ave.
Sunnyvale, Calif. 94086
(408) 732-2806
Circle 488
**Dynamic Object-Rendering Environment Doré, a library of graphics primitives for visualizing computer-intensive applications.
**High-level database allows software developers to create complex geometric objects and control such things as shading, texture, transparency and source of light.
**Target hardware platforms include supercomputers and high-end graphics workstations.
**Source code licenses: $250 for universities and research labs, $15,000 for commercial users. Per-copy binary license, $200.

COMPANY PROFILE

DG walks on the VAR side to regain lost momentum

KEEPING AMERICA COMPETITIVE

Megan Nields, Staff Editor

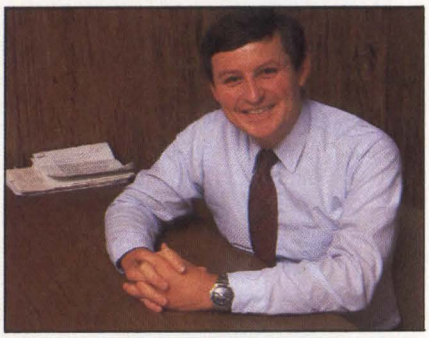
Let's say you're a "small" company —somewhere around a billion dollars —and you can't match the sales power of companies like IBM Corp. and Digital Equipment Corp. What is your competitive strategy?

If you happen to be Data General Corp., Westboro, Mass., you strengthen your flagging value-added reseller channel and have them sell your products for you. But first, you have to convince them that your products can compete against the big guns of the industry.

VARs have always been a major force behind the strength of Data General. In fact, about 50 percent of Data General's business goes through its VAR channel.

However, DG's relationship with its VARs has had its ups and downs. During the past several years, DG has lost some notable VARs, such as McDonnell Douglas Co., St. Louis, Mo. The loyalty of other VARs has been strained by what they cite as sagging product development and complicated business procedures.

Despite such criticism, and recent financial setbacks, International Data Corp. in Framingham, Mass., ranks DG fairly high compared to other vendors in its relations with VARs. In fact, says IDC market watcher Stephen Bosley, the company should see some added revenue coming from its VAR channels. Even so, in Bosley's



Ward MacKenzie, *vice president of Data General's VAR Marketing and Development Group, has a simple formula for success: keep everybody happy.*

view, "It may take a while for DG to convince more resellers to carry their products."

Changing VAR perceptions about its products is a primary concern at DG, points out Ward MacKenzie, vice president of DG's VAR Marketing and Development Group. The down-but-not-out computer company has made a decision "to aggressively go after the maximum number of ways we can translate our computers into systems," he says.

One of the most important ways to do this is to beef up the VAR channel. "We have a long history in this business and a successful base of VARs around the world," says MacKenzie, who explains, "Our strategy is very simple: to help our VAR base succeed. That way we'll all be happy. For DG to be sucessful, our VARs have to be successful as well."

Assist and recruite

DG plans on helping VARs in two ways. The first is to assist the existing base of VARs by giving them all the tools they need to be sucessful in their particular business. The second is to look at certain VARs who are not selling DG equipment and convince them that they should be.

Mackenzie sums up the new campaign as "a very aggressive set of programs designed to enhance our business relationship with existing VARs and aggressively recruit new ones."

As part of this courting campaign, DG has instituted a new dollar-volume discount schedule that cumulatively discounts everything a VAR buys from DG. MacKenzie says this somewhat counters the current trend of most companies, which are decreasing margins and discounts and putting pressure on VARs to make a profit from their own added-value.

Since VARs invest heavily in selling DG's products, they deserve this discount, says MacKenzie. "We want our VARs to have adequate profits so they can reinvest in their market. It is in our own best interest to help make them as prosperous as possible."

Another way the company is achieving VAR satisfaction is through the formation of four regional VAR councils. Meetings are held quarterly with groups of VARs who represent major territories in the Unites States. The VAR councils discuss present and prospective ideas and programs.

"We get a tremendous amount of feedback about what our VARs like about us and what we could be doing better," MacKenzie notes. VARs "tend to be really honest since they are running a business based on the relationship with their vendor. And because it's a partnership, we in turn must listen to them."

Perk up the relationship

VAR perks besides the discounts include financial plans where DG pays for administration costs, and a program that allows VARs to lease systems to customers. DG finances the lease, and the VAR gets credit for the sale.

For those VARs who want to make the switch to DG, the company has set up conversion centers in Massachusetts and California that allow VARs to make the leap from the systems they now sell to DG machines. Both centers can also work on converting the VAR's current base of installed equipment and products to run in place with DG's products.

It becomes "a zero-risk decision for VARs to transfer to Data General machines," says MacKenzie. "Very seldom do we go through the whole conversion process without getting the end-business. And this way, the entire business relationship is sealed before anything is actually signed."

Other VAR programs in the works include a revamped licensing program and a new market-penetration strategy—all aimed at building more long-term VAR partnerships. "Year-to-year growth numbers don't mean much in this business," says MacKenzie. "We are looking at more long-term, strategic kinds of business. We want people to see Data General as the preferred VAR supplier."

Just what kind of VARs is DG looking for in its comeback quest? Basically, "a company that has a mission to

Highlights of Data General's VAR comeback campaign

Data General Corp. has adopted a multilayered strategy in a campaign to woo value-added resellers:

- Instituted a single dollar-volume discount schedule that cumulatively affects everything a VAR buys from DG.
- Established four regional VAR councils to assist VARs and discuss ideas and programs.
- Picked up the tab for some administrative costs related to VAR programs.
- Established a program that allows VARs to lease systems to their customers.
- Set up "conversion centers" that let non-DG VARs switch to DG machines and bridge systems to their customers.
- Launched a revamped VAR-licensing program and market-penetration strategy.

TEK COLOR PRINTERS

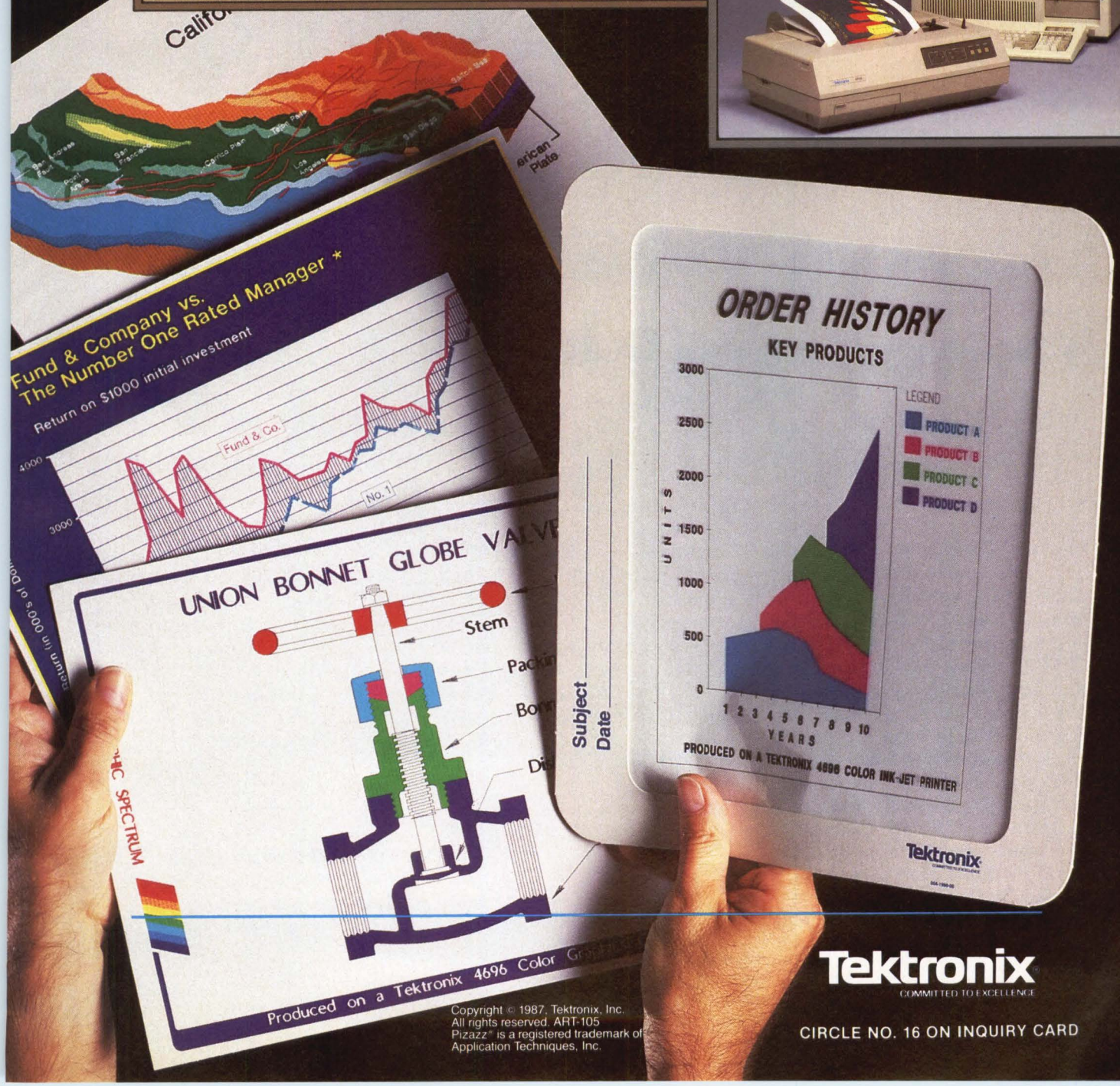
HOW TO MAKE YOUR PC APPLICATIONS LOOK GOOD ON PAPER.

The Tek 4696 Color Printer: A reliable, cost-effective printer. From presentation graphics to solids modeling, the IBM-PC compatible 4696 creates rich, vibrant color on paper or transparencies.

Behind the 4696 is Tek's world-renowned graphics technology and applications expertise. Technology that matches dot size with ink and paper formulation for excellent results.

To enable superb color output from nearly any PC application, you receive a copy of Pizazz® software with your 4696. You also get the full backing of the 67-country strong Tektronix service and support network.

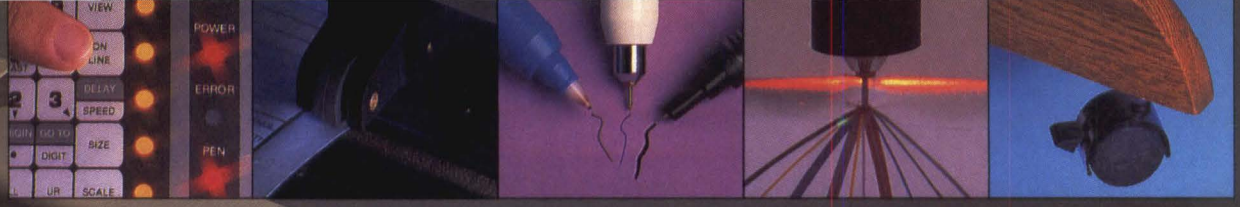
For more information about the complete 4690 Color Printer Family and OEM/VAR dealer programs, contact your local Tek representative. Or call 1-800-225-5434. In Oregon, 1-235-7202.



Tektronix
COMMITTED TO EXCELLENCE

Copyright © 1987, Tektronix, Inc.
All rights reserved. ART-105
Pizazz® is a registered trademark of Application Techniques, Inc.

CIRCLE NO. 16 ON INQUIRY CARD



LP4000 with Multi-pen Changer

Here's what to look for when you want great value

IOLINE plotters are designed to give you more flexibility and features for less cost than any other machine of their kind.

For example, our plotters draw not only on A through E sizes of media, but also plot on hundreds of in-between sizes from 1.5″×1.5″ up to 37″ wide roll stock. This saves you time and money by allowing you to make "check plots" on small, low-cost paper before committing to full-size media for final work.

It's easy also to set paper size, pen speed, micro-calibration, plot rotation—everything exactly as you want—by just tapping a few keys on the plotter's intelligent keypad. Plus, up to 3 sets of personalized defaults can be saved in its non-volatile memory.

They're fast, too. Our high-performance LP4000™ draws at speeds selectable up to 20 inches per second (ips) axially with .001″ resolution. For less demanding applications, our economical LP3700™ plots up to 10 ips axially with .0025″ resolution.

Another feature is compatibility. IOLINE plotters emulate both HP-GL and DM/PL plotter languages so they work with a host of software like AutoCAD, VersaCAD, and CADKEY, to name a few.

Furthermore, our Multi-pen Changer™ option holds up to 20 pens and, with our hyperBUFFER™ option, you can dramatically increase plotting throughput with intelligent vector sorting and compression buffering of up to 1MB of plot data.

Now here's the clincher: Our top-gun LP4000 costs just $5,495* less options. And there are other models priced even lower!

Why wait? Call us now at **206-821-2140.** Or, circle our reader service number and we'll gladly send you our brochure.

Remember, getting your money's worth—that's what IOLINE plotters are all about.

IOLINE™

LARGE-FORMAT PEN PLOTTERS

IOLINE CORPORATION 12020 - 113th AVE. NE KIRKLAND, WA 98034 (206) 821-2140 TELEX 4949856 IC UI FAX (206) 823-8898

LP4000, LP3700, Multi-pen Changer, and hyperBUFFER are trademarks of Ioline Corporation. AutoCAD is a registered trademark of Auto Desk Inc. VersaCAD is a registered trademark of T&W Systems. CADKEY is a registered trademark of MicroControl Systems, Inc. *Suggested U.S. List price.

CIRCLE NO. 17 ON INQUIRY CARD

COMPANY PROFILE

KEEPING AMERICA COMPETITIVE

solve specific problems for customers and the technical skills and marketing expertise to establish a strong position in their specific area of business," states MacKenzie. "VARs aren't just resellers of computers, they are solutions providers. Keeping that in mind, as well as the idea of a true business partnership, is the key."

And what do the VARs themselves think about DG? On the whole there is renewed enthusiasm about present and future relationships.

President Tyce McIntosh of Compusystems, Fort Wayne, Ind. (who is also chairman of one of the DG VAR councils), says, "The biggest change we've seen in the past year is creativity. The programs are a lot more in tune with our needs." Compusystems sees a lot of two-way communication.

McIntosh cites the new leasing program as a very attractive draw to DG. "The company is much more alert to marketing and support than they have been in the past. They're not just product oriented."

Others share McIntosh's opinion. Jean Rauch, manager of local system support at Online Computer Library Center Inc., Dublin, Ohio, says, "In the past, we did not have a very good relationship with Data General. There wasn't a real spirit of cooperation."

But, the situation began to change last September. DG rehired it's former Online account manager and later assigned a second account manager to the VAR. DG also improved its maintenance and billing systems, Rauch notes. □

GRAPHICS SOFTWARE

X Window standard wins support, not products

Tim Scannell, Senior Editor

Is the world ready for yet another standard that promises to easily and efficiently tie together like and unlike computers into a well-oiled network?

Both Digital Equipment Corp. and the Massachusetts Institute of Technology think so. They have released the latest version of a graphics operating environment, along with a tool kit that lets software developers construct high-level graphics applications, without concern for the hardware or networks on which they'll run.

The system, called X Window System Version 11, has won the backing of some of the leading computer manufacturers in the industry, including IBM Corp. and Hewlett-Packard Co.

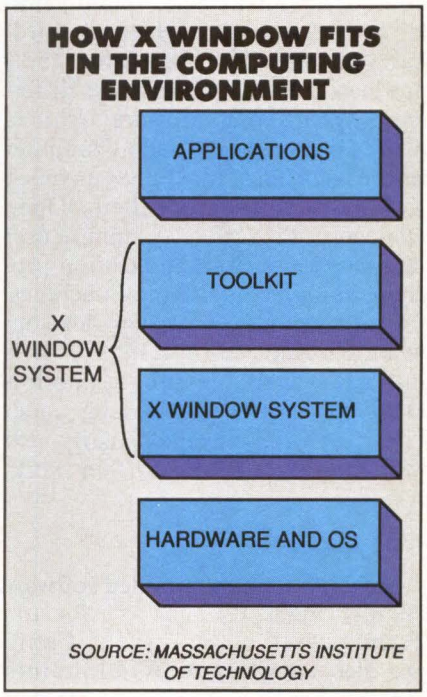
Hold the applause, however, because X Window is not yet out of the woods. As with many would-be standards, it receives verbal support from a variety of heavyweight vendors, but it doesn't generate real-life products.

For example, Sun Microsystems Inc. officially supports X Window. Furthermore, Sun is working with DEC, MIT and others to develop a 3-D extension that will be compatible with such current graphics standards as PHIGS and PHIGS Plus. Sun also was the only vendor to demonstrate X Window Version 11 at the July SIGGRAPH show in Anaheim, Calif. However, Sun still promotes its network extensive windowing systems (NeWS) environment over the DEC-MIT product. NeWS has been available to software developers since May 1987 and has about 39 licensees, says marketing director Jim Davis.

"There are extensive technical discussions as to why either environment is better," says Davis, "but, as to which one is used, we really don't care. We support both."

Also, while the ANSI's Technical Committee on Computer Graphics Standards (X3H3) has agreed to consider X Window as a proposed standard, critics like ex-Apple Computer Inc. chairman Steven Jobs—who has referred to X Window as "brain dead"—insist there may be better alternatives around the corner. The critics caution not to jump too hastily to a graphics conclusion.

MIT professor Steven Lerman, director of the $50 million Project Athena that gave birth to X Window, counters, "We have fought a lot of religious battles to get X Window



The X Window System layer *connects applications to hardware, providing windowing, graphics and text capabilities, either locally or across a network. The tool kit layer can be used by software developers to create common user interfaces.*

going. No one will ever call anything perfect. That's the nature of computer science."

The X Window System has had a fairly meteoric rise into the applications spotlight, but it stems from many years of research at MIT into so-called "work group" computing. Project Athena (MMS, March 87 Page 49) is a five-year program launched near the end of 1983 to look into the use of powerful workstations in an educational environment.

Initially, only a handful of companies and three or four people worked full time to develop Version 10 of the product, a prototype unveiled in January, says Lerman. In contrast, this latest version has been worked on by at least 80 programmers and software engineers, nearly half of whom are DEC employees. Athena has also evolved into a fairly massive programming effort, consisting of some 19 million bytes of source code and some 9M bytes of documentation.

The benefit of a system like X Window centers on a single, "plain vanilla" environment through which third-party developers can filter their products, and users can access different programs and hardware architectures. For instance, Apollo Computer Inc., Chelmsford, Mass., has unveiled X Window software, called "Open Dialogue," that offers a common user interface for various application programs running on different machines. Priced at about $2,500 per development kit and run-time library, it is initially available for Apollo's DN3000 workstation running under UNIX. It will be available early next year for DEC, IBM and Sun workstations

X on the spot

Makers of computer-aided software engineering tools, such as Atherton Technology Inc., Sunnyvale, Calif., are also adopting X Window into their design fold, because it offers a common operating environment for various hardware and software systems. From all indications, X Window will also be easily migrated to the Open Systems Interconnection (OSI) architecture when that becomes available, observes Atherton's president and chief executive officer, Dr. Banin.

In X Window's corner is the fact it is virtually in the public domain, meaning developers can have access to the system and source code for about the price of the magnetic tape that contains it. X Window also reportedly increases the amount of computing power available to users at a small increase in price—at least on large-scale minicomputers. For example, a DEC VAX minicomputer operating at 1 million instructions per second (MIPS) with seven users costs about $17,000 per user. But, a VAX with 20 MIPS and seven users operating under X Window, averages about $21,000 per seat, according to DEC worksystems marketing manager Chris Reed.

Tools are now the need

Despite the cost-justification figures, however, X Window has not managed to dramatically sweep the industry. And one of the reasons for this is that, thus far, there has been nothing generically available for third-party software developers to work with to develop X Window-type products. There were pieces, but no tools to pull them together.

Some companies, Hewlett-Packard for one, took the initiative and developed their own tool kits for developers of software for specific computers. Other companies, like Microsoft Corp., have demonstrated X Window-based interfaces on microcomputers and are considering them as interface alternatives.

As a result, X Window has mostly resided in the development labs of MIT rather than in the R&D think tanks of major corporations. DEC is the exception since it has been working with MIT on X Window from the beginning. DEC recently announced that all of its future systems and software would sport X Window compatibility.

Now that X Window is out on the streets, the toughest battles are yet to be fought in terms of competition and acceptance. For instance, IBM supports X Window Version 10 on its RT PC system and plans to provide a tool kit for X Window Version 11 sometime early this year. But, the tool kit is being developed with the help of Carnegie-Mellon University, not MIT. So, it is not yet clear if there are any differences between it and the DEC-MIT version. Also, while MIT's X Window is functionally similar to Microsoft's Windows graphics environment, it is not presently compatible with the Presentation Manager portion of Microsoft's Operating System/2. That's something MIT will have to correct since OS/2 is being groomed to be the future platform for high-performance personal computers and personal-computer-based workstations.

MIT, meanwhile, is pushing X Window with a passion. More upgrades are slated in three to six months, targeting toward such environments as the IBM PS/2, Apple Computer's Macintosh and the Ada programming language. "There are a lot of applications, and a lot more will come," enthuses Lerman.

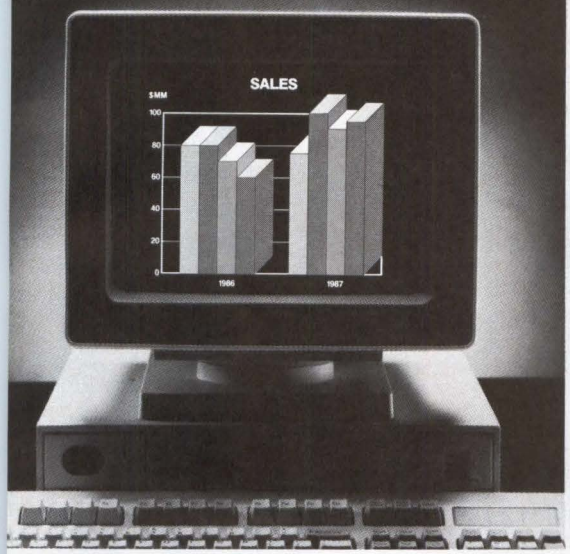
A system in search of ideas

Recently, the university announced plans for an industry-sponsored consortium to solicit ideas and promote the implementation of further versions of X Window. Headed by Robert Scheifler, director of MIT's Laboratory of Computer Science, the consortium will appoint specific companies and individuals to continue development of the graphics interface and ensure that the project stays on course. "We see ourselves as leaders, trying to develop things before they are standards," states Lerman.

At the moment, DEC and MIT are thumping the hardest for X Window. DEC encourages all of its third-party developers to explore X Window as a user interface within their products and has enveloped X Window into the corporate-wide vision of distributed computing. Says workstation software program manager Richard Treadway, "Now, we can build systems that interface with people a lot closer to the way they work."

MIT, this year, has also moved from time-sharing computers at its Cambridge, Mass., campus to completely networked and X Windowed workstations. The network consists of 500 workstations linked through 60 file servers and used by about 5,000 students and faculty. □

FROM CREATION



TO COMMUNICATION

You've created a file or document on your PC. Now what?

Because most business information needs to be communicated, most people print the computer file and send the papers by mail, courier or fax. Or maybe send a floppy disk.

If the recipient needs to manipulate or revise the data, it must be rekeyed.

That's the time-honored—and the time-consuming—way of doing business.

What's a faster, cheaper, better way? Western Union EasyLink® service.

Western Union EasyLink lets you send and receive data and documents between computers. Without a detour onto paper or the inconvenience of a courier. And you can be sure what you send is exactly what's received.

You can use EasyLink to move the information that moves your business in seconds. You can move orders and text files. Receive reports and graphics. Even send product specs and spreadsheets.

Fast revisions—without rekeying

EasyLink connects the computers you use, regardless of type or location. Files on one computer can be sent to other computers, eliminating the need to rekey data.

More than just computer communications

EasyLink even lets you send messages to fax machines. Reach your company's mainframe. And communicate *between* offices or businesses.

Best of all, the cost of sending a message is comparable to a postage stamp. And unlike telephone, the distance makes no difference.

Western Union—a leader in electronic communication

With EasyLink, we're bringing proven reliability to today's technology. And you'll get added value with EasyLink services like InfoMaster®, the largest electronic library with more than 800 databases.

Let EasyLink take your PCs from creation to communication. To learn how *your* business can benefit, return the coupon. Or call:
1-800-247-1373, ext. 7193

IF YOU CREATE IT ON A PC SEND IT ON A PC WITH EASYLINK

MMS 2/88

YES, tell me more

Show me how EasyLink can turn my company's PCs into an efficient, economical new way to communicate.

Name _____

Title _____ (please print)

Company _____

Bus. Address _____

City/State/Zip _____

Bus. Phone ( ) _____

Mail to: ***Western Union EasyLink***
P.O. Box 37472
Omaha, Nebraska 68137

Or call: ***1-800-247-1373, ext. 7193***

western union EasyLink

© 1988 Western Union Corporation

CIRCLE NO. 18 ON INQUIRY CARD

SETTING THE TABLE FOR COLOR

User demand for, and technology developments in, color hard copy create new opportunities for VARs, OEMs and system integrators

A new generation of printers based on thermal ink-jet technology will offer letter quality text along with color graphics capabilities.

Greg Porell, CAP International Inc.

A number of forces are shaping the color hard copy (CHC) marketplace—among them, improved product reliability, falling prices, quantum leaps in output quality and the increasing availability of software drivers. These forces, according to CAP International Inc.'s Color Hard Copy Market Requirements Service, Marshfield, Mass., will push CHC placements to 2.1 billion products by 1991 and will generate $4.7 billion dollars. For system integrators, value-added resellers (VARs) and OEMs, such numbers mean not only substantial challenges but also lucrative opportunites.

First and foremost in the minds of system builders, for whom price/performance is the operative phrase, should be the progress made in product technology. The old barriers that stymied acceptance of color devices are falling. In the past, CHC products suffered from reliability problems, low resolution (180 dots per inch and below), slow print speeds (over 4 minutes per 8.5-by-11-inch image) and few interface options. However, today's reliable products offer impressive specifications: high-resolution print (300 to 400 dpi), faster output (less than 50 seconds for an 8.5-by-11-inch image) and a number of serial, parallel or video interface options.

Adding more fuel to the color market is the development of software drivers for the peripherals. Tremendous growth in software application packages that support full-color output allows system integrators, VARs and end users to employ CHC products in ways that were not possible in the past. Presentation graphics and personal computer CAD software drivers have been active development areas, and progress is being made in desktop publishing applications. In fact, Adobe Systems Inc. has introduced a full-color version of PostScript (see "Color

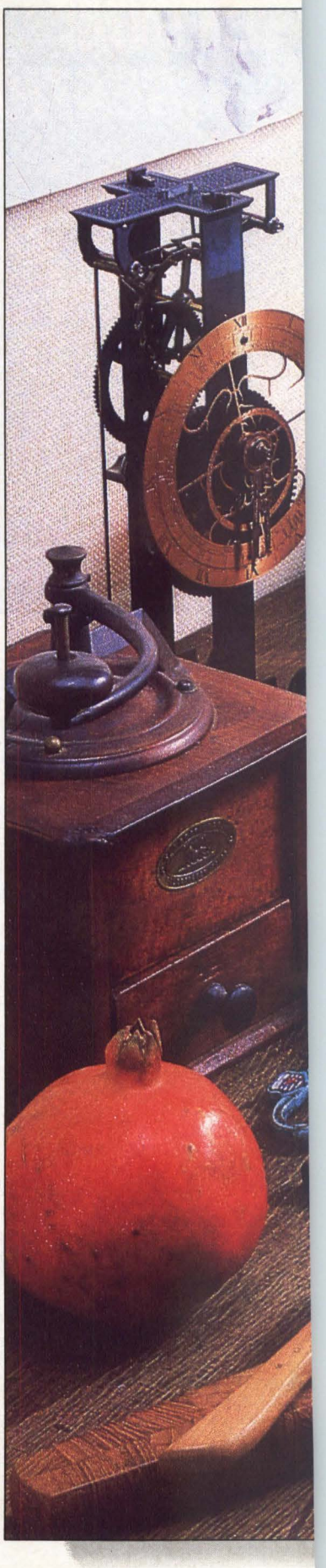
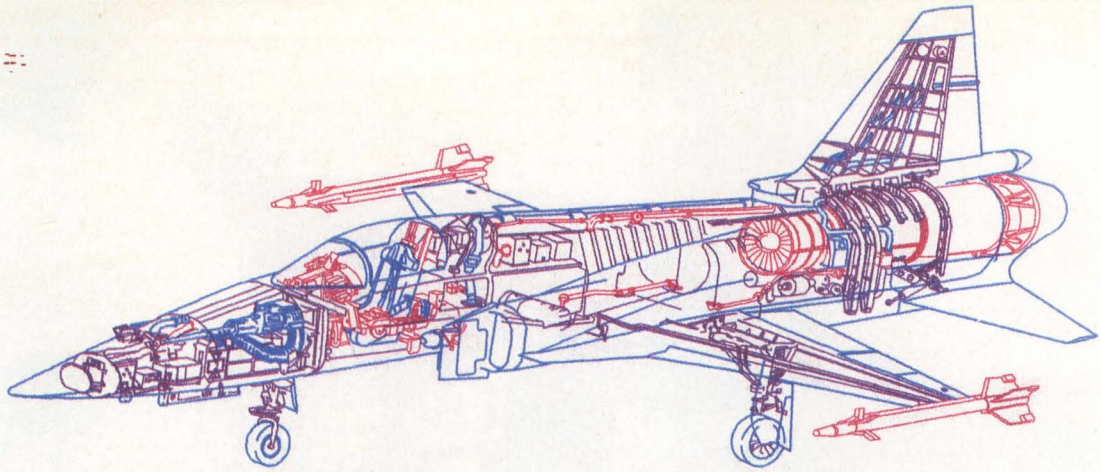


Image printed by Iris 3024 ink-jet printer from Iris Graphics.



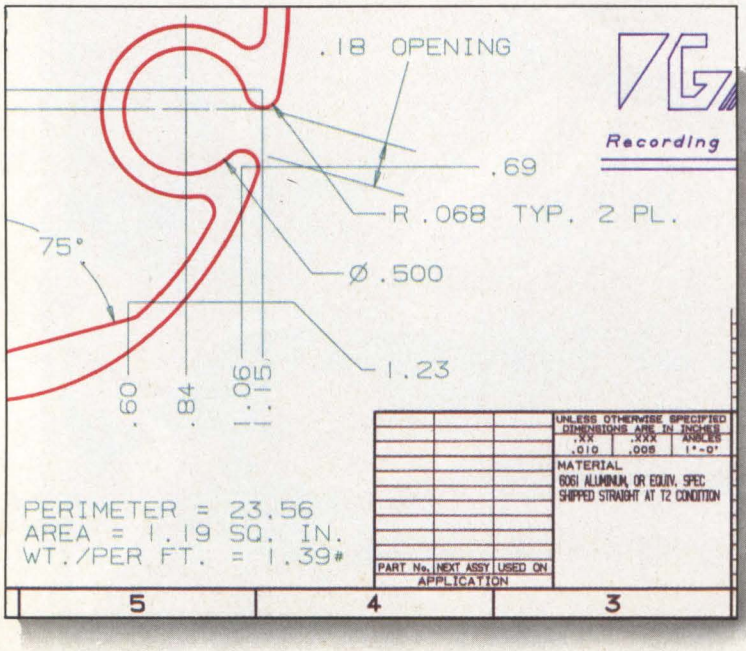
JDL's dot-matrix printers *can serve as small-format (17 by 22 inches) CAD/CAM output devices. (Sample output, right.)*

comes to desktop publishing").

In addition, CHC products are hitting the market running with a wide selection of software drivers available at introduction. For example, when Hewlett-Packard Co. recently announced its PaintJet thermal ink-jet printer, more than 50 software drivers were available. Furthermore, Xerox Corp. claims its 4020 ink-jet printer has over 150 software drivers available for end users. This is a significant step toward easing the use of CHC devices for end users and increasing the applications of color technologies.

Perhaps most important for steady growth has been the falling prices for color hard copy devices. CalComp recently reduced the pricing of its 5800 Color Electrostatic Plotter Series by approximately 38 percent. The company now offers 400-dpi, full-color electrostatic plotters ranging in price from $49,000 to $69,000, down from a top-end price of more than $100,000. And this downward slide in prices appears in both impact devices (dot-matrix printers and pen plotters) and non-impact machines (ink-jet and thermal-transfer, electrostatic, electrophotographic and photographic units). Moreover, these attractive prices have come while performance marches ahead.

Pen plotters *such as Western Graphtec's MP3000 series have captured the largest share of placemets in the total market. (Sample output, below.)*



Dot-matrix, a versatile vet

More than 40 percent of CHC product introductions in the past have been based on dot-matrix technology. These products offer color as a standard feature or as an inexpensive option because new applications demand full-color capability. Their greatest appeal is versatility in text-quality selection, printing speeds and full-color graphics on plain paper.

Matrix technology, despite rumors to the contrary, continues to evolve. Advances in paper handling and improved printhead designs make higher resolutions at faster speeds possible. For example, the increasing use of 24-wire printheads and precisely controlled servos allow users to mix text and graphics on a page at relatively high resolutions (up to 360 dpi).

NEC Information Systems Inc. offers the P5XL, and more recently, the P9XL, which have 24-wire printheads, 360-by-360-dpi print resolution and bidirectional printing capabilities. In addition, Alps Electric (USA) Inc. has introduced the P2400C and ALQ series, which were the first product lines to offer interchangeable printheads with either 18- or 24-wire configurations. Okidata introduced its Microline 290 series, which offers print speeds up to 400 cps, 288-by-72-dpi resolution, nine- and dual-nine-wire printhead configurations.

Japan Digital Laboratories (JDL) and Juki Office Machine Corp. have both introduced dot-matrix printers that can serve as small-format (17 by 22 inches) CAD/CAM output devices. These units offer HP Graphics Language compatibility, and JDL offers a vector-to-raster graphics converter for high-volume plotting. JDL is also offering roll-paper feed for large-format engineering/scientific plots, thereby bridging the gap between printers and pen plotters.

Pen plotters, (such as Western Graphtec Inc.'s MP3000 A- and B-size plotters) traditionally strong color hard-copy participants, have captured the largest share of placements in the total market and are expected to be one of the leaders through the rest of the decade. This steady growth can be attributed to new personal computer CAD applications and product price/performance improvements.

The $4,895 CalComp 1023 offers cut-sheet media selection and the company's Batchplot software utility driver, which can plot as many as 60 AutoDesk Inc. AutoCAD plots in a single batch run.

Houston Instrument recently introduced the DMP-60 series, with a number of optional features. Geared toward the personal computer CAD market, the DMP-60s plots sizes from 8.5 by 11 inches to 36 by 48 inches. Two models are available in the series, the DMP-61 and DMP-62. The DMP-61 offers plotting speeds of 32 inches per second (ips) and is priced at $4,695, while the $6,495 DMP-62 allows users to select one of 23 media sizes and plots at 24 ips. Both units have on-board Motorola Inc. 68000 microprocessor-based intelligence that features such capabilities as multiple fonts, filled fonts, closed-area fill capability with 15 fill patterns, 10 character sets and a new smooth-curve generating algorithm.

Houston Intrument's wide-format SCAN-CAD Accessory is also available for the DMP-60 series and allows the plotter to function as an input scanning device for the input of data to a host system. This scanner is priced at $2,995. Also available is a 1M-byte buffer board option with a replot feature that plots multiple originals without reloading the plot file from the computer.

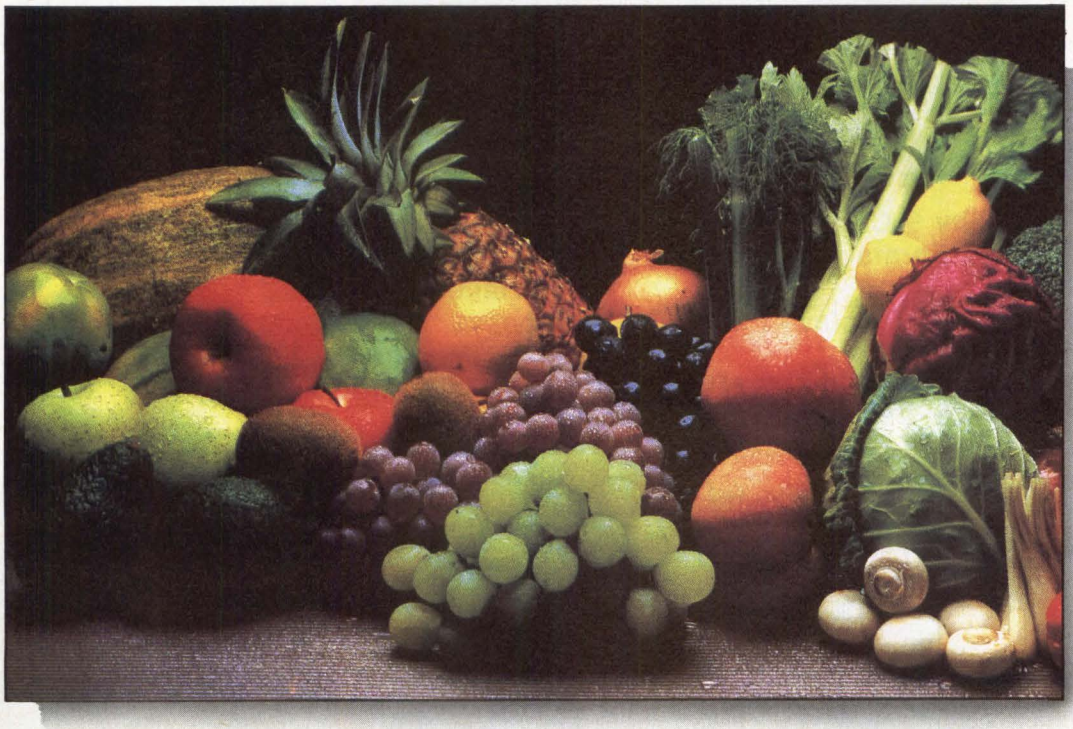
Benson Inc. sells what it refers to as the Smart Buffer Plot buffering system with its recently introduced, large-format 16 series. Offering cut-sheet and roll media selection, the buffer option, by enhancing data throughput, provides faster plotting speeds.

Similar performance gains have also taken place in small-format plotters, with introductions such as the ImageGraph from Fujitsu Components. The $1,200 unit produces 8.5-by-11-inch and 11-by-17-inch plots, offers HP Graphics Language compatibility and a standard 6K-byte buffer.

Electrophotographic future shines

All the CHC activity in electrophotographic technology has been concentrated in color copier configurations and in prepress proofing applications. Xerox recently introduced the 1005 full-color copier and Canon U.S.A. Inc., the Color Laser Copier system. These products are beginning to offer features found on traditional monochrome copiers such as reduction/enlargement, cut-sheet paper tray feeders and sorters and slide adapters to make copies from 35-mm slides.

These devices have print speeds of up to 6 pages per minute (ppm) and resolutions of 400 dpi. The developments in color copiers are



Canon's electrophotographic *Color Laser Copier system produces up to 5 pages per minute at resolutions of 400 dpi. (Sample output, left.)*

GCR Tape Drive

+ "Reliability" = Maintenance Free

- High Reliability 9 CMOS-LSI
- ½" IBM Tape Format
- Auto-Loading
- Convenient LED Display
- Simple Mechanism
- Tri-density (6250, 1600, 3200)
- Tape Speed 100IPS, 50IPS (3200 BPI)
- Transfer Rate 20KB - 1MB/SEC
- Interface Pertec/SCSI
- Capacity 175MB/2400 feet
- Buffer Memory 512KB
- Rack Mounting/Desk Top

ANRITSU CORPORATION
10-27 Minamiazabu 5-chome, Minato-ku, Tokyo 106, JAPAN
Phone: (03) 446-1111/Telex: 0-242-2353 ANRITU J/Cable: ANRITDENKI TOKYO

ANRITSU AMERICA, INC.
15 Thornton Road, Oakland, NJ 07436, U.S.A.
Phone: (201) 337-1111/Telex: 642-141 ANRITSU OKLD

CIRCLE NO. 19 ON INQUIRY CARD

expected to fuel the continued growth of CHC applications by allowing users to produce multiple copies of original documents presentations and reports.

One interesting area of color hard copy has been the grafting of color electrophotography to page-printer configurations. Currently, Colorocs Corp. is working on the development of a page printer configuration. This device is expected to hit the market in late 1988 and will produce up to 6 ppm in full-color at 300 dpi and over 20 pages per minute in monochrome. This device will function as a dual-purpose device and is expected to be priced at approximately $20,000.

With these developments, electrophotography is expected to be a major player in the CHC marketplace.

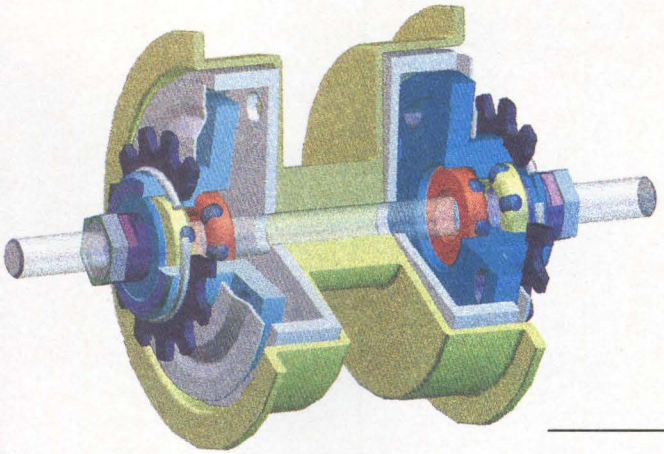
Electrostatic gets passing grades

Since the introduction of the ECP-42 from Versatec Inc. in late 1982, four other manufacturers including Benson, CalComp, Precision Image and Synergy Computer Graphics Corp. have entered the color electrostatic marketplace with a number of different approaches to the electrostatic plotting process.

Most of the vendors offer 400-dpi plot resolution in sizes from 8.5 by 11 inches to 34 by 46 inches with a number of different interface and emulation modes. Data throughput and plotting speeds have also benefited from a number of developments.

Versatec plotters *provide different interfaces and emulation modes. (Sample output, above.)*

These vendors use single-pass, four-pass, five-pass and drum-based plotting techniques. However, the single-pass technology incorporated into products from Synergy and Benson makes it possible for four charging stations and four toning stations aligned in a row to apply all four toners in a single pass. No paper rewinding and refeeding is necessary as is the case in CalComp and Versatec multiple-pass plotting approaches. Also, Precision Image has developed a product that offers cut-sheet media and a helical scanning approach on a drum-based plotting area.



Hewlett-Packard's thermal ink-jet *PaintJet engine heats the ink, creating a bubble that forces ink through a nozzle. (Sample output, above.)*

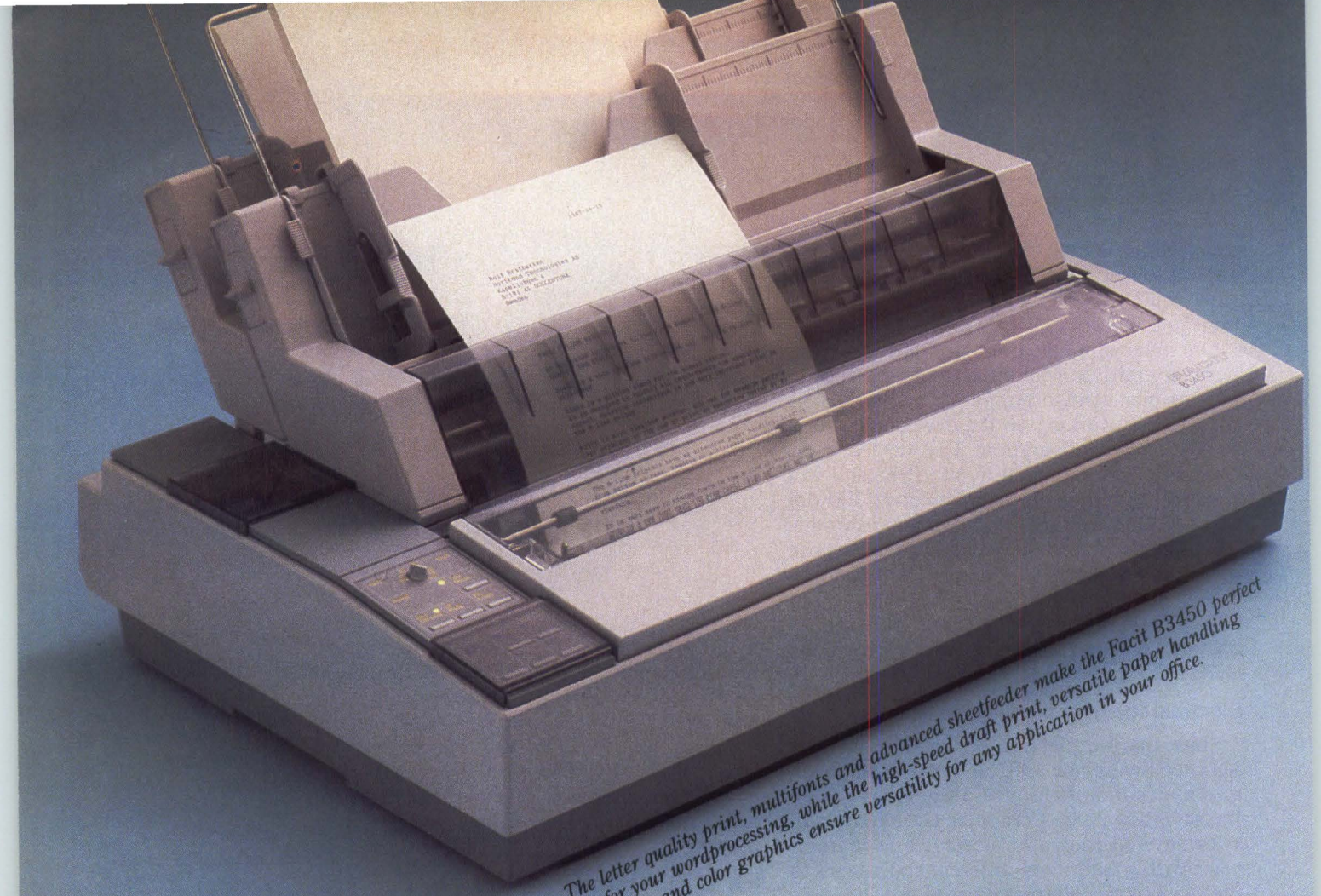
Ink jet wins friends

A number of product developments in the ink-jet area are expected to offer significant growth potential. A new generation of printers based on thermal ink-jet technology will offer letter quality text along with color graphics capabilities. These developments will allow ink-jet technology to capture some of the traditional office-environment applications.

Recent introductions such as HP's PaintJet offer the thermal ink-jet approach—the ink is heated, creating a bubble that forces ink through a nozzle. According to HP, this technique addresses the clogging problems formerly associated with ink-jet technology, and the improved ink projection allows faster print speeds. The PaintJet uses disposable printheads and costs $1,395.

A similar process, but with a different ink chemistry, is used in Howtek Inc.'s Pixel-Master. The PixelMaster uses solid-ink rods that are melted and projected on paper from a 32-nozzle, circular printhead. Melting solid ink and the ink's chemical properties allow the PixelMaster to print on a number of different media, including plain paper.

Ink-jet technology has also found applications in large-format areas. Iris Graphics Inc.'s 3024 offers a selection of eight different dot sizes and produces an image that is close to a continuous tone when looked at with the naked



The letter quality print, multifonts and advanced sheetfeeder make the Facit B3450 perfect for your wordprocessing, while the high-speed draft print, versatile paper handling and color graphics ensure versatility for any application in your office.

Letter Quality
is just the beginning....

The new Facit B3450 matrix printer utilizes a 24-pin printhead to produce excellent letter quality print. This means that you can use the printer for all types of wordprocessing applications – including those with very high print quality requirements, such as business correspondence. Two letter quality fonts in several pitches are standard and you can further customize your printouts by adding from a range of font cards. Since you probably use cut sheets for your wordprocessing, the Facit B3450 can be equipped with an advanced cut-sheet feeder with single- and double-bin operation, handling several paper formats and envelopes.

WORDPROCESSING IS JUST THE BEGINNING

Let's not forget that the B3450 handles a multitude of applications besides wordprocessing! Just flick a switch and it changes personality to a high-throughput draft printer. And add a 4-color ribbon to make it a fully-fledged color printer. Furthermore, you can use almost any type of paper since the B3450 features four paper paths to serve different applications.

The Facit B3450 is very easy to install and use. All functions are controlled from the control panel and the three command set emulations, plus parallel and serial interfaces, ensure easy integration with most computers and softwares.

With the introduction of the B3450, the Facit "B-line" matrix printer family is now comprised of five printers tailored for different applications. See them all at your nearest Facit representative.

CIRCLE NO. 20 ON INQUIRY CARD

FACIT

Head Office: *Facit AB, S-172 91 Sundbyberg. Sweden. Phone: 46 8 764 30 00.*

AUSTRALIA: Elmeasco Instruments Pty. Ltd., 2-427-3322. *AUSTRIA:* Ericsson Information Systems GmbH, 0222-613 641. *BELGIUM:* Ericsson S.A., 02-243 82 11. *CANADA:* Facit Canada Inc., 416-825-2712. *CYPRUS:* LBM (Lillytos) Ltd 516 46 34. *DENMARK:* Facit A/S, 02-63 33 11. *FINLAND:* OY Facit, 0-420 21. *FRANCE:* Facit S.A., 1-4780 7117. *GREAT BRITAIN:* Facit 0634- 83 00 08. *GREECE:* American Computers & Engineers Hellas S.A., 01-671 97 22. *HONGKONG:* Gilman & Co. Ltd., 5-893 00 22. *ICELAND:* Gisli J. Johnsen HF, 1-64 12 22. *INDIA:* Forbes Forbes Campbell & Co. Ltd., 22-20 48 081. *ITALY:* Facit Data Products S.p.A., 039-63 63 31. *JAPAN:* Electrolux (Japan) Ltd., 03-479-7570. *KOREA:* True Trading Co. Ltd., 2-783-3855-7. *THE NETHERLANDS:* Facit B.V., 3480-21784. *NEW ZEELAND:* Northrop Instruments and Systems, 9-501-801, 501-219. *NORWAY:* EB • Ericsson Information Systems ANS, 02-35 58 20. *PORTUGAL:* Regisconta Sarl, 1- 56 00 91. *SINGAPORE:* Far East Office Eqpts Pte Ltd., 66-745 82 88. *SPAIN:* Facit S. A., 1-733 76 96. *SWEDEN:* Facit AB, 08-764 30 00. *SWITZERLAND:* Ericsson Information Systems AG, 01-821 59 21. *USA:* Facit Inc., (603) 424-8000. *WEST GERMANY:* Facit GmbH, 0211-61 09296.

eye. This product is being used in prepress graphic arts applications, but can also be used as an engineering/scientific printing device for integrated circuit design applications.

Photographic improves its image

The photographic technology area has experienced and benefited from a number of the market developments driving the other technologies. But, the trend in the market is toward full systems offerings with vendors such as General Parametrics Corp. and most recently, Matrix Instruments Inc., offering input, image processing and output peripherals combined with creation software packages. These systems integrate text and graphics and supply output devices such as 35-mm slide makers, thermal transfer devices and ink-jet printers.

Image resolutions in the photographic area have been climbing toward 2,000 by 2,000 lines. Such products as the ImageMaker from Presentation Technologies produce text slides from a process similiar to phototype setting. The unit comes with a selection of font wheels and uses a light beam to trace the characters, imaging them on film.

Another promising technology advance is the use of photographic technology in the color copier area. Konica Business Systems' Color 7 and Ilford's recently introduced CC120 furnish high-quality copy capability at under $20,000 (both are $16,995). These are the first copier configurations utilizing photographic technology at this low cost.

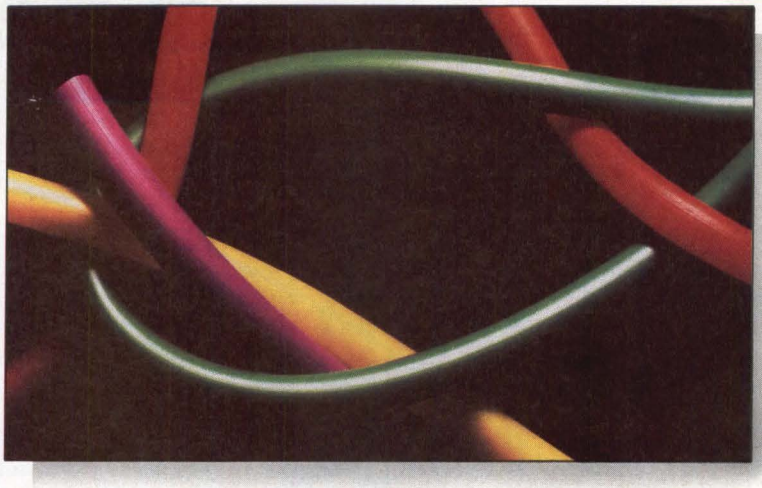
The old barriers that stymied acceptance of color devices are falling.

Thermal transfer heats up

A number of approaches are being taken in the area of thermal transfer. Traditionally it has been based on a wax donor ribbon. Now, heat-resistive ribbon, sublimation and dye diffusion are emerging.

Products from Calcomp, Versatec, Mitsubishi Electronics America Inc., Seiko Instruments U.S.A. Inc. and Shinko Electric Co. Ltd. are making inroads in personal computer CAD, desktop publishing and presentation graphics. These products offer 8.5-by-11-inch and 11-by-17-inch output, 300-dpi resolution and print speeds of under 1 minute per page.

Technology developments in the sublimation and dye-diffusion transfer printing methods were also demonstrated during 1987. And Hitachi America Ltd., Eastman Kodak Co. and Sony Corp. of America introduced units that use video capture systems. The print quality of dye-diffusion transfer printers resembles an almost continuous tone image. Dainippon Printing Co. Ltd. has displayed a diffusion system for prepress proofing applications where high quality is required.



Ilford's photographic copier, *the CC120, furnishes high-quality copy capability at under $17,000. (Sample output, above.)*

Why now for CHC?

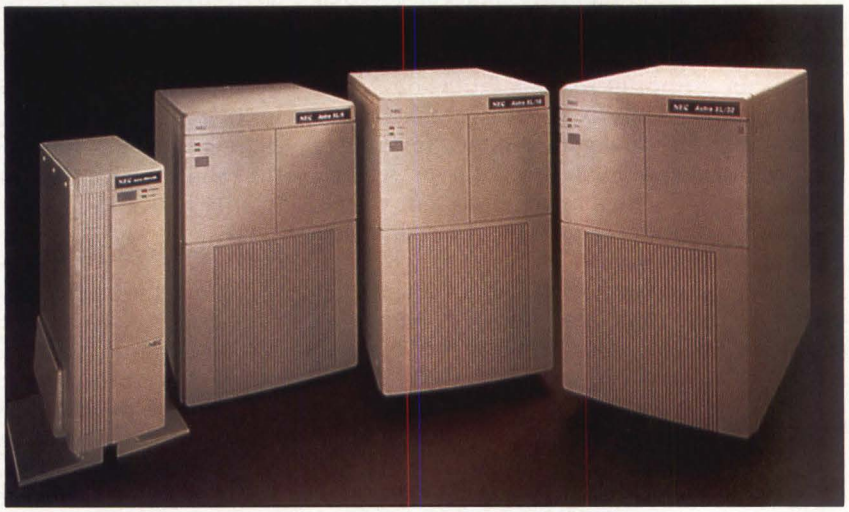
Although some industry analysts stress intangible causes, such as aesthetics or the power of color communication, CHC market activity can be traced to more concrete origins. First, more full-color monitors are being used with personal computers and workstations. In 1986, the number of monitor vendors' color shipments almost equalled those for monochrome units. In fact, industry participants feel that 1987 was the year when the shipments of color monitors passed monochrome unit shipments.

A second key impetus is the color copier. Products such as the Xerox 1005 and Canon Color Laser Copier based on electrophotography, lower cost thermal-transfer color copiers from such companies as Sharp Electronics Corp. and Panasonic Industrial Co. and photographic-based color copiers from Konica and Ilford will generate multiple copies of the color originals created by the installed base of over 1 million color hard-copy devices. Color copiers will be able to produce these documents with greater ease and therefore exploit the communicative powers of color.

Third, the image processing capabilities of host systems, including personal computer systems in the IBM Corp. PS/2 and Apple Computer Inc. Macintosh II class and entry-level workstations perform image manipulation and processing operations that were prohibitively expensive in the past. And image-capture systems allow the input of additional graphics or text to be merged with existing data.

With market drivers falling into place and product technologies enabling CHC products

HOW TO XL IN BUSINESS.



It's simple. Get acquainted with NEC's powerful new Astra® XL family. The Astra MicroXL, XL/8, XL/16 and XL/32 series. Each of these multiuser systems, using the UNIX® System V operating system, offers true compatibility and upgradability.

The XL family is MC68020-based, with up to 16MB main memory, up to 2GB of disk storage and can accommodate up to 32 users. Plus, it runs a range of IBM and other communications protocols and offers advanced networking capabilities.

In addition, the Astra XL family is ready to work right now with the most popular software development tools available. Including databases like UNIFY,* office automation software like Q-OFFICE +® and a variety of popular languages like C, COBOL, FORTRAN and more.

At NEC, we're continually advancing the technology of computers and communications. With the kind of products and programs you'd expect from a $17 billion industry leader.

The new Astra XL family. It's just what you need to excel in business.

NEC

C&C Computers and Communications

See us at UniForum '88 Booth #1831

For more information and the name of the NECIS VAR nearest you, call 1-800-343-4418 (in MA 617-264-8635).
For more information on our VAR and ISV programs, call 1-800-443-4849 (in MA 617-264-8635).
Or write: NEC Information Systems, Dept. 1610, 1414 Massachusetts Ave., Boxborough, MA 01719.

CIRCLE NO. 21 ON INQUIRY CARD

Hitachi's dye-diffusion *thermal-transfer printers create output that resembles an almost continuous tone image. (Sample output, above.)*

to meet the demands of end users, color hard copy appears to be well on its way to being a major player in the overall printing and plotting marketplace. CAP International's most recent end user research indicates a 71 percent increase in purchase intentions for CHC devices. More than 48 percent of the survey respondents indicated that they "definitely" or "probably" would purchase a color printer or plotter in the next year. This is twice the percentage indicated a year ago in similar end-user research. This purchase likelihood increases to over 75 percent in the next two years, according to CAP research. This interest is not all from first-time purchasers, either. Survey results indicate that 80 percent of the end users intend to purchase an additional color output device.

For system integrators, VARs and OEMs building color into the desktop publishing, office automation, business graphics and image processing systems users will be buying, the market is green. □

Interest Quotient (Circle One)
High 532 Medium 533 Low 534

Greg Porell, associate director at CAP International Inc., is responsible for research and client support of the Color Hard Copy Market Requirements Service. Prior to joining CAP, he was managing editor of *Electronic Imaging* magazine.

Companies mentioned in this article

Adobe Systems Inc.
1870 Embarcadero Road
Palo Alto, Calif. 94303
(415) 852-0271
Circle 361

Alps Electric (USA) Inc.
3553 N. First St.
San Jose, Calif. 95134
(408) 432-6000
Circle 362

Benson Inc.
385 Ravendale Drive
Mountain View, Calif. 94039
(415) 964-7900
Circle 363

CalComp
2411 West La Palma Ave.
Anaheim, Calif. 92803
(714) 821-2000
Circle 364

Canon U.S.A. Inc.
1 Canon Plaza
Lake Success, N.Y. 11042
(516) 488-6700
Circle 365

Colorocs Corp.
2830 Peterson Place
Norcross, Ga. 30071
(404) 448-9799
Circle 366

Dainippon Printing Co. Ltd.
1-1, 1-chome
Ichhigaya-Kagocho
Shinjoku-Ku
Tokyo, 162, Japan
Circle 367

Eastman Kodak Co.
343 State St.
Rochester, N.Y. 14650
(716) 724-4000
Circle 368

Fujitsu Components
3320 Scott Blvd.
Santa Clara, Calif. 95054
(408) 727-1700
Circle 369

General Parametrics Corp.
1250 Ninth St.
Berkeley, Calif. 94710
(415) 524-3950
Circle 371

Hewlett-Packard Co.
3000 Hanover St.
Palo Alto, Calif. 94304
(415) 857-1501
Circle 372

Hitachi America Ltd.
6 Pearl Court
Allendale, N.J. 07401
(201) 825-8000
Circle 373

Houston Instrument
8500 Cameron Road
Austin, Texas 78753
(512) 835-0900
Circle 374

Howtek Inc.
21 Park Ave.
Hudson, N.H. 03051
(603) 882-5200
Circle 375

Ilford
W. 70 Century Road
Paramus, N.J. 07653
(201) 265-6000
Circle 376

Iris Graphics Inc.
12 Jacob Way
Reading, Mass. 01867
(617) 438-1500
Circle 377

Japan Digital Laboratories (JDL)
2801 Townsgate Road
Suite 104
Westlake Village
Calif. 91361
(805) 495-3451
Circle 378

Juki Office Machine Corp.
20437 S. Western Ave.
Torrance, Calif. 90501
(213) 320-4860
Circle 379

Konica Business Systems
500 Day Hill
Windsor, Conn. 06095
(203) 683-2222
Circle 380

Matrix Instruments Inc.
1 Ramland Road
Orangeburg, N.Y. 10962
(914) 365-0190
Circle 381

Mitsubishi Electronics America Inc.
991 Knox St.
Torrance, Calif. 90502
(213) 515-3993
Circle 382

NEC Information Systems Inc.
1414 Massachusetts Ave.
Boxborough, Mass. 01719
(617) 264-8000
Circle 383

Okidata
532 Fellowship Road
Mt. Laurel, N.J. 08054
(609) 235-2600
Circle 384

Panasonic Industrial Co.
2 Panasonic Way
Secaucus, N.J. 07094
(201) 348-7000
Circle 385

Precision Image
501 Chesapeake Drive
Redwood City, Calif. 94063
(415) 366-8900
Circle 386

Presentation Technologies
743 North Pastoria Ave.
Sunnyvale, Calif. 94086
(408) 749-1959
Circle 387

Seiko Instruments U.S.A. Inc.
1130 Ringwood Court
San Jose, Calif. 95131
(408) 943-9100
Circle 388

Sharp Electronics Corp.
P.O. Box 650
Mahwah, N.J. 07430
(201) 529-9500
Circle 389

Shinko Electric Co. Ltd.
1450 Broadway
New York, N.Y. 10018
(212) 398-0550
Circle 390

Sony Corp. of America
1 Sony Drive
Park Ridge, N.J. 07656
(201) 930-6585
Circle 391

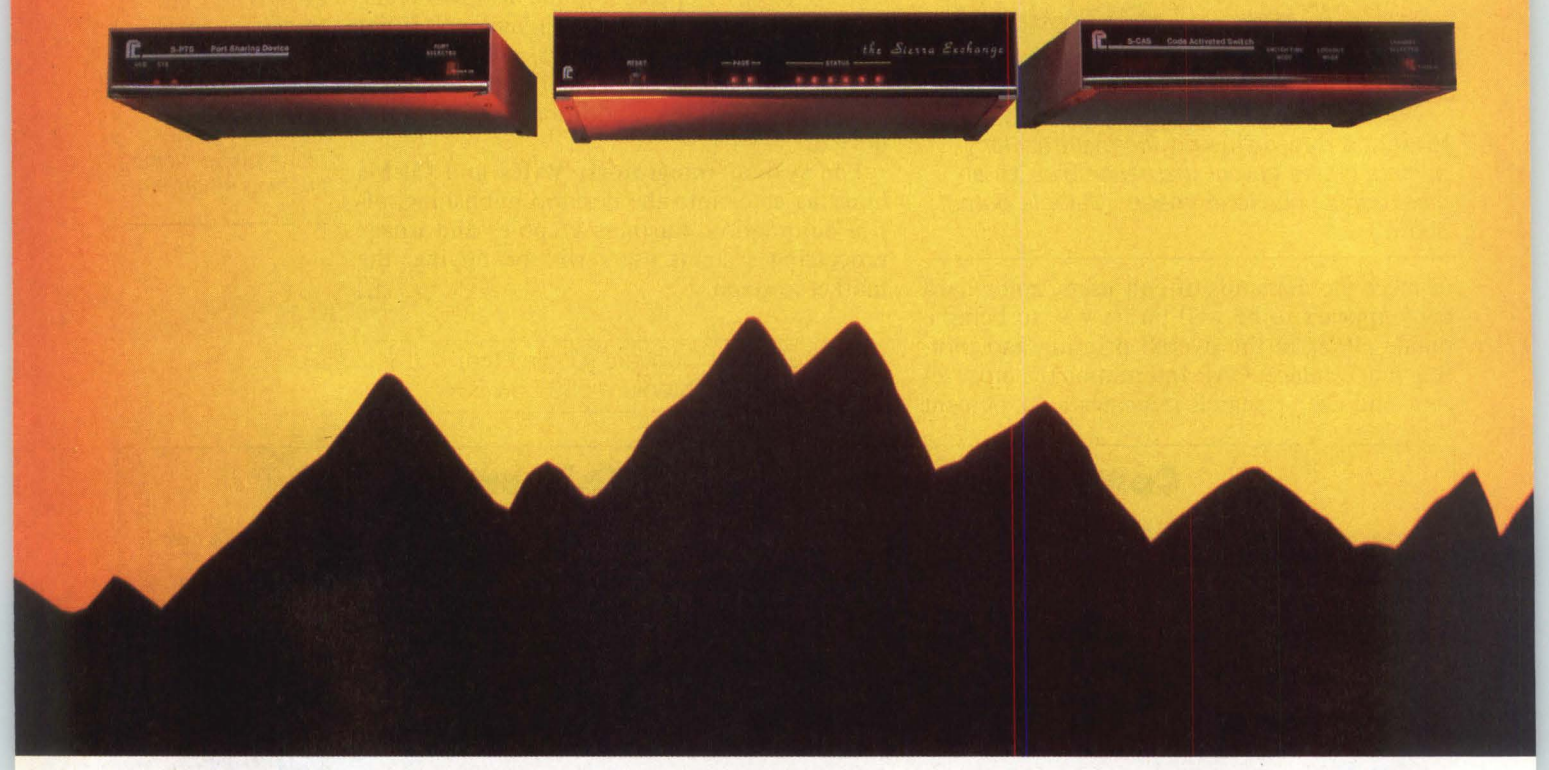
Synergy Computer Graphics Corp.
260 Santa Ana Court
Sunnyvale, Calif. 94086
(408) 749-8600
Circle 392

Versatec Inc.
2710 Walsh Ave.
Santa Clara, Calif. 95051
(408) 988-2800
Circle 393

Western Graphtec Inc.
12 Chrysler St.
Irvine, Calif. 92718
(800) 854-8385
Circle 395

Xerox Corp.
P.O. Box 24
Rochester, N.Y. 14692
(716) 423-5078
Circle 394

The Family That Shares its Resources Shares the Wealth



When your communication needs call for serial, parallel or a combination of devices, Reliable has the answer for you. Meet some of our family:

Code Activated Switches

One user can access up to 8 devices under code control and direct output to a combination of printers, terminals, modems or plotters. Our switch selectable graphics mode lends itself to passing graphics data while maintaining the integrity of code control.

Sierra Exchange

A true data spooler that is expandable to TWO MEGABYTES of buffer accommodating communication rates of up to 38.4 K bps. You can output to any array of serial OR parallel devices with as many as three communication channels operating simultaneously without operator involvement.

Port Sharing Units

Distribute the expense of even the most costly peripheral by allowing up to 8 users to access or share in its productivity. Access is granted sequentially or on a user defined priority basis.

CALL NOW for more information on our OEM and VAR pricing programs or for your own customized resource sharing solution.

(800) 222-0042
(408) 733-1787 in CA
(408) 733-0827 FAX

CIRCLE NO. 22 ON INQUIRY CARD

reliable communications, inc.

136 So. Wolfe Road
Sunnyvale, CA 94086

COLOR BRIGHTENS DESKTOP PUBLISHING

What's expensive and slow, but saves money and time? For some applications, the answer might be PostScript-based color desktop publishing.

David Simpson, Senior Editor

Within two months, you'll be able to buy a color desktop publishing system, complete with Adobe Systems Inc.'s PostScript page description language and a 300-dot-per-inch (dpi), color thermal-transfer printer. If that seems too good to be true, that's because, in part, it is.

For one thing, the controller and printer alone will cost almost $25,000. Add a personal computer and page-composition software and the price approaches or exceeds $30,000, depending on whether you go with an IBM Corp. PC or an Apple Computer Inc. Macintosh. Moreover, you'll have to plan your coffee breaks around the printing, because the system is slow. For example, a typical 8½-by-11-inch page with color graphics and text will take between 1 and 2 minutes to print.

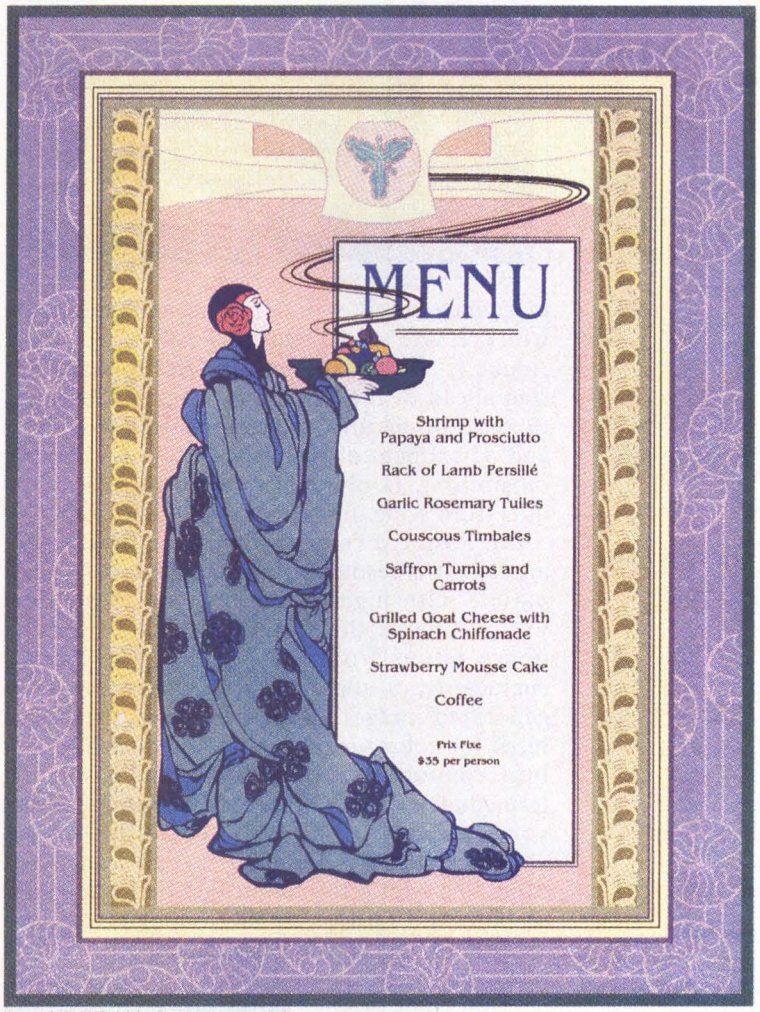
Nevertheless, the appeal of adding color to PostScript-based desktop publishing will be irresistible to some, particularly for applications such as prepress color proofing and presentation graphics.

QMS packs one-two-three punch

QMS Inc. expects to be the first company to field a PostScript-compatible color printer marketed for desktop publishing. Shipments are slated for this month or next. The brain of the system is a QMS controller residing in an enclosure that attaches to the printer. A Motorola Inc. M68020 microprocessor powers the controller. The enclosure also includes a rigid disk drive for functions such as downloading fonts. At press time, QMS was undecided about the optimum amount of RAM, noting that it would be between 4M bytes and 16M bytes.

The heart of the system is the G650 color thermal-transfer print engine manufactured by Mitsubishi Electronics America Inc. This engine uses a sequential color wax-transfer process and square pixels, and prints in seven colors (red, green, blue, yellow, cyan, magenta and black).

The muscle of the system is a color version of PostScript, which allows users to specify cyan,



Copyright© 1987 Adobe Systems Incorporated.

This image *was created on an Apple Macintosh Plus using Adobe Illustrator software and a prototype QMS printer based on a Mitsubishi thermal-transfer print engine and a PostScript controller.*

At the heart *of QMS' color printer is Mitsubishi's 300-dpi, G650 thermal-transfer printer. The unit prints in seven colors: black, cyan, magenta, yellow, red, green and blue.*

magenta and yellow or red, green and blue. And with pressure mounting from PostScript clones, Adobe is adding color capabilities to stay one step ahead of the emulators. Foremost among those additions are features for color correction and adjustment of screen angles on four-color separations. (Differently rotated screens keep dots from lying directly on top of each other.)

But PostScript's most important advantages are that it is resolution-independent and compatible with high-resolution typesetting devices, such as the Linotronic 300 and 500 image setters from the Linotype Co. These characteristics allow users to send computer-generated images directly to prepress equipment for color separations. This procedure, in turn, eliminates time-consuming and costly intermediate steps. "Call it 'desktop prepress,' if you like," says Tony Bove, co-editor of the *Desktop Publishing* newsletter in San Francisco. "But," he adds, "the connection between color graphics editing on personal computers to color separation and prepress equipment will be the most important catalyst for the acceptance of desktop color printers in the office."

The last piece of the puzzle is page-composition application software. And most popular packages, such as Aldus Corp.'s PageMaker 3.0 and Xerox Corp.'s Ventura Publisher, have recently added robust color capabilities. Alternatively, value-added resellers and software developers can write their own customized applications around PostScript and printers such as QMS'. Graphics packages such as Adobe's Illustrator and Aldus' FreeHand allow users to specify color percentages and to create color separations.

QMS will sell its printer through its traditional channels—OEMs, VARs and distributors. The company's reseller subsidiary—Laser Connection Inc.—will also sell the system through a limited number of key distributors.

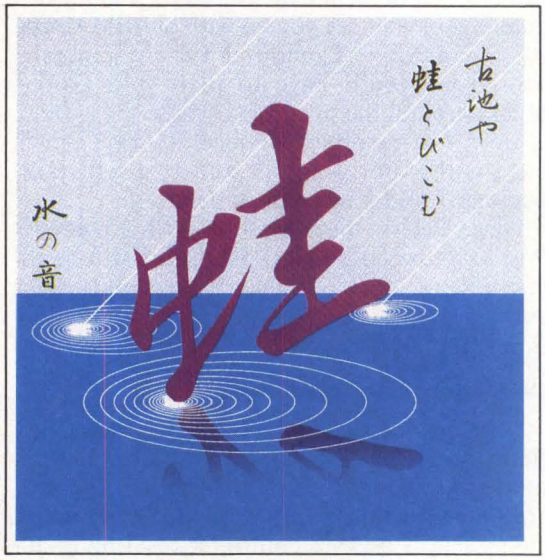
Although the QMS is one of the first PostScript-based color desktop publishing systems —and many others are sure to follow—it serves as a model for identifying potential applications.

The proof's in the PostScript

Despite the high cost, there are two key application areas that can benefit from color desktop publishing: prepress proofing and presentation graphics for small groups.

Using a system such as QMS' for prepress proofing can save time and money because it eliminates a step in the conventional color-proofing process. In most publishing scenarios, users send color images to the printer and get color proofs, called Chromalins. These proofs are used to check the color of the image. Chromalins usually cost about $150 per page.

A PostScript-based system enables users to proof and correct their color hard copy and then send the files directly to the printing house (assuming the printing house has a PostScript-compatible device), thus bypassing the intermediary color-proofing step. The goal, of



This image of Kanji characters *was originally painted and then scanned into Adobe Illustrator software running on a Macintosh Plus. The output device was a prototype QMS printer based on a Mitsubishi thermal-transfer print engine and PostScript controller.*

Color laser printers to debut in third quarter

The check's been in the mail for over a year now, but it looks as though affordable color laser printers will finally arrive in the third quarter of this year. That's according to Frank Rowe, executive vice president at Colorocs Corp., which is expected to be the first to develop an under-$40,000 color laser printer.

Colorocs designs the engines and delivers prototypes to controller manufacturers and OEMs. QMS Inc. and Texas Instruments Inc. are among the OEMs that have received prototypes from Colorocs. Sharp Corp. manufactures the print engines in Japan.

The color laser printer is based on the same technology that is behind Colorocs' color copier: The laser puts down an image on a photoreceptor, which in turn picks up toner. Colorocs plans to ship this color copier in March. Printer speeds will depend on how the controllers are implemented, but Rowe expects it to print four-color pages, with text, at about 10 pages per minute. Black-only speeds will push 30 to 40 ppm. Rowe also estimates that the system, including controller, will cost between $30,000 and $35,000.

course, is to eliminate the iterative and costly process of sending images to the printing house, receiving Chromalin proofs, correcting them if they're wrong, resending the page, and so forth.

On the down side, the color quality from the in-house printing machine will probably not exactly match what you'll get from the commercial printer. However, Liz Bond, director of marketing at Adobe, maintains that the color quality of the hard copy will be "adequate enough that you'll be able to use it as a proofing device."

The degree that colors from the Mitsubishi engine will match the final color separations depends, in part, on the quality of the software —both the PostScript interpreter and the application software. "You're never going to get an exact match between color output and the printing press," says Jonathan Seybold, president of Seybold Seminars, a Malibu, Calif., publisher of reports on the desktop publishing market. "What you want is a predictable match," he says.

In fact, even Chromalins don't exactly match the final color separations. Thus, with a PostScript-based color-printing system, you get a match that may not be exact, but it's as good as possible and about as good as using the traditional method.

Buyers remain skeptical

Some prospective buyers remain skeptical. "Color proofing is a pretty generous word for it," says David Dunkelberger, vice president and creative director at Weisz and Yang Inc., a graphics design company in Westport, Conn. Dunkelberger is afraid that the mismatch in color between the Mitsubishi engine and color separations will cause the same design problems as the current mismatch between the screen (monitor) color and printer output.

Weisz and Yang Inc. was one of the first companies to get a prototype of the QMS output system. However, at press time, the company had not received the PostScript version. "I don't want to downplay it," says Dunkelberger, "It's just that I have to see it." To create color comprehensives for corporate clients, Weisz and Yang uses various combinations of Apple Macintosh IIs, SEs and Pluses, Mitsubishi monitors and the thermal-transfer engine. Also, they use a turnkey system from Lightspeed Inc., based on a Macintosh II; a SuperMac Spectrum monitor; and color page-layout software.

It should be noted that PostScript-based color desktop publishing will not eliminate color separations, at least in the near term. The 300-dpi thermal-transfer printers are just not exact enough to be used for final color separations. It could, however, eliminate interim proofing. "The driving force catalyzing desktop color printing," says *Desktop Publishing's* Bove, "will be lower proofing costs."

Adobe is refining the color calibration powers of PostScript, and application package developers are also adding more precise color-specifying functions. Current versions of PageMaker, Ventura Publisher, Apple's MacPublisher and Quark Inc.'s XPress, for example, have features for adding spot color. In addition, companies are licensing Pantone Inc. ink colors (referred to as the Pantone Matching System, or PMS), which will enable them to get as close to printing-press output as possible.

The next step for PostScript is Display PostScript which, according to Adobe's Bond, will be available later this year. Display PostScript will be either loaded by flexible disk or be resident on a monitor controller and will provide true what-you-see-is-what-you-get (WYSIWYG) in color. Additionally, it will be

'You're never going to get an exact match between color output and the printing press. What you want is a predictable match.'

LaserView PLUS:
The Editors' Choice is Now Supported by All the Standards.

". . . unquestionably altered the definition of high resolution."
PC Week

". . . provides the sharpest image of all."
PC World

"LaserView: The Master of the Raster"
Bits & Bytes Review

". . Breathtaking . . . the Rolls Royce of large screen monitors."
InfoWorld

What They've Seen:
LaserView, the ultra-high resolution, 2,000,000 pixel (1664x1200) display system for IBM PC, XT, ATs.

The ultimate system for displaying two full facing pages of legible text and graphics for your publishing applications.

Or detailed design drawings without excess panning for CAD/CAM applications.

CIRCLE NO. 23 ON INQUIRY CARD

What You'll Get:
LaserView PLUS,™ everything the editors raved about, PLUS a whole lot more: IBM-Monochrome and Hercules compatibility. And now LaserView stands alone. Literally! You can run all your standard software without a second monitor. So the premium display for professional graphics applications is now the only display you'll need.

For details and the dealer nearest you, call 415-770-0100.

LaserView and LaserView PLUS are trademarks of Sigma Designs, Inc. IBM is a registered trademark of International Business Machines. Hercules is a trademark of Hercules Computer Technology, Inc.

Sigma Designs, Inc.
46501 Landing Parkway
Fremont, CA 94538

S I G M A D E S I G N S

bundled with workstations such as the Macintosh II and Intel Corp. 80386 machines.

Another potential application for color desktop publishing is presentation graphics. However, because of the slow output speed of the QMS system, these jobs initially will be limited to small-group presentations, say, less than 25 copies. To make this application more attractive, you can run film through the Mitsubishi engine to create color transparencies for overheads that will match the color handout material.

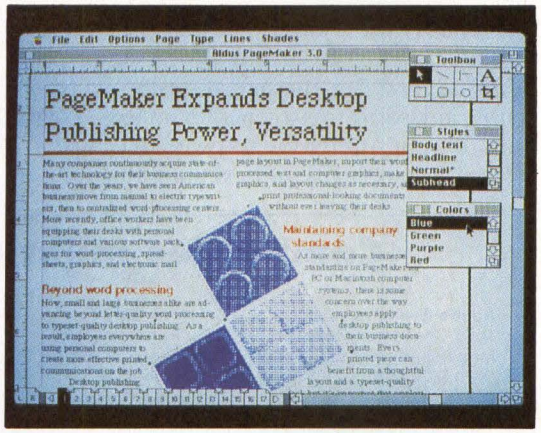
However, the high cost of the QMS system will be difficult to justify for this type of application. Herb LaButte, manager of automation services for Dana Corp.'s Center of Technology group, Ottawa Lake, Mich., says that his company could not justify the system for internal use. "It's relatively slow and expensive, and we don't have the volumes right now," he says, adding, "What I'd like to see is something in the $10,000 range."

'The driving force catalyzing desktop color printing will be lower proofing costs.'

Dana Corp., Toledo, Ohio, makes automotive parts for major customers such as Ford Motor Co. and General Motors Corp. The company uses Ventura Publisher software running on PC clones and Apple LaserWriter Plus printers as output devices for its publications. One potential market for the QMS system, says LaButte, is as a replacement for plotters in corporate-level presentation graphics applications in Fortune 500 companies.

Potential buyers should be aware of some serious drawbacks to color desktop publishing. As with monochrome laser printers, the advent of color desktop publishing does not give users their own printing presses. All medium- and high-volume printing or duplicating will still be done on large, high-speed printing presses. In addition, current desktop publishing technology can't deal with color photographs.

The ultimate goal, of course, is to have a fast, inexpensive color laser printer that prints at resolutions that are acceptable for color separations. "What is really needed," says Bove, "is a higher resolution PostScript-based raster plotter in the $20,000-to-$40,000 range. This plotter must provide the quality and correction



The newest version *of Aldus' PageMaker page-composition software, version 3.0, includes a variety of color-specification features.*

features of color prepress systems, while using software that is based on the Macintosh II or 80386 machines."

VAR/OEM opportunities abound

Color desktop publishing opens up a variety of profit opportunities for resellers, OEMs and system integrators. OEMs and controller manufacturers, for example, can follow the lead of QMS and develop specialized hardware to drive emerging printer technologies. Printer manufacturers can improve color capabilities, resolution and speed. And software developers can write drivers and add to the functionality of leading desktop publishing packages or develop their own, customized, packages to target vertical markets with technical documentation and graphics arts.

Software developers and VARs can also create custom templates for color desktop publishing systems. Another opportunity to add value is to provide integrated software solutions such as, say, combining a drawing program with a page-composition package and driver software for PostScript devices. In the Macintosh environment, this integration is largely taken care of, but in the PC environment the task often requires the skills of a system integrator.

Color desktop publishing also will add to the fortunes of VARs and system integrators. Unlike black-and-white desktop publishing, color prepress proofing and similar applications require skills that are beyond the ability of most end users. "The largest market is for people that don't want to be, or can't be, system integrators," says Seybold, who adds, "Dealers are migrating to becoming VARs."

Bove expects typesetting houses to be among the first customers for PostScript-based color desktop publishing systems. He adds that there are well over 200 Linotronic service companies, not counting large corporations, which

have in-house typesetting equipment. As the price of systems such as QMS' decline, ad agencies and graphics-arts outfits will line up to buy.

"[The QMS system] is only a building block," says Gary Carroll, QMS' senior product manager. He further states: "We're not selling any software to generate images. There's a lot of opportunity for software developers."

As the complexity of desktop publishing increases, the integration task will go beyond hooking up various pieces of software to encompass networking, printer sharing, file servers, optical disks, scanners and film recorders. This integration task is well-suited to system integrators and VARs. □

Interest Quotient (Circle One)
High 535 Medium 536 Low 537

Companies mentioned in this article

Adobe Systems Inc.
1585 Charleston Road
Mountain View, Calif. 94039
(415) 961-4400
Circle 349

Aldus Corp.
411 1st Ave. S.
Seattle, Wash. 98104
(206) 622-5500
Circle 350

Apple Computer Inc.
20525 Mariani Ave.
Cupertino, Calif. 95014
(408) 996-1010
Circle 351

Colorocs Corp.
2830 Peterson Place
Norcross, Ga. 30071
(404) 448-9799
Circle 352

IBM Corp.
1133 Westchester Ave.
White Plains, N.Y. 10604
(914) 765-1900
Circle 353

Laser Connection Inc.
7852 Schillinger Park W.
Mobile, Ala. 36608
(205) 633-7223
Circle 354

Lightspeed Inc.
47 Farnsworth St.
Boston, Mass. 02210
(617) 338-2173
Circle 355

Mitsubishi Electronics America Inc.
Peripherals Division
991 Knox St.
Torrance, Calif. 90502
(213) 515-3993
Circle 356

QMS Inc.
1 Magnum Pass
Mobile, Ala. 36618
(205) 633-4300
Circle 357

Quark Inc.
300 S. Jackson
Denver, Colo. 80209
(303) 934-2211
Circle 358

Texas Instruments Inc.
Data Systems Group
P.O. Box 809063, H-860
Dallas, Texas 75380
(800) 527-3500
Circle 359

Xerox Corp.
101 Continental Blvd.
El Segundo, Calif. 90245
(213) 536-7000
Circle 360

MEGARAM MEGARAM MEGARAM MEGARAM MEGARAM MEGARAM

The cost of fast disk access just came DOWN!

MegaRam
Solid-State Disks.
Capacities: 2 to 512 Mbytes.

Thousands of users worldwide know that the MegaRam is the most cost-effective way to lower system response times!

Today it is more economical than ever to put the lightning fast MegaRam solid-state disk to work for you. With access times in the microseconds, the MegaRam lets you add more users and applications while simultaneously improving performance. Increased performance results in better system utilization and productivity.

The MegaRam is particularly well-suited for frequently accessed data, such as index/database files, scratch files and CAD/CAM, as well as for disk based operating systems.

- Fully software compatible
- Easy to install; low maintenance
- Multi-ported
- Capacities from 2 to 512 Mbytes
- Both battery and magnetic backup
- Ideal for harsh environments

Interfaces to mini and micro computers: Data General, HP, DEC, Prime, Gould... and, the MegaRam is available ***now!***

Request our new free brochure today!

CIRCLE NO. 24 ON INQUIRY CARD

With the MegaRam, the only thing going up is your productivity.

IMPERIAL

Imperial Technology, Inc.
A Subsidiary of First Mississippi Corporation
831 S. Douglas Street · El Segundo, CA 90245
Telephone: (213) 536-0018
Telex: 664469 · Fax: (213) 536-0124

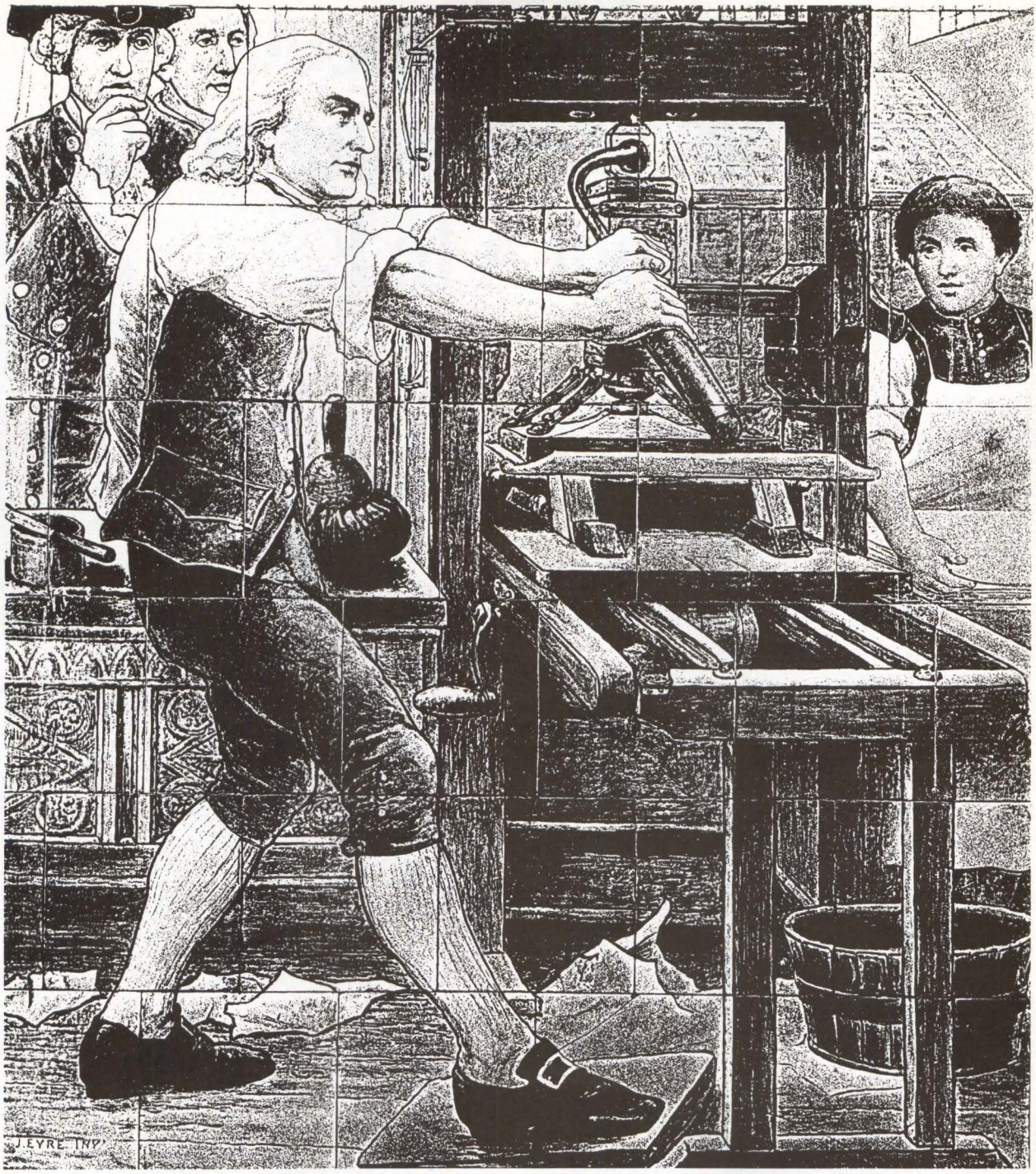


Illustration of Benjamin Franklin first exhibited in the Great Exhibition of 1851, now permanently on display in the Cafe Royal, Edinburgh.

Independent, idealistic, visionary – his own man. All descriptions which could be applied to both the creative genius and entrepreneur in their pursuit of an ideal.

Such a man was Benjamin Franklin, American statesman and distinguished scientist.

His first attempt to go it alone as a printer – an honest artisan – failed, and it was only his reserves of inner strength and single-mindedness which sustained him.

It's a great pity he couldn't have set up here in Glenrothes. He would have found no shortage of help and encouragement from well-established companies in the town – Benjamin could even have bought all his paper supplies right here in Glenrothes.

Here, in the heart of Scotland, he would have had the most breathtaking scenery in Europe to allay any homesickness and he could have played golf at St Andrews – before the folks back home in Massachusetts discovered the game.

If like Benjamin, you too are in pursuit of excellence, everything you need is here.

We'd like your company.

GLENROTHES

DEVELOPMENT CORPORATION

FOR FURTHER INFORMATION PLEASE CONTACT: JOHN McCOMBIE, DIRECTOR OF DEVELOPMENT, GLENROTHES DEVELOPMENT CORPORATION, BALBIRNIE HOUSE, GLENROTHES, FIFE, SCOTLAND KY7 6NR. TELEPHONE: 0592-754343. TELEX: 727125.

CIRCLE NO. 25 ON INQUIRY CARD

How KMW meets graphics processing needs from A to E.

As much graphics processing power as you need.

Look to KMW for the right connections to fit your needs. Our high performance graphic element processors – the VP-10 and the VP-30 – can handle everything from simple A-size plots to high density E-size plots. Both processors are designed to help you produce graphics output as efficiently as possible.

Our VP-10 is perfect for plots up to 24". Buffered input allows the VP-10 to store 2Mb of graphics data.

The high speed VP-30 has a disk storage capacity expandable to 40Mb and can handle plots up to 44".

Better productivity through decreased downtime.

If you're letting your host computer rasterize your data, it ties up the whole system, keeping you and your co-workers from getting any work done while the plot's in progress. But the VP-10 and VP-30 rasterize data independently of the host computer, so you can stay productive while your plots are being produced. And both processors can receive input while they're outputting a plot.

Compatible with a variety of software packages and output devices.

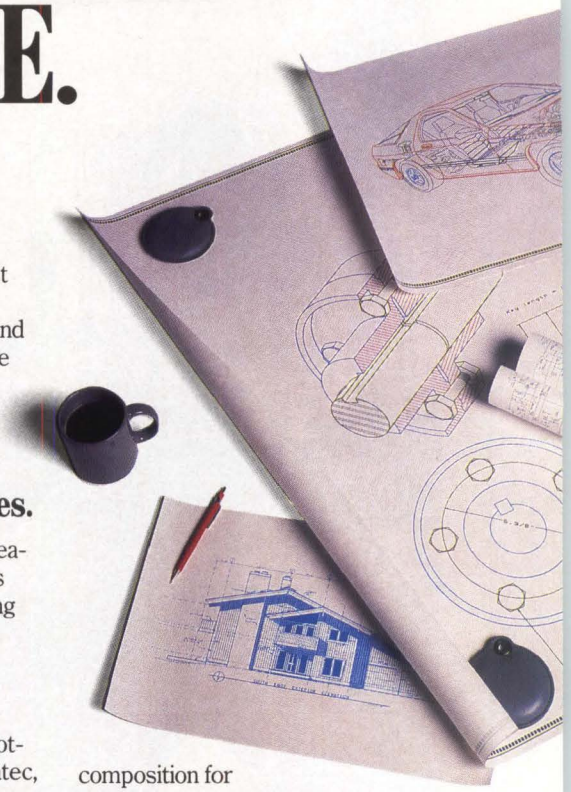
The VP-10's pen plotter emulation feature allows compatibility with hundreds of graphics software packages, including VersaCAD, AutoCAD, and SAS. The VP-30 can be used with such popular packages as CADAM, CADS4X and Scicards/Quickplot.

The VP-10 supports electrostatic plotters from Benson, CalComp and Versatec, as well as small color raster devices from Seiko and Mitsubishi. Input data formats include KMW.PLT, HPGL (HP pen plotters), and CalComp 906/907. The VP-30 supports Versatec, Benson and CalComp electrostatic plotters – including color – and drives them at full speed. It accepts CalComp 906/907, 925, 960 and KMW.PLT data formats.

This wide range of compatibility allows you to use different plotters without having to replace your processor.

Designed for better quality – in black and white or color.

Both the VP-10 and VP-30 produce monochrome and color raster page composition for applications such as architectural, mechanical or electrical CAD and business graphics. In conjunction with an electrostatic plotter or thermal printer, both processors let you produce plots of the highest quality – in a fraction of the time it would take to produce a pen plot.



Expert answers from KMW.

KMW has been helping companies make the right connections for more than ten years, with graphics processors, channel interfaces, and protocol converters. For complete information, call the toll-free number below. Or write KMW Systems Corporation, 6034 W. Courtyard Drive, Austin, Texas, 78730.

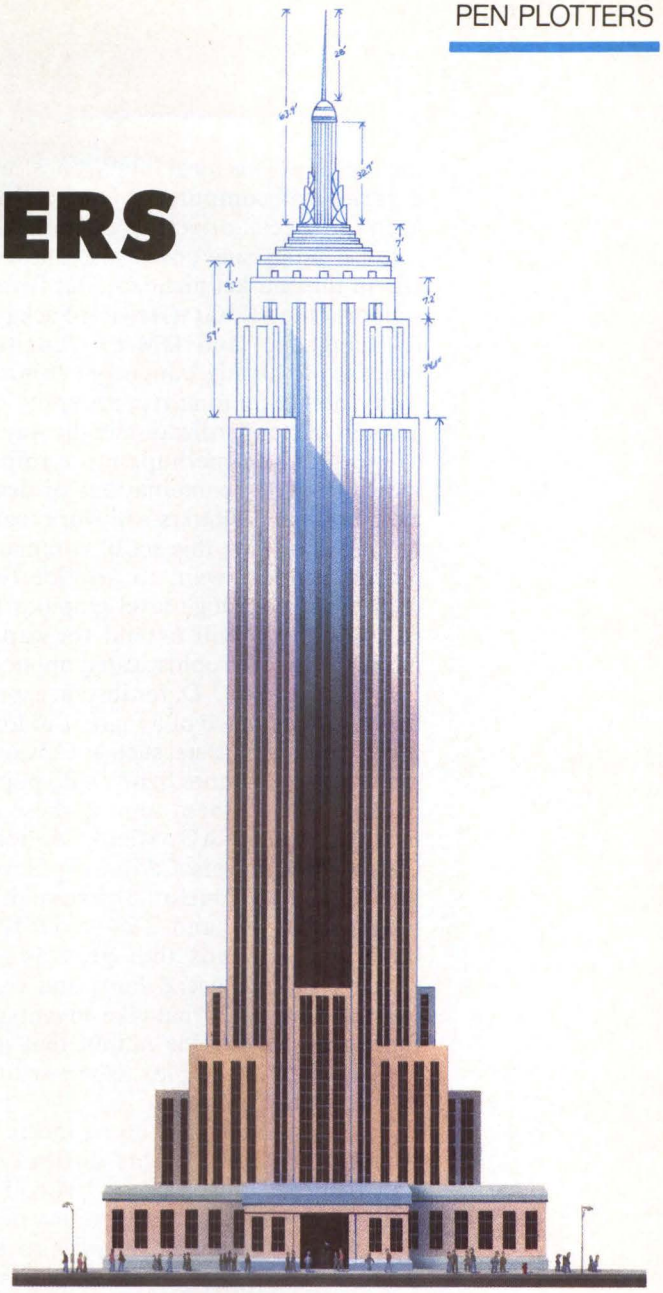
KMW SYSTEMS CORPORATION

(800) 531-5167
In Texas, (512) 338-3000

Trademarks: Versatec – Versatec, Inc., a Xerox Company; Benson – Benson Corporation; CalComp – California Computer Products, Inc.; Seiko – Seiko Instruments USA; HPGL – Hewlett-Packard; Scicards/Quickplot – Scientific Calculations. **Registered trademarks:** Mitsubishi – Mitsubishi Electric Corp.; AutoCAD – Autodesk; VersaCAD – Versacad Corp.; CADAM – CADAM, Inc.; CADS4X – Computervision; SAS – SAS Institute Inc.
©1987 KMW Systems Corporation

CIRCLE NO. 26 ON INQUIRY CARD

SMART PLOTTERS GET FASTER



With local intelligence, pen plotters overcome the slow mechanical limitations of motors, pens and moving parts

Edward R. Teja, Contributing Editor

Despite the widespread integration of personal computers into computer aided engineering (CAE) systems, they still remain the new kids on the block. And although the watchword in computer system integration appears to be "desktop," most design centers where mechanical designers, architects, civil engineers and other planners toil over sketches or blueprints are found in large facilities. In these shops, teams of engineers rely on relatively large equipment to produce complex designs.

Selecting the right peripheral to provide hard copies of drawings on paper, vellum, polyester film media or transparency film ranging in size from ANSI A to E is the system integrator's job.

Mini-Micro Systems has examined the current generation of pen plotters and finds they provide the resolution and throughput that used to come only from large, expensive flatbed plotters (see Table). The new plotters are available in space-saving upright roll-feed and cut-sheet configurations and are priced from about $1,700 to $14,000.

These prices reflect a spectrum of plotting capability and a choice of pen configurations from one to 20. For example, mechanical resolution (the accuracy with which the plotter places a dot on the media) varies from within 0.004 mm to within 0.0002 mm. However, price doesn't always indicate performance so much as it indicates the choice of options. Some vendors do offer low-cost units that plot slower or handle small sized output. Zericon's model 3600-D, for instance, plots at only 7 ips, for $1,695. It's hard to argue that this is low performance. You are getting at least what you paid for. But not all vendors adhere to this marketing strategy. Instead, they choose to pack high performance into all models and then let system integrators and value-added resellers upgrade to get additional features that might be needed for a specific application—features such as extra pens.

Both Houston Instrument and Ioline Corp., for example, treat their plotters as single-pen units that expand, in the case of Houston Instrument, to six pens, and, in the case of Ioline, to 20 pens. Ioline features a single-pen unit that, for $500 above base price, upgrades to an eight-pen plotter. Then, once this upgrade is accomplished, the system integrater adds as many as three four-pen trays at $100 apiece. This strategy ensures that the system integrator can specify a particular performance level, without having to pay for unneeded options.

The speed of the pen across the media is but a small part of the throughput story.

Smartly drawn

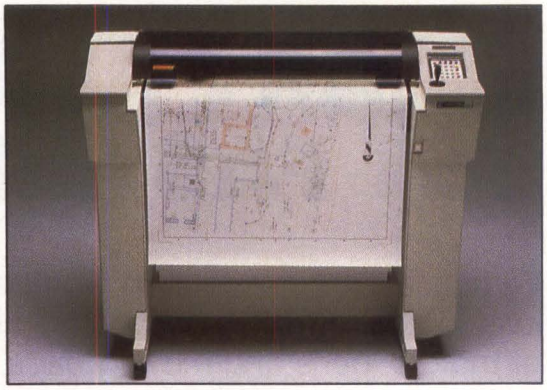
As with more glamorous peripherals, plotters have followed an upward path toward more

intelligence. This local intelligence can support a variety of computer systems, without the need for special drivers in the host.

Local processing power also allows the plotters in this market niche to offer firmware that supports the HP-GL (Hewlett-Packard Graphics Language) and DM/PL (Digital Microprocessor Plotting Language) command sets. And this commonality provides a certain amount of standardization in the way hosts talk to plotters and, perhaps more important, it indicates which combinations of design packages, hosts and plotters will work together. But beyond executing this set of commands, some plotter vendors want to provide the system with even more high-level graphics functions, functions that will extend the capability of plotters to more sophisticated applications.

In the world of 3-D, for instance, pen plotters haven't made much of a mark. But local intelligence permits plotters, such as CalComp's Plotmaster, to tie in more tightly with popular CAD packages. Prominent among these are Autodesk Inc.'s AutoCAD, Micro Control Systems' CADKEY and VersaCAD Corp.'s VersaCAD. For example, Houston Instrument's $4,695 model DMP-61 and $6,495 DMP-62 have built-in commands that provide automatic closed-area fill, special fonts and cross hatching. CAD packages that take advantage of these functions can provide output that used to be too laborious or complex to be worthwhile with only low-level products.

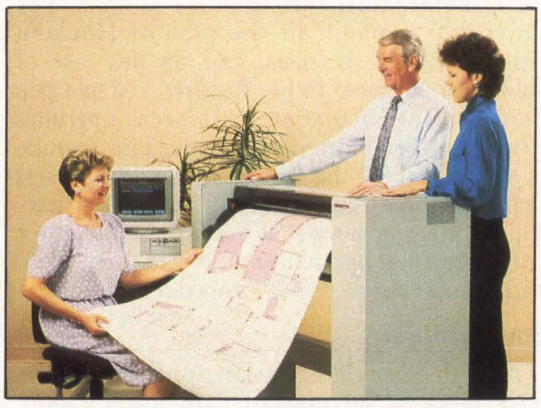
Because plotters can do so much, matching devices and needs is more difficult than ever. CalComp has broken up its 1040GT family of eight-pen plotters and now offers devices that vary widely in capability and also in price—from $4,895 to nearly $14,000 (installed). The new 1032 replaces the familiar 1041GT (CalComp will continue to service the 1041). The 1032 plots drawings up to D size, and it features built-in optical sensors that help the plotter to automatically adjust force, velocity and acceleration parameters to pen type—liquid ballpoint, fiber or plastic tip, etc. CalComp's other three plotters produce drawings up to E size. The top two models of this family handle both cut-sheet and continuous-roll with either paper or one of the various films.



Houston Instrument's DMP-62 *plotter handles cut-sheet drawings up to ANSI E size at speeds up to 32 ips.*

Most vendors offer a model or two that features continuous-roll paper handling for unattended operations. To exploit that feature even more, CalComp also offers a software utility called BatchPlot that lets AutoCAD users plot up to 60 drawings in one run.

Taking advantage of the recent improvements in plotter technology, Hewlett-Packard Co. has replaced its family of 758X model plotters. The new $9,900 HP DraftMaster, which handles cut-sheet paper, and the $11,900 roll-feed DraftMaster II represent substantial price reductions over older models along with improvements in performance. (The DraftMaster I upgrades to a model II with a field-installed $2,500 option.)



Hewlett-Packard's DraftMaster *plotters use a 10-MHz Motorola M68000 microprocessor to provide intelligent graphics functions.*

The speed's the thing

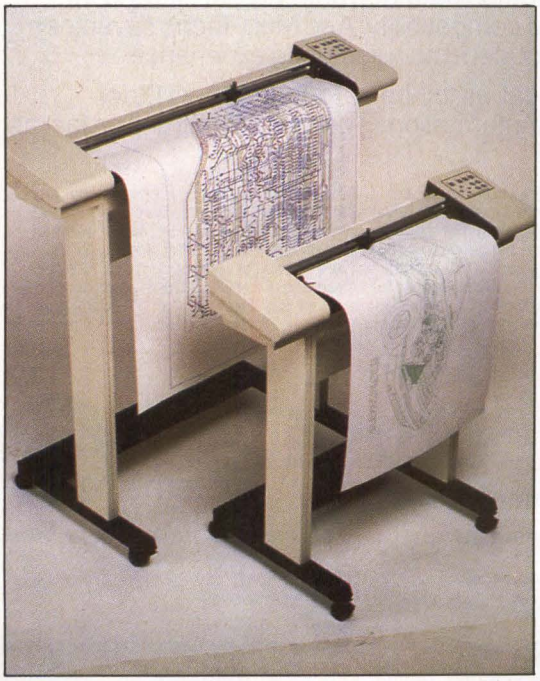
A large part of the competition and product differentiation among these peripherals centers on how fast the plotters plot. Given equal resolution and repeatability, the name of the game should be throughput. But plotter manufacturers talk about throughput only indirectly by touting pen acceleration and plot speed.

Acceleration, as the word implies, refers to how fast the plotter moves its pen. It is measured in terms of the lateral force exerted on the pen; the more Gs exerted on the pen, the faster it takes off. Older models accelerate at less than 1G. Most of the newer plotters range as high as 4Gs. And some vendors specify the

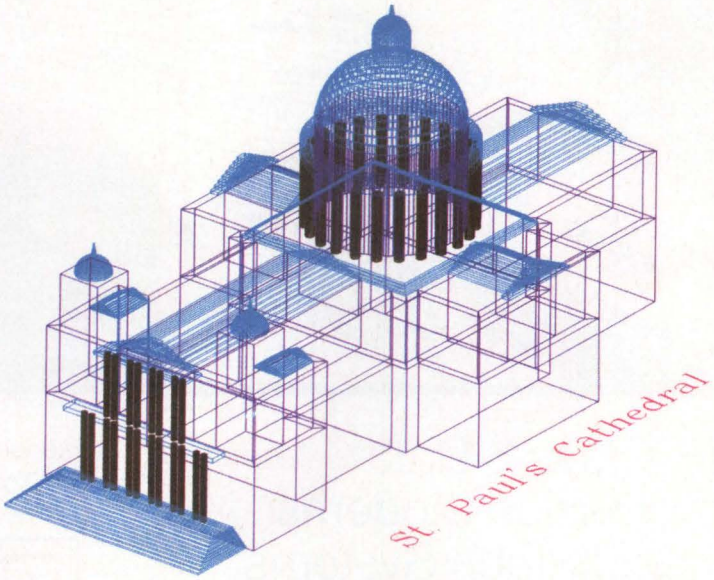
pen's acceleration differently for each direction in which the pen moves. For instance, both of HP's DraftMaster plotters claim 5.7G diagonal acceleration and 4G acceleration on the axis.

Pen acceleration is limited not so much by positioning mechanics as by overall plotter-system design. For example, if the media-handling components of the plotter can't keep pace with the pens, the media will distort or even tear. Media distortion affects repeatability and, when sufficiently severe, can render a drawing worthless. And the larger the media, the worse the problem. Some companies compensate by slowing pen movement for plotters that work with E-sized drawings. And most vendors make the plot speed and acceleration programmable because the amount of media distortion is going to depend on the particular media (its thickness, smoothness, etc.). At any rate, the maximum quoted speed is not usually the maximum rate that the pens can move. Rather, it is the maximum rate that the pens can move while producing a quality of output the vendor is willing to guarantee.

Houston Instrument's DMP-61 (the fastest unit listed in the Table) pushes the capability of the pens at 32 inches per second (ips), according to the vendor. When they try to write faster, the ink won't flow freely enough to produce a completely solid line. But the high speed, even higher than the vendor rates, is available for doing quick check plots, which are analogous to draft-quality text from a printer.



CalComp's 1040GT family *of plotters use a proprietary Batchplot utility to run as many as 60 plots in a batch.*



CalComp's Plotmaster *furnishes the high-level commands that design packages such as AutoCAD use to obtain the shading and multiple colors needed for quality 3-D graphics, as above.*

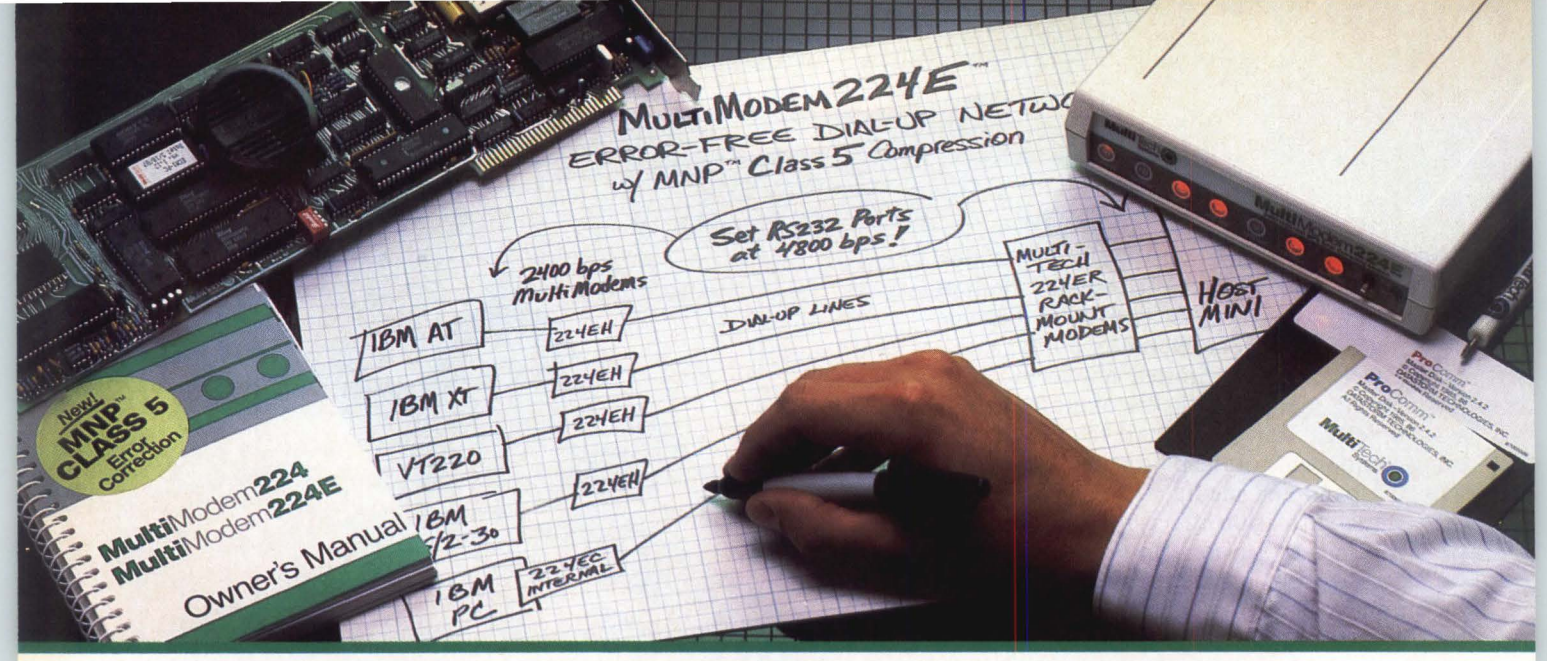
HP attacks the media-distortion problem directly. DraftMaster plotters depend on 3-inch-wide strips of polymide placed along the front and rear edges of the platens. This strip, called a media stabilizer, dampens media movement. Stable media lets the plotter provide its best quality at its highest speed, and the 24-ips plot speed doesn't tax the limits of ink flow.

Speed at any cost is not a design goal of plotter manufacturers. Most plotter vendors, therefore, make the plot speed programmable. Furthermore, raw speed—the speed of the pen across the media—is but a small part of the throughput story.

The other part is efficiency—how well the algorithm that plans the path the pen takes does its job. When the fastest route between two points is a straight line, brute speed wins out every time; but when the pen's route is more complex, local intelligence proves its worth.

The firmware in CalComp's 1040GT family of plotters works hard to minimize the amount of pen movement and the number of pen changes required for any particular drawing. The 1040GT family has one of the slowest pen acceleration specs—1.2G—but, according to CalComp, the algorithms in the plotter's proprietary ROMpack firmware cartridge give it as much as 100 percent more throughput than pen plotters with equal plotting speed and acceleration.

CalComp's strategy bears up well under close inspection. Plotters with local intelligence in-



MNP™ Class 5 Data Compression Modems from Multi-Tech Systems:

When it has to be as *fast* as it is good

- In the dial-up modem world, Class 3 MNP is the hands-down choice for hardware-based error correction. With its 100% error-free transmission, the MNP protocol is used in dozens of manufacturers' 1200 & 2400 bps modems, and our MultiModem224E modems have been recognized as the best of their kind (see box).
- Well, the best just got better. Multi-Tech modems now offer MNP *Class 5* data compression along with error-correction. Class 5's 2-to-1 compression and serial port speed conversion means that you can buy a 2400 bps modem from Multi-Tech and run it at speeds of up to 4800 bps*. Error free!
- Multi-Tech Class 5 modems will communicate automatically with MNP Class 4 and Class 3 modems, as well as non-MNP modems. And if you wish, you can even upgrade your present Multi-Tech Class 3 & 4 modems to Class 5 (call us for details).

PC MAGAZINE EDITOR'S CHOICE

In the May 12, 1987 edition of PC Magazine where 87 modems were reviewed, only three were awarded *Editors Choice*: "For a high-performing 2,400-bps modem with a slew of extras, check out Multi-Tech Systems' MultiModem224E... with [its] high immunity to line noise and the extra advantage of MNP error correction, [this modem] should do a fine job of managing fast, error-free data communications."

- Our Class 5 modems incorporate all of the features of our Class 3 versions. Features like phone number & configuration memory, auto-repeat dial and "AT" command compatibility. And Multi-Tech's seventeen years of modem manufacturing experience.
- Please call us toll-free at **1-800-328-9717**, for additional information... get a modem that's as fast as it is good!

* The compression throughput of MNP Class 5 is, like all compression schemes, dependent on the type of data being sent. The more "compressible" the data, the greater the throughput. For example, a typical text file transfer at 2400 bps should yield a throughput of between 4400 and 4900 bps. And the MultiModem224E's speed conversion and flow control features let you set your modem's RS232C port at 4800 or even 9600 bps, to take full advantage of the Class 5 compression.

Trademarks: MultiTech, MultiModem—Multi-Tech Systems, Inc.; PC Magazine—Ziff Davis Publishing; MNP—Microcom Network Protocol licensed from Microcom, Inc.

Multi Tech® Systems

CIRCLE NO. 27 ON INQUIRY CARD

See Us at Interface '88

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 • 1-612-631-3550 • FAX 612-631-3575 • TWX 910-563-3610 (U.S.A.) • Telex 4998372 MLT TC (International)

crease performance by combining long series of commands into macro commands that eliminate unnecessary pen motion. Furthermore, the intelligent plotter can anticipate drawing problems and provide solutions. The HP family of plotters, for example, uses a 10-MHz Motorola Inc. 68000 processor to provide features such as a continuous smooth-curve generator. Normally a shallow curve is treated as a series of individual drawing events. The smooth curve generator is a software feature that looks ahead to identify an approaching shallow curve and then maintains the plotter speed while drawing the curve. HP's DraftMaster eliminates unnecessary pen-up moves. That helps speed things considerably. By combining pen-up commands, the plotter can move the pen directly to the beginning of the next vector on the curve.

Most implementations are in multiple-user environments, where the cost of the plotter can be shared by several workstations.

Unfortunately, the very fact that local intelligence bears so heavily on performance means that it isn't possible to make direct comparisons without benchmarking the drawings that a system must actually handle.

Ioline's LP4000 features *20 ips plotting on A- through E-sized media and on roll stock as wide as 37-inches.*

A POINT-TO-POINT PLOTTER COMPARISON

	Sheet size	Maximum acceleration (G)	Plot speed (ips)	Mechanical resolution (mm)	Pens	Base model price ($)
CalComp						
1023	A-D	2.8	30	0.0125	8	4,895
1042GT	A-E	1.2	24	0.0005	8	9,900
1043GT	A-E	1.2	24	0.0005	8	8,905
1044GT	A-E	1.2	24	0.0005	8	13,900
Hewlett-Packard Co.						
DraftMaster I 7595	A-E	4	24	0.0002	8	9,900
DraftMaster II 7596	A-E	4	24	0.0002	8	11,900
Houston Instrument						
DMP-61	A-D	4	1-32	0.0005	1-6	4,695
DMP-62	A-E	2	1-32	0.0005	1-6	6,495
Ioline Corp.						
LP3700	A-E	2	10	0.0025	1-20	4,195
LP4000	A-E	0.8	20	0.001	1-20	5,495
RDK Inc.						
RY-5200	A-D	2	20	0.003	8	5,395
RY-5214	B-D	4	16	0.0125	4	4,895
Zericon						
3600-D	C-D	1	7	0.004	1	1,695 (direct from manuf.)

Source: Mini-Micro Systems

Compressing the pen's many requested movements into just a few requires buffer memory. Furthermore, buffer memory is important for caching vectors sent from the host computer. RDK Inc. provides a 12K-byte buffer for its four-pen model RY-5214 ($4,895) and 128K bytes of buffer space for its eight-pen model RY-5200 ($5,395). Ioline's LP4000 and LP3700 plotters have standard buffers of 4K bytes and 14K bytes (which will handle about 1,500 vectors), respectively. The company also offers a 512K-byte hyperbuffer with plot-optimization intelligence. The RY-5214 uses ceramic and ballpoint pens and can be adapted for ink pens and pencils.

The real world buffered

In some cases, sufficient buffer memory for optimization tasks still might not be enough for the overall application. Houston Instrument features an optional 1M-byte buffer ($995) that equips its plotters to work with local area networks. And this strategy makes sense, for at $6,000-plus for a pen plotter, it is reasonable to expect most implementations to be aimed at multiple-user environments, where the cost of the plotter can be shared by several workstations.

Certainly, pen plotters aren't an all-purpose output device, and pen plotting isn't the only technology competing in its market area, but, in terms of price and performance, the current generation is keeping pace with the needs of the system integrator. □

Companies mentioned in this article

CalComp
2411 W. La Palma Ave.
Anaheim, Calif. 92803
(800) 225-2667
Circle 343

Hewlett-Packard Co.
16399 W. Bernardo Drive
San Diego, Calif. 92127
(800) 367-4772
Circle 344

Houston Instrument
8500 Cameron Road
Austin, Texas 78753
(512) 835-0900
Circle 345

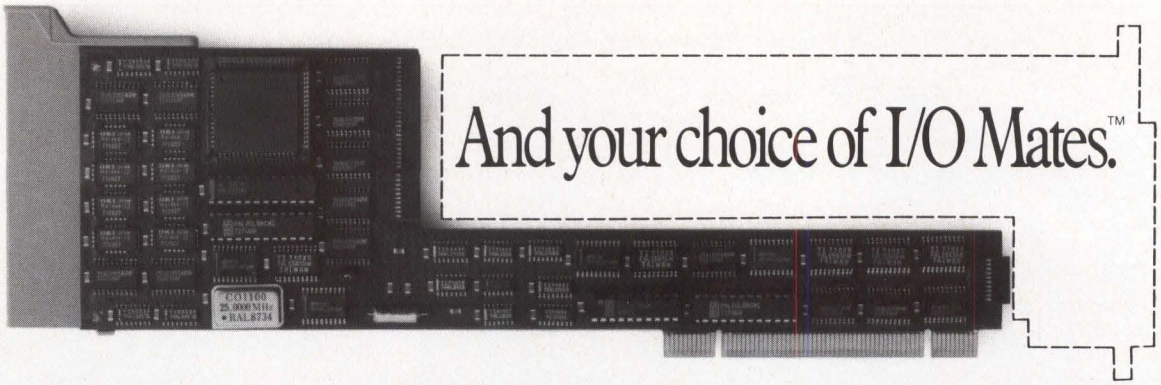
Ioline Corp.
19417 36th Ave. W.
Suite D1
Lynnwood, Wash. 98036
(206) 775-7861
Circle 346

RDK Inc.
P.O. Box 14743
Austin, Texas 78761
(512) 832-5464
Circle 347

Zericon
4423 Enterprise St.
Freemont, Calif. 94538
(415) 490-8380
Circle 348

Interest Quotient (Circle One)
High 538 Medium 539 Low 540

Introducing the OpenEnder™ Intelligent Multi-Channel Communications Board for PS/2.



Now, with DigiBoard OpenEnder™ Intelligent Communications Boards, you can channel the power of IBM Personal System/2 to up to 32 users. 400% faster than the boards you're probably using now.

But what really sets DigiBoard OpenEnders apart is that you only have to pay for the expensive intelligent part once. Because your I/O functions are handled by affordable I/O Mate™ modules that simply plug in.

So, for the first time in the history of intelligent communications boards, your I/O options are wide open. And they always will be.

DigiBoard
Plugging you into tomorrow.

Call 1-800-344-4273. In Minnesota, (612) 922-8055.

CIRCLE NO. 29 ON INQUIRY CARD

Finally a TI™-34010 graphics controller card in sync with your 286/386-based application

Vectrix matches your high-speed microprocessor with high-speed graphics. The PRESTO! graphics controller card utilizes a proprietary Digital Differential Analyzer (DDA), the TI-34010 graphics controller, 512K to 4.5 MBytes of on-board DRAM, and a unique organization of high-speed video shifter RAMS. The result — line drawing speeds in excess of 10 million pixels per second.

5 YEARS OF GRAPHICS EXPERIENCE

Sophisticated technology like this doesn't just happen. Vectrix has been a leader in the complicated and competitive field of graphics for over five years. During that time, we have assembled an experienced, innovative engineering staff ready to focus their expertise on your system needs.

OEM-ORIENTED DEVELOPMENT TOOLS

Because they understand your requirements, our engineers provide a variety of tools to simplify applications development. Onboard high-level graphics commands are accessible directly or through standard programming language libraries provided on disk. Our PRESTO! TI-34010 Toolkit simplifies development of customized firmware. An optional RAM card is available for either data storage or additional code.

PRESTO!'s optional Line Drawing Engine accelerates the speed of the TI-34010. Bitblts, raster ops and enhanced DMA transfer capabilities further enhance PRESTO!'s speed.

Thus PRESTO! is ready to provide the graphics for your next system. And Vectrix stands ready to serve you with state-of-the-art technology, proven product reliability, and an engineering staff capable of translating your system needs into product functionality.

SPECIFICATIONS

Resolution — 1280 x 1024 or 1024 x 768

Available in the following configurations:
16 colors
256 colors from a palette of 4096
256 colors from a palette of 16.8 million

Speed — 10,000,000 pixels per second
Average Block Move: 25 million bits/second
Horizontal line or fill: 50 million bits/second
DMA speed: matches host bus speed

Interface — 16-bit PC family

Video — 60 Hz non-interlaced

SOFTWARE DEVELOPMENT TOOLS

Industry-standard PGL Command Set Compatibility

PRESTO! TI-34010 Developer Toolkit

PRESTO! PGL Developer Toolkit

TI is a registered trademark of Texas Instruments, Dallas, Texas

Vectrix
THE COMPUTER GRAPHICS COMPANY

Vectrix Corporation, 2606 Branchwood Drive, Greensboro, NC 27408 (919) 288-0520

CIRCLE NO. 28 ON INQUIRY CARD

Last year it was Peripheral of the Year.

This year it's four times better.

Last year, the Honeywell Bull 4/66 dot matrix printer was so well received by OEMs that we decided to build a family of four high-end printers around it. These new printers share the qualities that made the 4/66 famous, and possess open architectures that allow for ease of customization. In short, they'll broaden the range of applications available to OEMs.

First is the model 4/62 for the office. It provides high letter quality throughput. Next, is the model 4/66P: it simultaneously emulates a printer and a plotter for CAD/CAM applications on the Hewlett Packard 7475A and other compatible systems. Third is the model 4/66C which is compatible with the IBM 3287. And finally, the 4/66T is compatible with IBM systems 34 and 36.

All our new printers are easy to use. They change automatically from fanfold paper to single sheets, so you never have to re-thread paper onto a tractor feed. Plus, all provide automatic forms loading a zero tear off feature, and can handle paper sizes from 3″ to 17″ wide.

And they're quiet. With 18-needle print heads set in anti-noise shields, they make less noise in an office than conventional typewriters.

Finally, all are very fast, and very versatile. They produce three modes: 480 cps draft, 180 cps near letter quality, and 75 cps letter quality (the 4/62 actually has a letter quality speed of 120 cps). And they'll provide up to 20 optional type fonts, and seven colors.

If you're an OEM looking for a dot matrix printer built especially to suit your needs, contact Honeywell Bull Italia, Printers Division, 120 Howard St., Suite 800, San Francisco, CA 94106. Or call us at 415-974-4340.

Honeywell Bull

Customers are more important than computers.

CIRCLE NO. 30 ON INQUIRY CARD

ION DEPOSITION COMES OF AGE

VARs, OEMs and system integrators take-note: Improved reliability and attractive prices are getting the attention of end users

Megan Nields, Staff Editor

Ever since its birth in the mid-1970s for bar-code applications, ion deposition has been touted as one of the most promising forms of non-impact printing technologies. Now that ion-deposition printers have been on the market for several years, it appears that the initial promise is not just hot air.

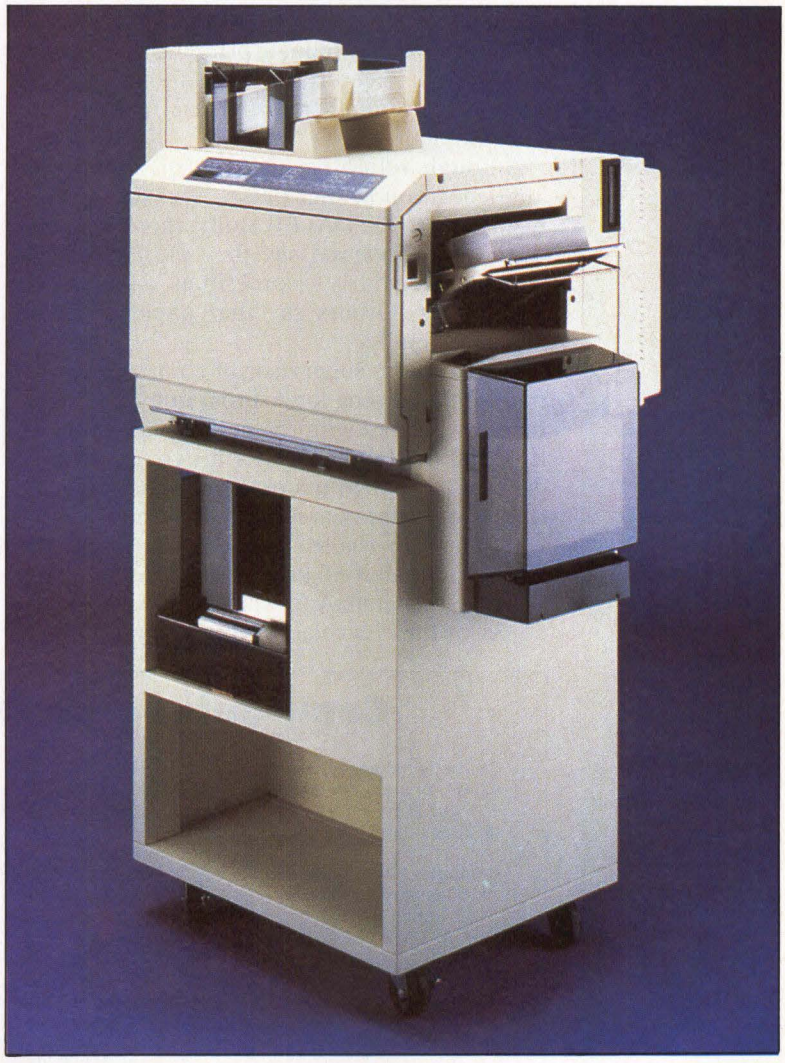
High reliability and low cost are the biggest boons cited by users in a recent survey conducted by DATEK Information Services, Waltham, Mass. The research company has come out with a study called "Ion Deposition: The Users' Perspective," that surveys 75 users of Delphax Systems printers. Delphax, of Randolph, Mass., is the major manufacturer of ion-deposition print engines for OEMs such as C. Itoh Electronics Inc., Honeywell Bull Inc., Northern Telecom Inc. and Xerox Corp.

Ion-deposition printers "give a lot of capability for a relatively low price," says Mike Zeis, DATEK research director. "Cost-conscious people can now use a non-impact page printer. The printer market is expanding because of this."

What justifies such boosterism? Delphax cites a 500,000-page MPBF (mean pages between failure) for its 75-page-per-minute and higher print engines (the S6000) and a 250,000 MPTF for its 30-ppm units (the S3000). Users report that these figures are accurate, with some claiming even higher reliability rates. "There just isn't too much inside to break," according to one user.

Users generally agree that, at this stage of the game, ion depostion is not directly competing with laser technology. Ion printers are mostly being used for high-volume, internal applications such as financial and technical reports, system output and database listings. Of the users surveyed by DATEK, 97 percent are "very" to "somewhat" satisfied with the print quality for these applications.

However, the gap between laser and ion deposition may be narrowing. Fred Collins, director of sales and marketing for the Image System Division of C. Itoh in Torrance, Calif., feels that ion deposition is in its early stages compared to laser technology, and that it is improving continuously. "We see a very bright future for these printers. Print-quality and



The Delphax S3000G *is a 30-ppm, non-impact ion-deposition printer designed for the OEM marketplace.*

price/performance are improving all the time. We expect them to compete with laser printers in a year or two."

Others echo the enthusiasm. Bill Wells, vice president of marketing for General Business Technology Inc. (GBT), Irvine, Calif., says his company's romance with ion deposition began about four years ago when they began selling Delphax's 60-ppm model with a GBT controller.

"These are very reliable printers," Wells says. "They just keep cranking and cranking. They're also much more cost-effective than laser technology."

Athough reliability is high on the list of ion-deposition printer pluses, it exacts a price. According to the DATEK study, more than half of those interviewed say they must clean the machine regularly—sometimes as often as every shift. Others say that paper must be loaded carefully.

John Fenton, supervisor of computer operations and planning for Ashton-Tate Corp., Torrance, is pleased with the perfomance of the C. Itoh 3000L 30-ppm printer his company uses, but feels that high maintainence costs and the lack of a warranty are less than attractive.

But on the whole, according to researcher Zeis, the reliablity figures of the DATEK study were phenomenal. And what does Delphax, the object of these accolades, think about all this? Marketing manager Jerry Pinsky says, "I don't want to seem overly enthusiastic, but ion-deposition technology is being received extremely well. It fits in all levels of printing and will print on virtually everything." He cites an example of a shoe manufacturer in England that prints on shoes.

Delphax's 30-ppm print engine is being hailed as an "incredible breakthrough in price performance" by GBT's Wells, although he feels the current quality of fonts "leaves a bit to be desired at the moment."

But Delphax is addressing this problem. It promises to deliver in the first quarter of this year fonts and type styles with 300-by-300-dot-per-inch resolution that, according to Pinsky, "will be equal to—if not better—than anything else in the printer market." Delphax is working on other quality enhancements such as improved toner and print cartridges, he says.

Wells feels that when the enhancements come through, the difference bewteen ion and laser quality will diminish greatly.

Perhaps, Pinski expesses it best when he says, "We are looking at a technology that has come of age. We've been saying this is good stuff, and now we are proving it." □

Interest Quotient (Circle One)
High 514 Medium 515 Low 516

Companies who OEM from Delphax

Check Technology Corp.
1284 Corporate Center Drive
St. Paul, Minn. 55121
(612) 454-9300

Computer Entry Systems
2120 Industry Parkway
Silver Spring, Md. 20904
(301) 683-3370

Datagraphix Inc.
10981 San Diego Mission Road
San Diego, Calif. 92138
(619) 291-9960

Derex Inc.
7716 Wiles Road
Coral Springs, Fla. 33067
(305) 753-0840

Digital Controls Corp.
3495 Newmark Drive
Miamisburg, Ohio 45342
(513) 435-5455

DSI
1440 S. Lipan
Denver, Colo. 80223
(303) 777-8211

General Business Technology Inc.
1891 McGaw Ave.
Irvine, Calif. 92714
(714) 261-1891

Honeywell Bull Inc.
3800 W. 80th St., MN-70
Minneapolis, Minn. 55431
(612) 896-3800

Micro Research Industries
3027 Rosemary Lane
Falls Church, Va. 22042
(703) 573-9538

Miltope Corp.
1770 Walt Whitman Road
Melville, N.Y. 11747
(516) 420-0200

NBS-Anser Inc.
5535 Airport Freeway
Fort Worth, Texas 76117
(813) 441-1981

NBS Southern Inc.
100 N. Belcher Road
Clearwater, Fla. 33575
(813) 441-198.

Northern Telecom Inc.
2100 Lakeside Blvd.
Richardson, Texas 75081
(214) 437-8000

Unisys Corp.
P.O. Box 41811
Detroit, Mich. 48232
(313) 972-7000

Xerox Corp.
P.O. Box 24
Rochester, N.Y. 14692
(716) 423-5078

Courtesy: DATEK Information Services

WITH AVIS ROVING RAPID RETURN, YOU GET YOUR RECEIPT 1-2-3.

(WITH HERTZ, IT'S 1-2-3-4-5-6-7-8-9-10-11 12-13-14-15-16-17.)

Now, during peak periods at major U.S. airports and selected downtown locations, an Avis Roving Rapid Return representative will meet you right at your car. Just three rapid entries into the Avis Carside Computer,SM and Wizard® calculates your rental charges and your printed receipt is ready in seconds.*

The Avis Carside Computer talks directly to our Wizard III computer system, so all your contract information is available instantaneously. And your receipt will be complete and accurate.

Hertz also offers a carside service. However, their machine is a stand-alone computing device—not a terminal linked to your rental information. So all your car rental information has to be manually entered—up to 17 separate entries (and extra chances for errors), before your transaction can be completed and a receipt issued.

AVIS®
Red hot℠

Avis invented Rapid Return. And now, with Avis Roving Rapid Return, you can be on your way in mere seconds.

Avis is always trying harder, with super services and low SuperValue Rates. So next time, rent Avis. It's as easy as 1-2-3!

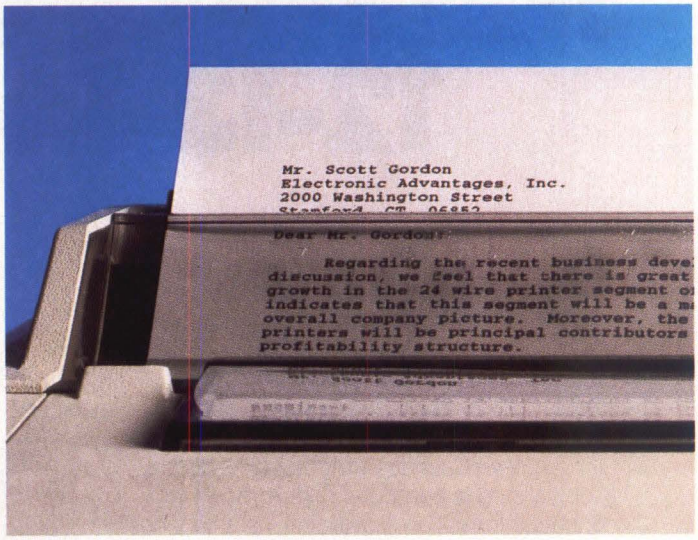
CIRCLE NO. 31 ON INQUIRY CARD

Avis features GM cars.
Buick Regal

© 1988 Wizard Co., Inc.
*For charge card customers who do not require modification of their rental charges.

THE ONE PRIN
IF YOU'RE HAV

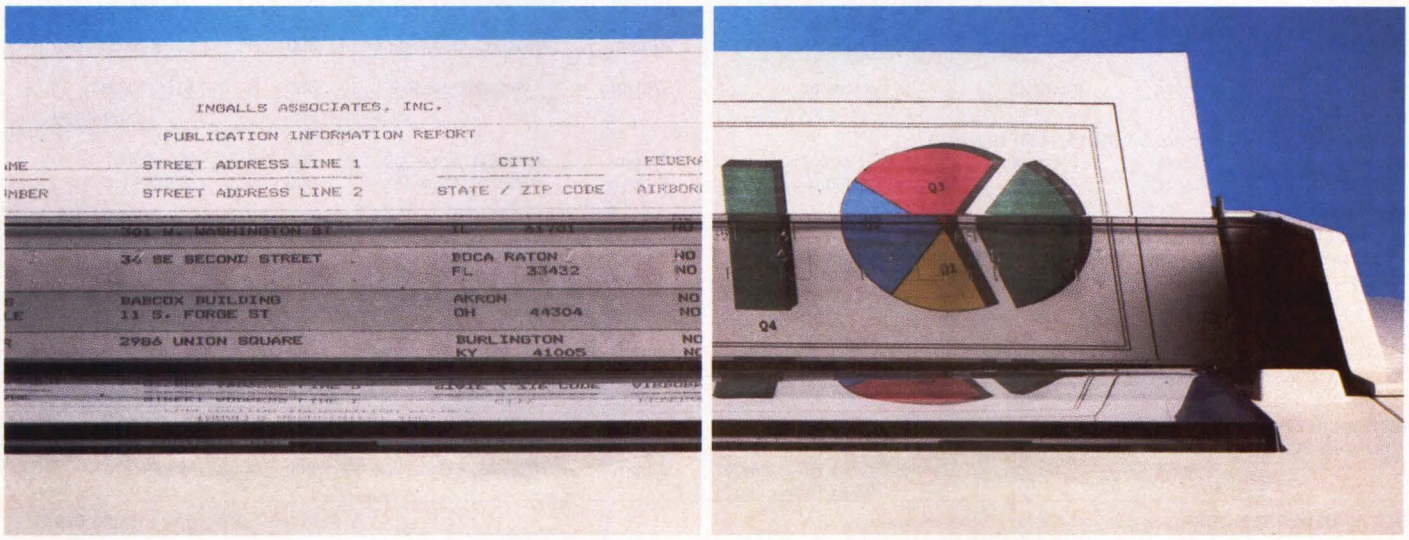
The one and only NEC Pinwriter® P9XL dot matrix printer. It can handle every printing job around the office with exceptional speed and agility.



Snap in a multistrike film ribbon and the P9XL will turn out top-drawer letters and documents. At a speed of 140 cps in letter quality mode. And with its impressive speed of 400 cps in draft mode, it can barrel through payroll, invoices, multipart forms, and continuous forms. Switch to color and you can whip around a few curves, charts, graphs and presentations. On paper or transparencies.

C&C Computers and Communications

TER TO HAVE ING ONLY ONE.



In fact the only thing the P9XL doesn't do around the office is break down. But then NEC is the largest manufacturer of 24-pin printers in the world. With the highest reliability standards in the industry.

So if you want a single printer that can do everything, there's only one in the running. The Pinwriter P9XL.

NEC PRINTERS. THEY ONLY STOP WHEN YOU WANT THEM TO.

NEC

NEC Information Systems, Inc.

For more information and the name of the NECIS dealer nearest you, call 1-800-343-4418 (in MA 617-264-8635). Or write: NEC Information Systems, Dept. 1610, 1414 Massachusetts Ave., Boxborough, MA 01719.

CIRCLE NO. 32 ON INQUIRY CARD

Company / Model	Print method	Engine	Emulations	Print speed	Interfaces	Resolution (dpi)	Color printing? (yes/no)	Price (quantity)
ACER TECHNOLOGIES CORP.								Circle 622
401 Charcot Ave., San Jose, CA 95131, (408) 922-0333								
LP-75	laser	Ricoh	HP LaserJet PLUS	6 ppm	RS232C, RS422, Centronics, parallel	300	N	$2,395(Q1)
ACOM COMPUTER INC.								Circle 623
3534 Atlantic Ave., Long Beach, CA 90807, (213) 424-2986								
LX3808	laser	Canon	HP LaserJet PLUS, IBM	8 ppm	RS232C, Centronics, IBM twinax	300	N	$4,495(Q1)
LX3815	laser	Ricoh	HP LaserJet PLUS, IBM	15 ppm	RS232C, Centronics, IBM twinax	300	N	$7,995(Q1)
LX3820	laser	Canon	HP LaserJet PLUS, IBM	20 ppm	RS232C, Centronics, IBM twinax	300	N	$24,995(Q1)
ADVANCED TECHNOLOGIES INTERNATIONAL INC.								Circle 624
1900 Wyatt Dr., #4, Santa Clara, CA 95054, (408) 748-1688								
1570/DW-3	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS	15 ppm	RS232C, Centronics	300	N	$6,800(Q1)
2670/DW-3	laser	Dataproducts	Diablo, Epson, HP LaserJet PLUS	26 ppm	RS232C, Centronics	300	N	$15,400(Q1)
2670/GR-2	laser	Dataproducts	Versatec	1,750 lpm	Versatec parallel	300	N	$16,900(Q1)
APPLE COMPUTER INC.								Circle 625
20525 Mariani Ave., Cupertino, CA 95014, (408) 996-1010								
LaserWriter	laser	Canon	Diablo	8 ppm	RS232C, AppleTalk	300	N	$4,499(Q1)
LaserWriter Plus	laser	Canon	Diablo	8 ppm	RS232C, AppleTalk	300	N	$5,299(Q1)
AST RESEARCH INC.								Circle 626
2121 Alton Ave., Irvine, CA 92714, (714) 863-1333								
TurboLaser/EL	laser	Ricoh	Diablo, HP	8 ppm	RS232C, Centronics	300	N	$1,995(Q1)
TurboLaser/PS	laser	Ricoh		8 ppm	RS232C, AppleTalk, Centronics	300	N	$3,995(Q1)
AT&T								Circle 627
5555 Touhy Ave., Skokie, IL 60077, (312) 982-2000								
495	laser	Hitachi	HP LaserJet, Qume	up to 10 ppm	RS232C, Centronics, IBM parallel	300	N	$3,595(Q1); $2,516(Q100)
BROTHER INTERNATIONAL CORP.								Circle 689
8 Corporate Place, Piscataway, NJ 08854, (201) 981-0300								
HL-8	laser	Canon	Diablo, Epson, HP LaserJet PLUS, IBM	8 ppm	RS232C, Centronics	300	N	$2,695(Q1)
BULL PERIPHERALS CORP.								Circle 628
303 Wyman St., Waltham, MA 02154, (617) 890-5200								
MP 6060	magnetic	Bull		90 ppm	Dataproducts	240	N	$77,851(Q1)
MP 6090	magnetic	Bull		90 ppm	Dataproducts	240	N	$97,314(Q1)
CANON U.S.A. INC. (PRINTER DIV.)								Circle 629
One Canon Plaza, Lake Success, NY 11042, (516) 488-6700								
BJ-80	ink jet	Canon	Canon, IBM	110-220 cps	Centronics			$679-$799(Q1)
BJ-130	ink jet	Canon	Canon, IBM	220 cps	parallel	360	N	$995(Q1)
LBP 8II	laser	Canon	Canon	8 ppm	RS232C, Centronics	300	N	$2,750(Q1)
CIE TERMINALS INC.								Circle 630
2505 McCabe Way, Irvine, CA 92714, (714) 660-1421								
LIPS 10 PLUS	laser	Konica	Diablo, Epson, HP LaserJet PLUS	10 ppm	RS232C, Centronics, parallel	300	N	$2,995(Q1)
C. ITOH DIGITAL PRODUCTS INC.								Circle 631
19300 S. Hamilton Ave., Suite 110, Torrance, CA 90508, (213) 327-2110								
Jet-Setter	laser	Konica	Epson, IBM, HP LaserJet PLUS	5 ppm	RS232C, RS422, parallel	300	N	$1,795(Q1)
C. ITOH ELECTRONICS INC.								Circle 632
19300 S. Hamilton Ave., Torrance, CA 90508-9116, (213) 327-9100								
MegaLine	ion deposition	C. Itoh	line printer	30 ppm	parallel		N	$12,995(Q1)
MegaPro	ion deposition	C. Itoh	Diablo	30 ppm	parallel	300	N	$17,000(Q1)
CITIZEN AMERICA CORP.								Circle 633
2401 Colorado Ave., Santa Monica, CA 90404, (213) 453-0614								
Overture 110	laser	Mita	Diablo, Epson, IBM	10 ppm	RS232C, Centronics	300	N	$1,995(Q1)
DATA GENERAL CORP.								Circle 634
3400 Computer Dr., Westboro, MA 01580, (617) 898-4081								
6454	laser	Canon	Canon	8 ppm	serial	300	N	$2,795(Q1)

It'll Do Wonders With The Economy.

The TeleVideo® 905 terminal is a wonder in the world of low cost terminals: a product that gives you more, for less.

Just $409 gets you an extremely reliable ASCII terminal packed with features other terminal makers charge extra for. There's a sleek monitor case with full tilt and swivel. A 14" high-contrast, super-dark screen with crisp, clear resolution. A full-size keyboard with sculpted keycaps. 32 non-volatile programmable function keys. A Wordstar™ mode. True accounting-style keypad. Buffered printer port. And, of course, TeleVideo's full one-year warranty.

The TeleVideo 905. It's the very affordable terminal that'll work wonders with the economy.

Call us toll-free or write, today, for more information.

TeleVideo Systems, Inc., 1170 Morse Avenue, Sunnyvale, CA 94088-3568.

TeleVideo®

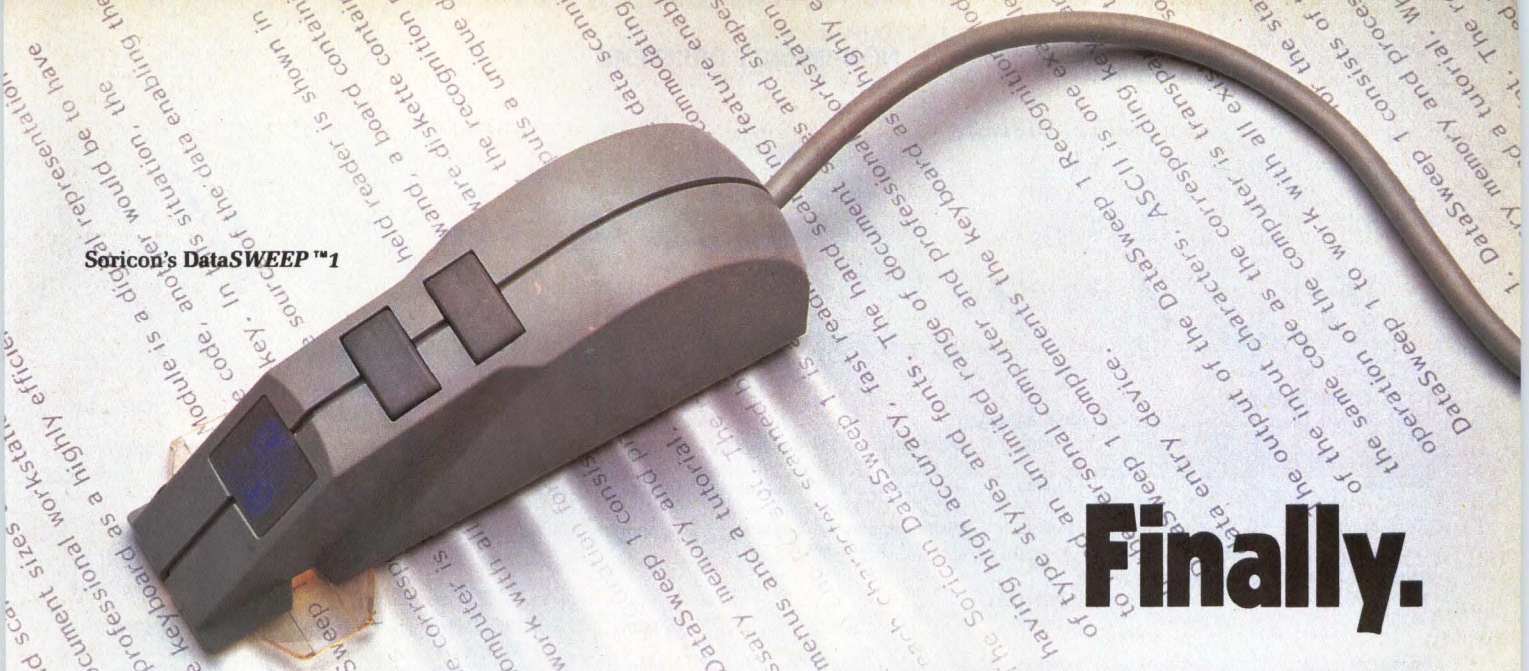
THE VISION YOU NEED TO SUCCEED.

Call 1-800-835-3228

© 1987 TeleVideo Systems, Inc. Wordstar is a trademark of MicroPro, Inc.

CIRCLE NO. 33 ON INQUIRY CARD

Company / Model	Print method	Engine	Emulations	Print speed	Interfaces	Resolution (dpi)	Color printing? (yes/no)	Price (quantity)
DATA TECHNOLOGY CORP.								Circle 635
2551 Walsh Ave., Santa Clara, CA 95051, (408) 727-8899								
CrystalPrint VIII	liquid crystal shutter	Casio	HP LaserJet PLUS	8 ppm	RS232C, parallel	300	N	$2,495(Q1)
CrystalPrint Series II	liquid crystal shutter	Casio	HP LaserJet PLUS	6 ppm	RS232C, parallel	300	N	$1,995(Q1)
DATAMETRICS CORP.								Circle 636
8966 Comanche Ave., Chatsworth, CA 91311, (818) 341-2901								
DmC-1600	thermal			700 lpm	RS232C, RS422, Centronics	152	N	$25,000(Q1); $23,000(Q100)
DmC-1900	thermal			600 lpm	Centronics	200	Y	$35,000(Q1); $33,000(Q100)
DmC-4680	thermal			300 lpm	RS232C, IEEE 488	200	N	$7,500(Q1); $7,000(Q100)
DATAPRODUCTS CORP.								Circle 637
6200 Canoga Ave., Woodland Hills, CA 91365, (818) 887-8000								
LZR 1230	laser	Toshiba	Diablo, Epson, HP LaserJet PLUS	12 ppm	RS232C, Centronics	300	N	$3,495(Q1)
LZR 2600 Series	laser	Toshiba	Diablo, Tektronix, line printer	26 ppm	RS232C, Centronics, Dataproducts	300	N	$12,900-$19,900(Q1)
SI480	ink jet		Dataproducts, Diablo, IBM	200, 400 cps	RS232C, Centronics	240	N	$2,795(Q1)
DATASOUTH COMPUTER CORP.								Circle 638
4216 Stuart Andrew Blvd., Charlotte, NC 28217, (704) 523-9500								
PW 1080	LED array	NEC	Diablo, Epson	8 ppm	RS232C, Centronics	300	N	$1,995(Q1)
PW 3080	LED array	NEC	Diablo, Epson, IBM	8 ppm	Centronics, IBM coax	300	N	$4,995(Q1)
PW 5080	LED array	NEC	Diablo, Epson, IBM	8 ppm	Centronics, IBM twinax	300	N	$4,995(Q1)
DECISION DATA COMPUTER CORP.								Circle 639
400 Horsham Rd., Horsham, PA 19044, (215) 674-3300, (800) 523-6529								
6415	laser	Ricoh	Epson	15 ppm	Centronics, IBM twinax	300	N	
DELPHAX SYSTEMS								Circle 640
35 Pacella Park Dr., Randolph, MA 02368, (617) 961-2312								
S3000G	ion deposition	Delphax	Diablo, HP LaserJet PLUS	30 ppm	Centronics, Dataproducts	300	N	
S3000L	ion deposition	Delphax	Dataproducts	300 ppm	Centronics, Dataproducts	300	N	
S6000-2	ion deposition	Delphax	Dataproducts, IBM	60, 75 ppm	Dataproducts, IBM channel	240	N	
DEREX INC.								Circle 641
7716 Wiles Rd., Coral Springs, FL 33067, (305) 753-0840								
DRL20	laser	Kyocera	Diablo, Epson, HP LaserJet PLUS, IBM, NEC, Qume	18 ppm	RS232C, Centronics	300	N	$8,395(Q1); $6,995(Q100)
S3000II	ion deposition	Delphax	Diablo, HP LaserJet PLUS	30 ppm	RS232C, Centronics, Dataproducts	300	N	$14,950(Q1); $12,700(Q100)
S6000II	ion deposition	Delphax	Dataproducts, IBM	75 ppm	Dataproducts, IBM channel	240	N	$59,900(Q1); $50,000(Q100)
DICONIX INC.								Circle 642
3100 Research Blvd., Dayton, OH 45420, (513) 259-3100								
150	ink jet		Epson, IBM	150 cps	RS232C, Centronics	192	N	$479(Q1)
300w	ink jet		Epson, IBM	310 cps	RS232C, Centronics	192	N	$749(Q1)
DIGITAL EQUIPMENT CORP.								Circle 643
129 Parker St., Maynard, MA 01754, (617) 897-5111								
LN03	laser	Ricoh		8 ppm	RS232C		N	
LN03 PLUS	laser	Ricoh		8 ppm	RS232C	300	N	
ScriptPrinter	laser	Ricoh		8 ppm	RS232C	300	N	
ELECTRONIC FORM SYSTEMS								Circle 644
2395 Midway Rd., Carrollton, TX 75006, (214) 250-7000								
Formwriter 2X	laser	Canon	Epson	8 ppm		300	N	$6,595(Q1)
Formwriter 8	laser	Ricoh	Epson	15 ppm		300	N	$8,995(Q1)
Formwriter 10XD	laser	Canon	Epson	20 ppm		300	N	$24,995(Q1)
EPSON AMERICA INC.								Circle 645
2780 Lomita Blvd., Torrance, CA 90505, (213) 539-9140								
GQ-3500	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS	6 ppm	Centronics		N	
FACIT INC.								Circle 646
9 Executive Park Dr., Merrimack, NH 03054-0334, (603) 424-8000								
P7080	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS	8 ppm	RS232C, Centronics	300	N	$3,895(Q1)
P7150	laser	Ricoh		15 ppm	RS232C, Centronics	300	N	$6,495(Q1)



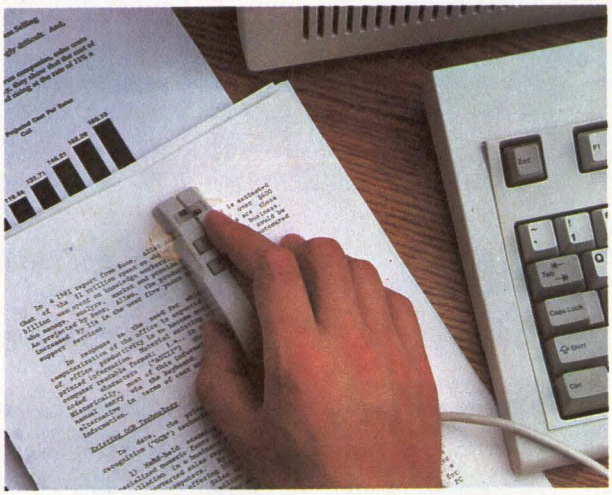
Finally.
DATA ENTRY has been made DATA EASY.

With Data*SWEEP*™*1* from Soricon. An intelligent, hand-held character reader/data entry system that provides the OEM,VAR and System Integrator with a solution-oriented system peripheral for ***selective,*** high-speed data input.

Provide your personal computer customers with the enhanced productivity of Soricon's OCR/ICR technology. With the continuing rise in keyboard data entry costs, **Data*SWEEP 1*** is a must for increasing data entry accuracy and productivity.
Ergonomically designed, it's the ideal price/performance solution for keyboard users in a wide variety of industries such as banking, insurance, securities, legal, medical and general office workplaces.

When you consider the **Data*SWEEP 1*** features and compare them to typical keyboard data entry, it becomes clear that intelligent character recognition (ICR) technology will become the standard method to efficiently and cost-effectively execute data entry.

- Scanning speed: 170 effective wpm
- Accuracy: Typically 99.3%
- Easy and quick to install and operate
- Requires very little host memory



The Soricon **Data*SWEEP 1*** ***"A Better Way"***

- Multi-font capability: Most office fonts from typewriters, laser printers, daisy wheels, near letter quality dot matrix printers and some typeset text and proportionally spaced type
- Automatically compensates for variations in user technique
- The system adjusts automatically to the specific type style
- Works with the IBM PC, XT, AT and 100% compatibles

Data*SWEEP 1* comes complete with the hand-held intelligent character reader, interface board (uses one full- size expansion slot), software diskette, user manual plus full service and manufacturer support.

Soricon's proprietary character recognition technology is not limited to **Data*SWEEP 1.*** It can be customized ***(in fact, that is our business)*** to function with other hosts, non-intelligent terminals, etc.

Call Soricon today TOLL-FREE, 1-800-541-SCAN for more information and a **Data*SWEEP 1*** demonstration.

SORICON CORPORATION

4725 Walnut St. Boulder, CO 80301
(303) 440-2800 FAX: 303-442-2438

CIRCLE NO. 34 ON INQUIRY CARD

Company Model	Print method	Engine	Emulations	Print speed	Interfaces	Resolution (dpi)	Color printing? (yes/no)	Price (quantity)
FUJITSU AMERICA INC. 3055 Orchard Dr., San Jose, CA 95134, (408) 432-1300								Circle 647
RX7100	LED array	Fujitsu	Diablo, Epson, HP LaserJet PLUS	5 ppm	RS232C, Centronics	300	N	$1,160(Q1)
RX7200	laser	Fujitsu	Diablo, Epson, HP LaserJet PLUS	12 ppm	RS232C, Centronics	300	N	$2,110(Q1)
RX7400	laser	Fujitsu	Diablo, Epson, HP LaserJet 500 PLUS	22 ppm	RS232C, Centronics	300	N	$6,380(Q1)
GENERAL BUSINESS TECHNOLOGY INC. 1891 McGaw Ave., Irvine, CA 92714, (714) 261-1891								Circle 648
6625XP	laser	Ricoh	IBM	15 ppm	RS232C, Centronics, IBM twinax	300	N	$7,495(Q1)
6636XP	laser	Canon	IBM	8 ppm	RS232C, Centronics, IBM twinax	300	N	$3,995(Q1)
6640XP	ion deposition	Delphax	IBM	30 ppm	Centronics, IBM twinax	300	N	$15,995(Q1)
GENERAL COMPUTER CORP. 580 Winter St., Waltham, MA 02154, (617) 890-0880								Circle 649
Personal LaserPrinter	laser	Ricoh		6 ppm	SCSI	300	N	$2,599(Q1)
GENICOM CORP. One Genicom Dr., Waynesboro, VA 22980, (703) 949-1000								Circle 650
5010	laser	Hitachi	Diablo, HP LaserJet PLUS, IBM	10 ppm	RS232C, Centronics	300	N	$3,495-$3,695(Q1)
HARRIS CORP. (COMPUTER SYSTEMS DIV.) 2101 W. Cypress Creek Rd., Fort Lauderdale, FL 33309, (305) 973-5125								Circle 651
PL4508	laser		Diablo, Epson, Qume	8 ppm	RS232C	300	N	$7,495(Q1)
HEWLETT-PACKARD CO. (BOISE DIV.) 11311 Chinden Blvd., Boise, ID 83714, (208) 323-6000								Circle 652
LaserJet Series II	laser	Canon		8 ppm	RS232C, RS422, parallel	300	N	$2,595(Q1)
HEWLETT-PACKARD CO. (VANCOUVER DIV.) P.O. Box C-006, Vancouver, WA 98668-C006, (206) 254-8110								Circle 653
QuietJet Plus	ink jet			160, 192 cps	RS232C, Centronics		Y	
ThinkJet	ink jet			150 cps	RS232C, Centronics		Y	
THE HOLOSCAN CORP. 4 Olsen Ave., Edison, NJ 08820, (201) 549-9000								Circle 654
H-28/DP-100	laser	proprietary	proprietary	28 ppm	RS232C, Centronics, Dataproducts		N	$17,000(Q1)
H-28/S-500	laser	proprietary	Tektronix	28 ppm	RS232C, IEEE 488, Centronics, Dataproducts		N	$24,500(Q1)
H-29/WP-300	laser	proprietary	Diablo, Epson, HP LaserJet PLUS, NEC, Qume	28 ppm	RS232C, Centronics	300	N	$19,000(Q1)
HONEYWELL BULL INC. 300 Concord Rd., Billerica, MA 01821, (617) 671-6000								Circle 655
PRU7260 Model 80	ink jet	Ricoh	Diablo	up to 8 ppm	RS232C, RS422, Centronics	300	N	$3,600(Q1)
HOWTEK INC. 21 Park Ave., Hudson, NH 03051, (603) 882-5200								Circle 656
Pixelmaster	ink jet	Howtek	Diablo, HP	2 ppm	RS232C, Centronics, GPIB	240	Y	$4,495(Q1)
IBM CORP. Old Orchard Rd., Armonk, NY 10504, (800) IBM-2468								Circle 657
Quietwriter III	thermal	IBM		160-274 cps	IBM PC parallel	240	N	$1,699(Q1)
Personal Pageprinter	laser			up to 6 ppm	video	300	N	$2,199(Q1)
Color Jetprinter	ink jet			15-50 cps	IBM PC parallel		Y	$745(Q1)
IMAGEN CORP. 2650 San Tomas Expressway, Santa Clara, CA 95052-8101, (408) 986-9400								Circle 658
2308/S ImageServer XP	laser	Canon	Diablo, Epson, IBM, Tektronix	8 ppm	RS423, Centronics, Dataproducts, Versatec	300	N	$8,950(Q1)
7320 ImageServer XP	laser	Canon	Diablo, Epson, IBM, Tektronix	20 ppm	RS423, Centronics, Dataproducts, Versatec	300	N	$32,950(Q1)
ImageStation/S	laser	Canon	Diablo, Epson, IBM, Tektronix	8 ppm	RS423, Centronics	300	N	$5,595(Q1)

Get Down to the Business of CIM

If the subject of automated manufacturing seems just a little too clean, too cool, too abstract... And you feel like some purely technical viewpoint is dominating your company's thinking on this crucial strategic matter... Then it's time you investigate CIM in a manager's element.

It's time you come to AMS.

At AMS, you have a unique opportunity to explore CIM as a real-life business proposition, an opportunity to take charge and be an active agent in your CIM education and planning processes.

The exposition (featuring 175 leading vendors of factory automation) constitutes a free market of information on CIM tools and techniques—the free market required for the gathering of objective facts. Furthermore, the exhibitors are as inclined to talk business dynamic, approach, and track record in modern manufacturing as they are inclined to talk bits and bytes and rate of flow.

AMS also offers a management-oriented Conference Program, with blocks of course work dedicated to Strategy, Integration, Information Management, Design, Production, Automated Material Handling, Storage and Distribution.

And **IMPACT™**—a special exhibit featuring a live, working demonstration of factory automation— dramatically illustrates how to plan and implement CIM in a real-world, multi-vendor situation. **IMPACT '88:** produced by KPMG Peat Marwick: Co-participants: CAM Software, Intergraph, American Software, Texas Instruments, Interactive Images, Stratus, Gould, Chipcom, Auto Simulations, Intermec.

For more information on attending AMS, including a detailed Conference Program, call or write: AMS Registration, Cahners Exposition Group, 1350 East Touhy Avenue, P.O. Box 5060, Des Plaines, Illinois 60017-5060: **(312) 299-9311.**

AMS® '88

April 19-21, 1988. Chicago, Illinois

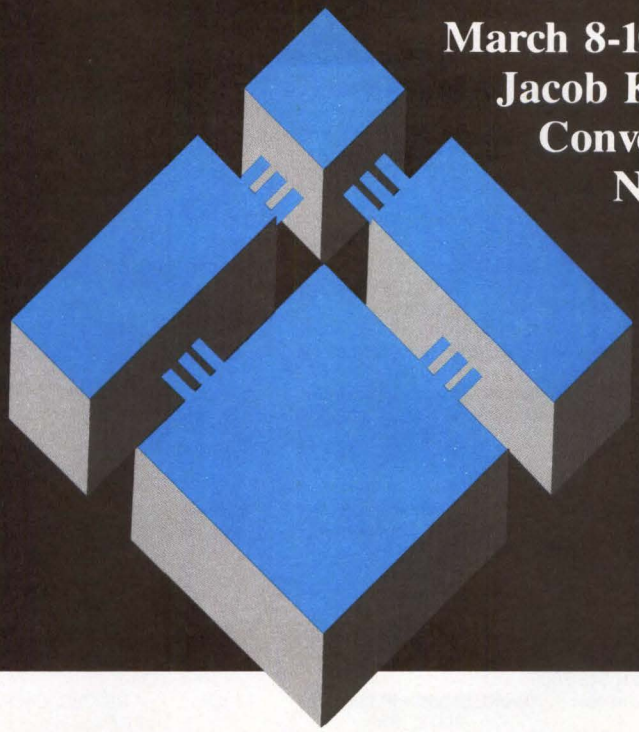
Advanced Manufacturing Systems Exposition and Conference

©1987 Reed Holdings, Inc.

Company / Model	Print method	Engine	Emulations	Print speed	Interfaces	Resolution (dpi)	Color printing? (yes/no)	Price (quantity)
IRIS GRAPHICS INC.								Circle 659
12 Jacob Way, Reading, MA 01867, (617) 438-1500								
2024	ink jet	Iris		8 min. per page	Versatec	240	Y	$49,500(Q1)
2044	ink jet	Iris		12 min. per page	Versatec	240	Y	$84,500(Q1)
3024	ink jet	Iris		6-12 min. per page	GPIB, IEEE 488, Versatec	240	Y	$75,000(Q1)
KANEMATSU-GOSHO (U.S.A.) INC. (INFORMATION SYSTEMS GROUP)								Circle 660
333 S. Hope St., Suite 2800, Los Angeles, CA 90071, (213) 626-1123								
M5311	laser	Canon		20 ppm	RS232C; Centronics; IBM coax, twinax	300	N	$18,974(Q1)
KENTEK INFORMATION SYSTEMS INC.								Circle 661
6 Pearl Court, Allendale, NJ 07401, (201) 825-8500								
K-2+	LED array	Kentek	Diablo, HP LaserJet PLUS	15 ppm	RS232C, RS422	300	N	
K-3	LED array	Kentek	Diablo, HP LaserJet PLUS	24 ppm	RS232C, RS422, Centronics	300	N	
K-4	LED array	Kentek	Diablo, HP LaserJet PLUS	24 ppm	RS232C, RS422, Centronics	300	N	
KYOCERA UNISON INC.								Circle 662
3165 Adeline St., Berkeley, CA 94703, (415) 848-6680								
F-1000A	laser	Kyocera	Diablo, Epson, HP LaserJet PLUS, NEC, Qume, line printer	10 ppm	RS232C, Centronics	300	N	$2,895(Q1)
F-2010	laser	Kyocera	Diablo, Epson, HP LaserJet PLUS, NEC, Qume, line printer	10 ppm	RS232C, Centronics	300	N	$4,635(Q1)
F-3010	laser	Kyocera	Diablo, Epson, HP LaserJet PLUS, NEC, Qume, line printer	18 ppm	RS232C, Centronics	300	N	$8,395(Q1)
MANNESMANN TALLY CORP.								Circle 663
8301 S. 180th St., Kent, WA 98032, (206) 251-5500								
MT90	ink jet		Diablo, Epson, IBM	220 cps	serial, parallel		N	$799(Q1)
MT910	laser	Kyocera	Diablo, Epson, IBM, HP	10 ppm	serial, parallel		N	$3,695(Q1)
MILTOPE BUSINESS PRODUCTS INC.								Circle 664
1770 Walt Whitman Rd., Melville, NY 11747, (516) 756-7660								
3801	ion deposition	Delphax	HP LaserJet PLUS, IBM, QMS, Xerox	90 ppm	Centronics, Dataproducts	240	N	$84,000(Q1); $65,000(Q100)
Series 37	ion deposition	Delphax	HP LaserJet PLUS, IBM, QMS, Xerox	37 ppm	Centronics, Dataproducts	300	N	$26,750(Q1); $19,700(Q100)
Series 75	ion deposition	Delphax	HP LaserJet PLUS, IBM, QMS, Xerox	75 ppm	Centronics, Dataproducts	240	N	$77,000(Q1); $56,000(Q100)
MITEK SYSTEMS INC.								Circle 665
6225 Nancy Ridge Dr., San Diego, CA 92121, (619) 587-9157								
120T	laser	Canon		8 ppm	RS232C, RS422, parallel	300	N	$4,995(Q1); $3,496(Q100)
125T	laser	Canon		8 ppm	RS232C, RS422, parallel	300	N	$6,295(Q1); $4,406(Q100)
150T	laser	Ricoh	Diablo, Epson, HP LaserJet, HP-GL	15 ppm	RS232C, parallel	300	N	$9,995(Q1); $7,206(Q100)
NBS SOUTHERN INC.								Circle 666
100 N. Belcher Rd., Clearwater, FL 34625, (813) 441-1981								
Mercurion 1/80	ion deposition	Delphax	Dataproducts, IBM	80 ppm	RS232C; Centronics; IBM coax, twinax, parallel	240	N	$59,950(Q1)
3840	laser	Hitachi	IBM	40 ppm	RS232C; RS422; Centronics; IBM coax, twinax, parallel	240, 300	N	$45,000(Q1)
NCR CORP. (PERSONAL COMPUTER DIV.)								Circle 667
1601 S. Main St., PCD-1, Dayton, OH 45479, (513) 445-7478								
6416	laser	Canon	Diablo, ISO 646	500 lpm	RS232C, Centronics	300	N	$3,220(Q1)
NEC INFORMATION SYSTEMS INC.								Circle 668
1414 Massachusetts Ave., Boxborough, MA 01719, (617) 264-8000								
Silentwriter LC-860+	LED array	NEC	Diablo, HP LaserJet PLUS, IBM	8 ppm	RS232C, Centronics	300	N	$2,995(Q1)
Silentwriter LC-890	LED array	NEC	HP LaserJet PLUS	8 ppm	RS232C, RS422, AppleTalk, Centronics	300	N	$4,495(Q1)
LC-3360	laser	NEC	Dataproducts, Diablo, Epson, HP LaserJet PLUS	30 ppm	RS232C, RS422, Centronics	300	N	$10,995(Q1)

Connect '88

March 8-10, 1988
Jacob K. Javits
Convention Center
New York, N.Y.



The Technical Conference and Exposition for the MIS/DP Professional

The only event for computer and communications professionals.

It's coming soon! An event that *finally* fits the times. Focused on the single topic that's impacting the present and helping to shape the future. ***Connectivity.***

Only **Connect '88** is dedicated to give you a first hand look at the latest connectivity options and integration solutions featured on the exhibit floor. The registration fee also includes an unparalleled three day schedule that features comprehensive conference sessions and invaluable technical seminars.

You can't afford to miss the singular event everyone is already talking about. **Connect '88.** Don't delay. Plan now to be a part of the excitement and learn what the emerging technologies can mean for your business today and tomorrow. For more information about **Connect '88,** just call **(203) 964-8287.**

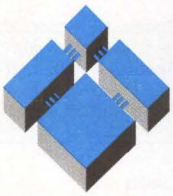
- Explore a sharply focused exhibit floor and view the latest connectivity related products.
- Discuss your specific connectivity needs with key executives and technicians from more than 100 major vendors.
- Participate in the spectacular **Connect '88** Technical Forum which is included as an integral part of this landmark event.
- Attend special vendor conferences presented by the industry's leading manufacturers.

At **Connect '88** take advantage of a landmark strategic symposium presented by **THE GARTNER GROUP.** This unique program will cover such important issues as the futures of local area communications, software management strategy, office information systems, enterprise networks, mid-range systems and personal computers.

Get an in-depth look at the future with five-year connectivity scenarios from Gartner Group executives.

DON'T DELAY

Save $10 —
Bring this coupon to Connect '88



Connect '88

The Technical Conference and Exposition for the MIS/DP Professional

March 8-10, 1988
Jacob K. Javits Convention Center
11th Ave. at 34th St.
New York, N.Y.

This coupon entitles you to a $10 discount on event admission (includes technical forum). On-site registration is regularly $35. With this coupon you pay only $25.

XJI

GARTNER GROUP, INC.

CEG®

CIRCLE NO. 35 ON INQUIRY CARD

Company / Model	Print method	Engine	Emulations	Print speed	Interfaces	Resolution (dpi)	Color printing? (yes/no)	Price (quantity)
OFFICE AUTOMATION SYSTEMS INC. (OASYS)								Circle 669
9940 Barnes Canyon Rd., San Diego, CA 92121, (619) 452-9200								
LaserPro 1510	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS, IBM, NEC, Qume, line printer	15 ppm	RS232C, Centronics	300	N	$7,295(Q1)
LaserPro 2200	laser	Minolta	Diablo, Epson, HP LaserJet PLUS, IBM, NEC, Qume, line printer	22 ppm	RS232C, Centronics, Dataproducts		N	
LaserPro Silver Express	laser		Diablo, Epson, HP LaserJet PLUS, IBM, NEC, Qume, line printer	8 ppm	RS232C, Centronics	300	N	$2,795(Q1)
OKIDATA								Circle 670
532 Fellowship Rd., Mt. Laurel, NJ 08054, (609) 235-2600								
Laserline 6	ink jet	Ricoh	HP LaserJet PLUS	6 ppm	RS232C, Centronics	300	N	$1,795(Q1)
Okimate 20	thermal	Okidata	Apple, Atari, Commodore, IBM	12-20 lpm	RS232C, Centronics		Y	$268(Q1)
OLIVETTI USA (OFFICE PRODUCTS DIV.)								Circle 671
765 US Highway 202, Someville, NJ 08807, (201) 526-8200								
PG108	laser	Canon	HP	8 ppm	RS232C, RS422, Centronics	300	N	$2,595(Q1)
PANASONIC INDUSTRIAL CO.								Circle 672
2 Panasonic Way, Secaucus, NJ 07094, (201) 348-7000								
KX-P4450	laser	Panasonic	Diablo, Espon, HP LaserJet PLUS, IBM	11 ppm	RS232C, Centronics	300	N	$2,595(Q1)
PERSONAL COMPUTER PRODUCTS INC.								Circle 690
11590 W. Bernardo Court, Suite 100, San Diego, CA 92127, (619) 485-8411								
LaserImage 1000	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS, HP-GL, IBM	6 ppm	RS232C, RS422	300		$2,495(Q1)
LaserImage 2000	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS, HP-GL, IBM	8 ppm	RS232C	300		$3,495(Q1)
LaserImage 3000	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS, HP-GL, IBM	15 ppm	RS232C	300		$6,395(Q1)
PRIME COMPUTER INC.								Circle 673
Prime Park, Natick, MA 01760, (617) 655-8000								
3410	laser	Hitachi	Diablo, IBM	10 ppm	RS232C, Centronics	300	N	$3,955(Q1)
PRINTRONIX INC.								Circle 674
17500 Cartwright Rd., Irvine, CA 92713, (714) 863-1900								
L1012	laser	Mita	Diablo, Epson, HP LaserJet PLUS	12 ppm	RS232C, Centronics		N	$3,495(Q1)
L2120	laser	Canon	Diablo, line printer	20 ppm	RS232C, Centronics, Dataproducts		N	$15,995(Q1)
QMS INC.								Circle 675
One Magnum Pass, Mobile, AL 36618, (205) 633-4300								
KISS plus	laser	Canon	Diablo, Epson, HP-GL, IBM, Qume	8 ppm	RS232C, Centronics	300	N	$2,390-$3,490(Q1)
Lasergrafix 1510	laser	Ricoh	Diablo, Qume, Tektronix	15 ppm	RS232C, Centronics, Dataproducts, IBM, Versatec	300	N	$11,995(Q1)
PS 810	laser	Canon	Diablo, HP-GL	8 ppm	RS232C, RS422, AppleTalk, Centronics	300	N	$5,495(Q1)
QUADRAM OLP								Circle 676
One Quad Way, Norcross, GA 30093, (404) 923-6666								
QuadLaser I	laser	Ricoh	Epson, HP LaserJet PLUS, IBM, Qume	8 ppm	RS232C, parallel	300	N	$3,495(Q1)
QuadLaser Plus	laser	Ricoh	Epson, HP LaserJet PLUS, IBM, Qume	8 ppm	RS232C, parallel	300	N	$3,795(Q1)
QuadLaser PostScript	laser	Ricoh		8 ppm	RS232C, RS422, AppleTalk, parallel		N	$3,995(Q1)
RICOH CORP.								Circle 677
3001 Orchard Parkway, San Jose, CA 95134, (408) 432-8800								
PC Laser 6000	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS, IBM	6 ppm	RS232C, Centronics	300	N	$2,395(Q1)
SEIKO INSTRUMENTS USA INC.								Circle 678
1130 Ringwood Court, San Jose, CA 95131, (408) 943-9100								
CH-5300 Series	thermal	Seiko		60-100 sec. per page	Centronics, video		Y	$5,995-$12,995(Q1)

Telecommunications. Data communications. Networking. ISDN. LANs. Integrated voice/data/image transmission. The connectivity solutions you need to advance your organization's systems, and your career, will all come together at INTERFACE...

- In the world's largest communications/networking product exposition.
- In the prestigious INTERFACE conference program.
- In INTERnet, a comprehensive multi-vendor LAN demonstration.

Join thousands of your colleagues who will find their connectivity solutions at INTERFACE '88. You'll have access to the exhibit floor of The World Congress on Computing, the first world-class event for MIS/DP professionals, held concurrently with INTERFACE. Return the coupon today for complete registration and travel information.

INTERFACE'88

Co-sponsored by BusinessWeek and Data Communications Magazines

March 28–31, 1988
McCormick Place • Chicago, Illinois

☐ **YES, I want to make all the right connections at INTERFACE '88! Send me registration and travel information.**

Name_____

Title_____

Company_____

Address_____

City_____ State____ Zip_____

Telephone ( )_____

☐ **Send me information on exhibiting.**

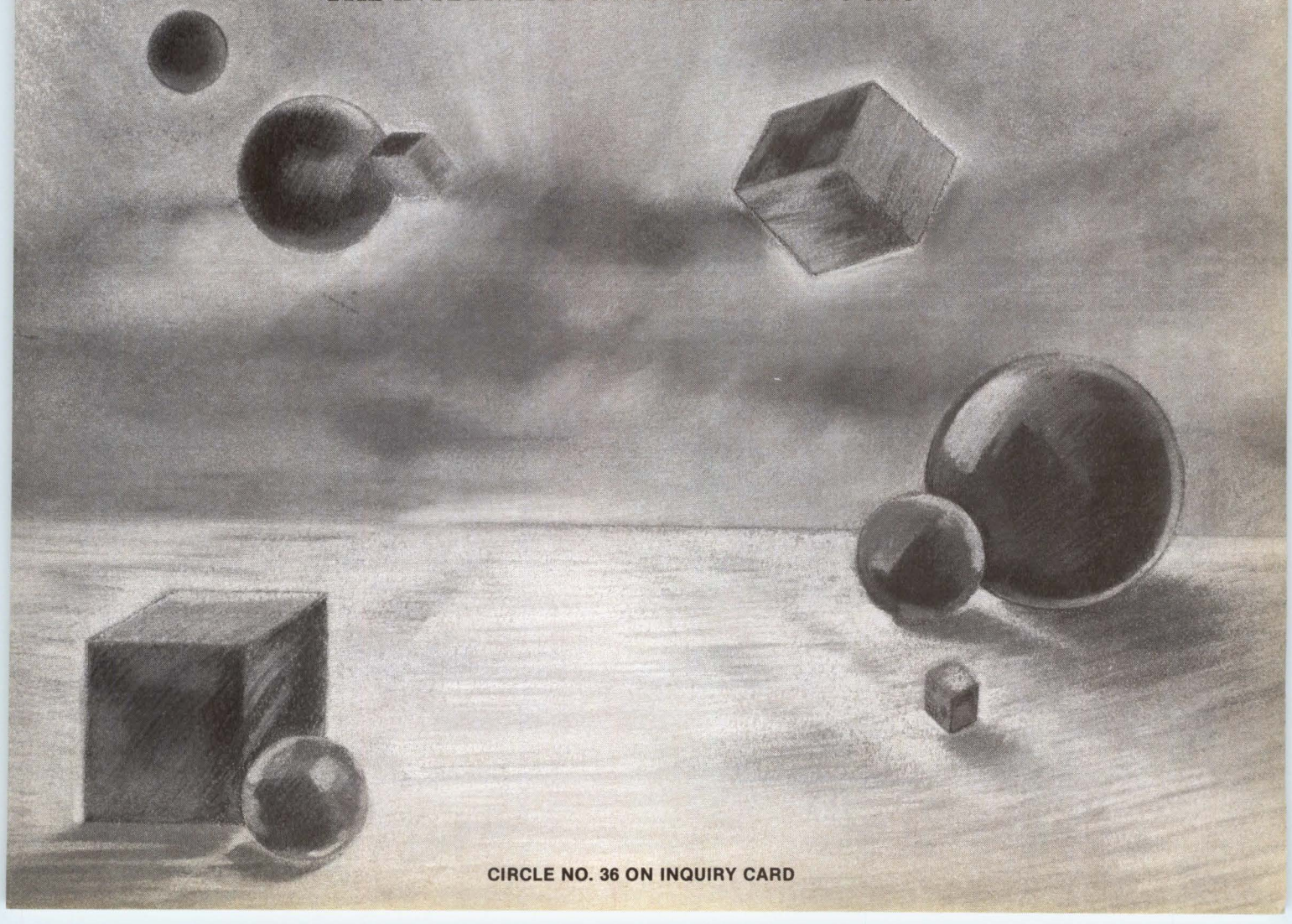
Return to: INTERFACE '88,
300 First Avenue, Needham, MA 02194

MMS 15

Produced by
☒THE INTERFACE GROUP, Inc.® ©1987
World's leading independent producer of conferences and expositions

MAKE ALL THE RIGHT CONNECTIONS AT INTERFACE

THE INTEGRATED COMMUNICATIONS SHOW

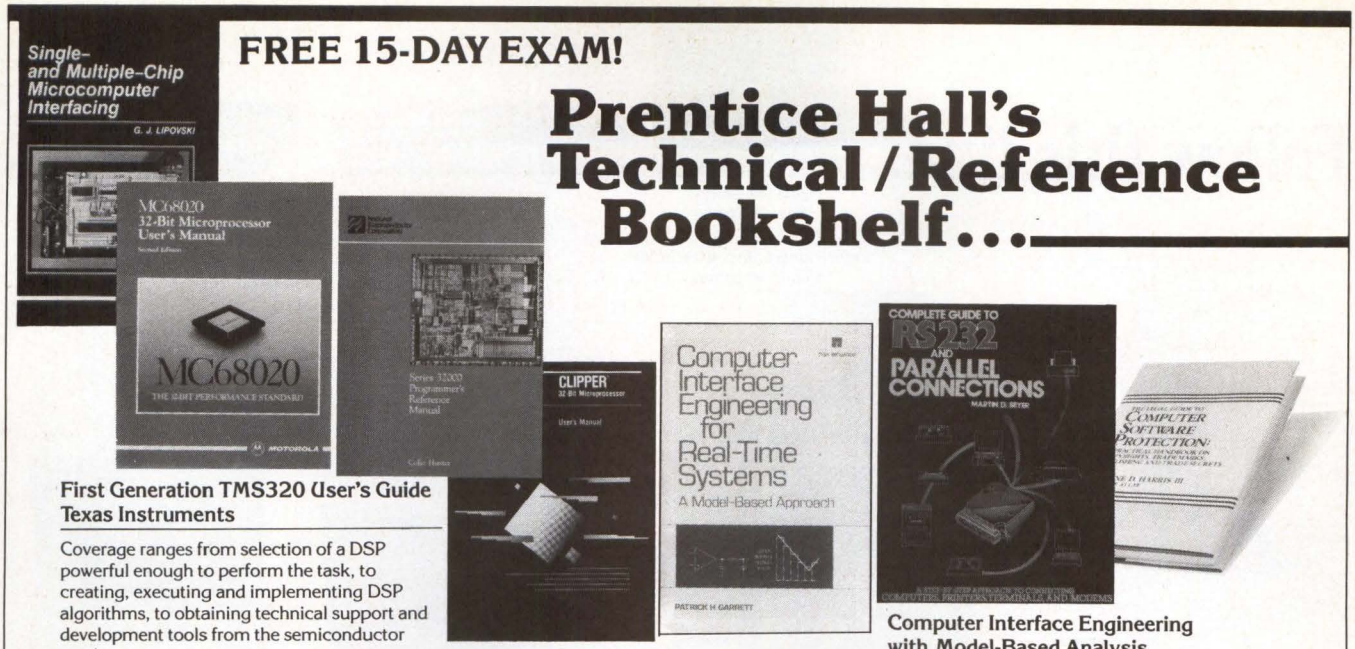


CIRCLE NO. 36 ON INQUIRY CARD

Company / Model	Print method	Engine	Emulations	Print speed	Interfaces	Resolution (dpi)	Color printing? (yes/no)	Price (quantity)
SIEMENS INFORMATION SYSTEMS INC.								Circle 679
240 E. Palais Rd., Anaheim, CA 92805, (714) 991-9700								
2200 Models 2, 3	laser	Siemens	IBM	103 ppm	IBM 370 channel	240	Y	$165,000-$189,000(Q1)
2300 Models 2, 3	laser	Siemens	IBM	206 ppm	IBM 370 channel	240	Y	$265,000-$283,000(Q1)
STAR MICRONICS AMERICA INC.								Circle 680
200 Park Ave., Suite 3510, New York, NY 10168, (212) 986-6770								
LaserPrinter 8	laser	Canon	Diablo, Epson, HP LaserJet PLUS	8 ppm	RS232C, Centronics	300	N	$2,699(Q1)
TALARIS SYSTEMS INC.								Circle 681
P.O. Box 261580, San Diego, CA 92126, (619) 587-0787								
802	laser	Canon	Diablo, Qume, Tektronix	8 ppm	RS232C, Centronics, Dataproducts, IBM	300		$87,990(Q1)
1500	laser	Ricoh	Diablo, Qume, Tektronix	15 ppm	RS232C, Centronics, Dataproducts, IBM	300		$11,990(Q1)
1590 Printstation	laser	Ricoh	DEC, Diablo, Tektronix	15 ppm	RS232C, RS422, Centronics, Dataproducts, SCSI	300		$8,490(Q1)
TEKTRONIX INC.								Circle 682
P.O. Box 1000, Wilsonville, OR 97070, (800) 225-5454								
4692	ink jet			½ ppm	Tektronix parallel		Y	$7,795(Q1)
4693D	thermal			1 ppm	Centronics, Tektronix parallel	300	Y	$7,995(Q1)
4696	ink jet			35 cps	Centronics	120, 240	Y	$1,795(Q1)
TELEX COMPUTER PRODUCTS INC.								Circle 683
6422 E. 41st St., Tulsa, OK 74135, (918) 627-1111								
851	ink jet			110, 220 cps	parallel		N	$650(Q1)
TEXAS INSTRUMENTS INC.								Circle 684
P.O. Box 809063, Dallas, TX 75380-9063, (800) 527-3500								
OmniLaser Model 2015	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS, Qume	15 ppm	RS232C, Centronics, IBM parallel	150, 300	N	$5,995(Q1)
OmniLaser Model 2108	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS, Qume	8 ppm	RS232C, RS422, AppleTalk, Centronics, IBM parallel	300	N	$5,995(Q1)
OmniLaser Model 2115	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS, Qume	15 ppm	RS232C, RS422	300	N	$7,995(Q1)
TOSHIBA AMERICA INC. (INFORMATION SYSTEMS DIV.)								Circle 685
9740 Irvine Blvd., Irvine, CA 92718, (714) 583-3000								
PageLaser 12	laser	Toshiba	Diablo, HP LaserJet PLUS, IBM, Qume	12 ppm	RS232C, Centronics	300	N	$3,699(Q1)
UNISYS CORP.								Circle 686
One Unisys Place, Detroit, MI 43232, (313) 972-7000								
AP9208	laser	Ricoh	Diablo	8 ppm	RS232C, Centronics	300	N	$3,395(Q1)
AP9215-1	laser	Ricoh	Diablo, Epson, HP LaserJet PLUS, IBM	15 ppm	RS232C, Centronics	300	N	$6,595(Q1)
Model 37	laser	Kyocera	Diablo, Epson, HP LaserJet PLUS, NEC, Qume	10 ppm	RS232C, Centronics	300	N	$3,795(Q1)
VARITYPER								Circle 691
11 Mount Pleasant Ave., East Hanover, NJ 07936, (201) 887-8000								
VT600	laser		PostScript	10 ppm	RS232C, AppleTalk, Centronics	600	N	
WANG LABORATORIES INC.								Circle 687
One Industrial Ave., Lowell, MA 01851, (617) 459-5000								
LCS15	laser	Ricoh	Diablo, HP	15 ppm	RS232C, Centronics	300	N	$8,000(Q1)
LDP8	laser	Canon	HP	8 ppm	RS232C, Centronics	300	N	$3,000(Q1)
XEROX CORP.								Circle 688
P.O. Box 24, Rochester, NY 14692, (800) 334-6200								
4020	ink jet			40, 80 cps	Centronics		Y	$1,495(Q1)
4045 Laser CP	laser		Epson, HP	10 ppm		300		

FREE 15-DAY EXAM!

Prentice Hall's Technical / Reference Bookshelf...



First Generation TMS320 User's Guide
Texas Instruments

Coverage ranges from selection of a DSP powerful enough to perform the task, to creating, executing and implementing DSP algorithms, to obtaining technical support and development tools from the semiconductor vendor.
1988, paper 0-13-319054-4 $18.95
Circle #101 for FREE 15-day exam

Digital Signal Processing Applications with the TMS 320 Family, Volume I
Texas Instruments

Applications-oriented, this book introduces the DSP devices/tools and the fundamental DSP operations to aid in designing a DSP application. Includes two floppy disks for the IBM PC.
1988, 736 pp., cloth 0-13-797374-8 $18.95
Circle #102 for FREE 15-day exam

A Digital Signal Processing Laboratory Using the TMS320
Douglas L. Jones & Thomas W. Parks

A self-study, step-by-step tutorial designed to introduce real-time digital signal processing using the Texas Instruments TMS32010 DSP microcomputer and its Evaluation Module (EVM) system. Includes floppy disk for IBM PC.
1987, 96 pp., paper 0-13-212391-6 $17.33
Circle #103 for FREE 15-day exam

Single- and-Multiple-Chip Microcomputer Interfacing
G.J. Lipovski

This book covers the hot chip from Motorola, MC68HC11. Uses the IEEE CSCC guidelines to present microcomputer system design in general, and interfacing in particular. Takes a combined hardware/software hands-on approach to microcomputer design.
1987, 688 pp., cloth 0-13-810557-X $40.00
Circle #104 for FREE 15-day exam

MC 68020 32-Bit Microprocessor User's Manual, Second Edition
Motorola, Inc.

Offers the latest, complete information to design engineers, software architects, and computer designers to aid in the completion of hardware and software systems using the MC 68020.
1986, 444 pp., paper 0-13-566860-3 $19.95
Circle #105 for FREE 15-day exam

MC68851 Paged Memory Management Unit User's Manual
Motorola, Inc.

Provides indepth coverage of the Motorola MC68851 (coprocessor to the MC68020)—complete with numerous illustrations, tables, and operating instructions.
1987, 332 pp., paper 0-13-566902-2 $19.95
Circle #106 for FREE 15-day exam

Series 32000 Programmer's Reference Manual
National Semiconductor

The first and only authorized user documentation manual for the NS 32000 family of microprocessors—a family designed to support multiple high level languages and operating systems.
1987, 323 pp., paper 0-13-806936-0 $20.95
Circle #107 for FREE 15-day exam

Clipper™ 32-Bit Microprocessor User's Manual
Fairchild Semiconductor Corp.

Presents a comprehensive description of the Clipper™ architecture (Fairchild's revolutionary 32-bit microprocessor based on supercomputer architecture) and architectural concepts.
1987, 512 pp., paper 0-13-138058-3 $23.95
Circle #108 for FREE 15-day exam

Microcomputer Hardware Design
D.A. Protopapas

Addresses fully the spectrum of today's microcomputer building blocks—including their principles and characteristics—with an emphasis on the external interfaces that designers deal with in real designs.
1988, cloth 0-13-581869-9 $42.67
Circle #109 for FREE 15-day exam

Computer Interface Engineering with Model-Based Analysis (with accompanying disk)
Patrick H. Garrett

Provides a quantitative model-based method for real-time computer interface design and analysis that replaces the current empirical methods. Includes ample design exercises and problems, and a computer-assisted-engineering disk (IBM PC compatible).
1987, 304 pp., cloth 0-13-163023-7 $46.00
Circle #110 for FREE 15-day exam

Complete Guide to the RS-232 and Parallel Connections: A Step-by-Step Approach to Connecting Computers, Printers, Terminals and Modems
Martin D. Seyer

Provides tutorial modules outlining all possible connections of computers, printers, terminals and modems; a standard step-by-step approach to any connection; tips for easy software setup; and a technique for establishing an updateable profile for a device's port; and much more.
Instock 4/88, paper 0-13-783515-9 $27.95
Circle #111 for FREE 15-day exam

The Legal Guide to Computer Software Protection: A Practical Handbook on Copyrights, Trademarks, Publishing and Trade Secrets
Thorne D. Harris III

Features all the forms and step-by-step procedures needed to copyright your computer programs and video displays, plus everything you need to know about software, publishing contracts, sales agreements, licensing agreements, warranties, disclaimers and limitations, trademarks, trade names, and more.
1984, cloth 0-13-528373-6 $29.95
Circle #112 for FREE 15-day exam

Order your copy of the **Prentice Hall Professional/Technical/Reference Catalog: Books for Computer Scientists, Computer/Electrical Engineers and Electronic Technicians** for only $2.00. (013-622804-6) **Circle #113 for FREE 15-day exam**

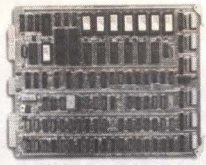
...at the leading edge

TO ORDER FOR 15-DAY FREE EXAM:

Simply circle the appropriate number(s) on the Reader Service Card at the back of this magazine. Your book(s) will be sent to you for your 15-day exam. If you are satisfied, keep the book(s) and pay the purchase price plus postage and handling. Otherwise return the book(s) by the end of the 15-day period and owe nothing.

PRENTICE HALL

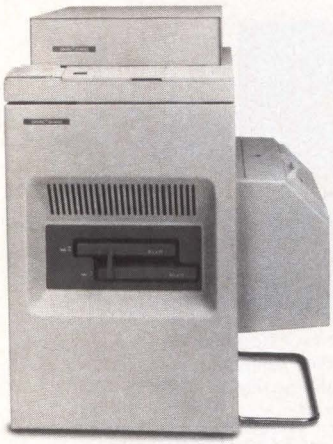
Follow this line.



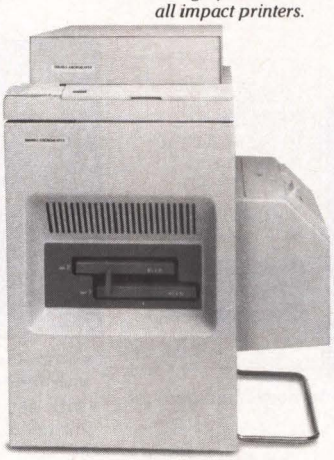
QMS Magnum® Series Board
Controller board for adding industrial graphics to virtually all impact printers.

QMS WedgeBox®
External printer interface

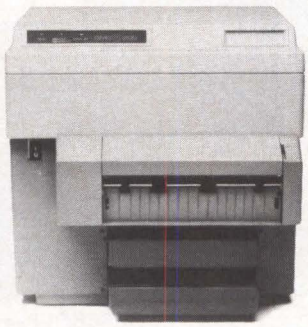
QMS KISS™*plus*—New
8 pages per minute.
Word processing/office automation.
Higher-resolution Canon® SX engine.
3 personality modules to match needs.



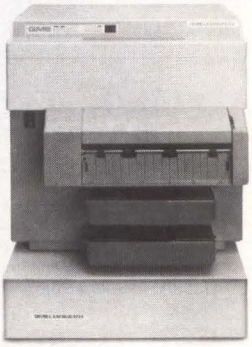
QMS-PS® 2400
24 pages per minute. 11" × 17" output.
PostScript language. Electronic publishing.



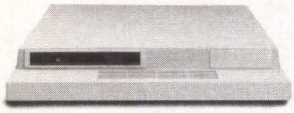
QMS Lasergrafix® 2400
24 pages per minute.
Engineering, scientific, CAD.
Multiuser environments.



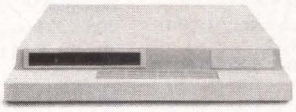
QMS-PS 800 II—New
8 pages per minute.
PostScript® language.
Desktop publishing.
Multiuser environments.



QMS Lasergrafix 800 II
8 pages per minute.
Engineering, scientific, CAD.
Multiuser environments.

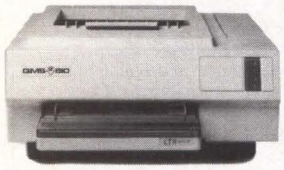


PS Jet™
PostScript upgrade for laser printers using Canon engines. 13 resident typefaces.

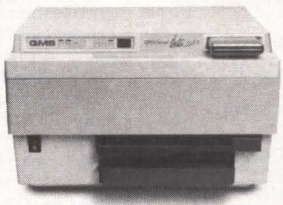


PS Jet+
PostScript upgrade for laser printers using Canon engines. 35 resident typefaces.

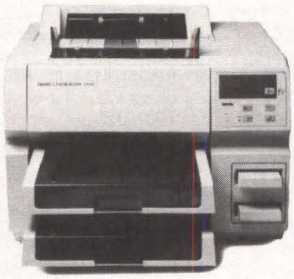
It will take you



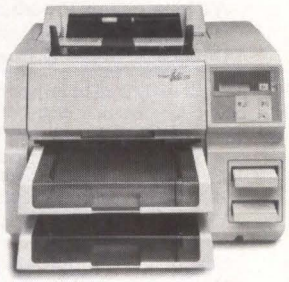
QMS-PS 810—New
8 pages per minute. PostScript language.
Desktop publishing.
Higher-resolution Canon SX engine.



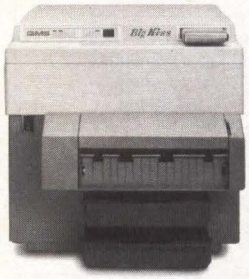
QMS SmartWriter® 8/3X
8 pages per minute.
Word processing/office automation.
IBM® System 3/X environments.



QMS Lasergrafix 1510—New
15 pages per minute.
Engineering, scientific, CAD.
Multiuser environments.



QMS SmartWriter 150
15 pages per minute.
Word processing/office automation.
Multiuser environments.



QMS Big KISS™ II
8 pages per minute.
Word processing/office automation.
Multiuser environments.

anywhere you want to go.

The QMS family of products can provide VAR's and OEM's with a printing solution for just about any application. Like industrial graphics. Word processing and office automation. Desktop/in-house printing and publishing. Advanced scientific/engineering/CAD graphics.

The flexibility and compatibility of QMS products make it easier to pull together a total system solution for your clients. VAR's and OEM's can choose from almost every product we manufacture, with innovative combinations of print engines, controllers, fonts and accessories to fit almost any niche. Plus, we're always willing to make custom modifications to our products to help you close the sale.

Of course, you can expect pricing that keeps your margins healthy and your bids competitive. What's more, you'll be working with a $100 million company well acquainted with the needs and immediacy of the VAR/OEM market. A company that's placed more printers and printer technology, in more different printing environments, than anyone else.

To find out how our line can have a positive effect on your bottom line, call 1-800-631-2692

PostScript is a registered trademark of Adobe Systems, Inc. IBM is a registered trademark of International Business Machines Corporation. Canon is a registered trademark of Canon U.S.A., Inc.

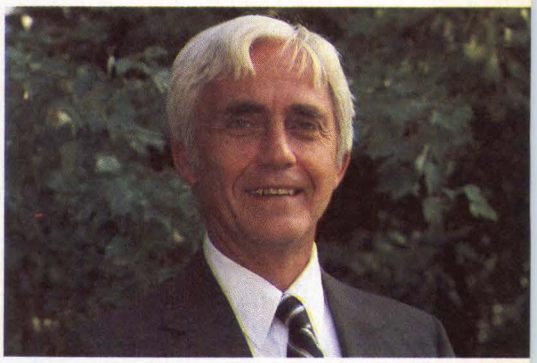
QMS®

CIRCLE NO. 37 ON INQUIRY CARD

TELCOR ON COMPRESSION

How to quadruple dial-up communications efficiency

Francis Bacon
Telcor Systems Corp.



Consistent 4:1 compression is now a reality for virtually any modem or dial-up line.

Why would anyone buy a 2,400-baud modem if they could communicate at 9,600 baud for the same money? Why would anyone pay four times the phone charges? Why would anyone wait four times longer for remote information to be displayed on a computer screen?

The answer, of course, is that no one would. Almost anyone who believed that dial-up communications performance could be increased by a factor of four, without major upheaval, would take advantage of the opportunity. This is the promise of data compression. Until now, that promise has been unfulfilled by compression techniques that were either not effective or which were difficult or expensive to implement.

All that has changed since the introduction of a patented data compression model last year by Telcor Systems Corp. The power of the model is derived from a data compression technique that simply works better than the previous ones—such as the Huffman or Lempel-Ziv models. While the design of these models is interesting, the really important point is that consistent 4:1 data compression is now a reality for virtually any modem or dial-up line.

The Huffman model is based on a table that translates each of the 256 ASCII character set into a coded bit pattern for transmission to the receiver. Most of these Huffman codes are actually longer than the original ASCII version of the character. Huffman works because the most frequently used characters have fewer bits than the ASCII so that, on average, the number of bits needed to represent a message is reduced.

Francis Bacon is chairman of Telcor Systems Corp.

Setting the table for Huffman

An example of how a Huffman encoding table might look is shown in Fig. 1. The table has 256 entries, one for each character. Each entry could consist of, say, 15 bits that are divided into three fields containing three, four and eight bits, respectively. Seven characters can be represented in the field containing three bits (plus the "non-character" code). Fifteen characters can be represented in the field containing four bits (plus the "non-character" code). The remaining 234 characters can be represented in the field containing eight bits.

The Huffman table is organized from top to bottom in descending order of frequency. That means that the most frequently used characters are encoded in three bits in the top seven table entries. If the first three bits contain a recognized character code, that is taken to be the value of the character, and the remaining bits in the entry are ignored.

Immediately below the top seven are encoded the next most often used 15 characters, in descending order of frequency. In each of those 15 table entries, the first field (three bits) is encoded with a special non-character value. That non-character code indicates that the software should look in the second field (four bits) for the actual character code. In this example, therefore, it takes seven bits to represent the next most frequently used 15 characters. The first three bits comprise the non-character code and the second four bits represent the character being transmitted. The remaining eight bits in the entry are ignored. Seven bits is still slightly better than the eight bits required for the full ASCII character.

If the character being transmitted is not one of the 22 most frequently used characters, it will be represented in one of the remaining 234 table entries, with the least frequent occupying entry 234.

In each of those entries it will take more bits to represent a character than it would to represent the ASCII version of the character, that is, 15 bits versus eight. In these entries, both the first and second fields contain the special "non-character" value, which tells the software to go on to the third and, in this case, last field for the character code.

Exchanges places at the table

Huffman tables may be either static or dynamic. A static table is one in which the frequency of each character in the message is assumed and so the order of the character in the table is determined ahead of time. That order is fixed so that, even if the actual frequency changes, the software will continue using the same table. Obviously, both the sender and receiver would have created identical tables prior to transmission to enable proper interpretation of the message codes.

In a dynamic Huffman model, a frequency algorithm determines which characters are represented at

TELCOR ON COMPRESSION

which levels in the table. Every time a character is used, its position in the table is exchanged for the position of the character immediately above it. The bit patterns in the table themselves do not actually change. What changes is the assignment of the bit patterns within a table entry to represent a particular character. An exchange is always made after the code currently assigned is sent across the line. This ensures that both sender and receiver can update their respective copies of the table in synch.

For example, let's suppose a data stream shifted from using uppercase and lowercase letters to all uppercase. In the first instance, the lowercase "e" might be the most frequently used character and be at the top of the table. Uppercase "E", on the other hand could very well be at the bottom. Once the shift to all uppercase occured, every time E was used its table assignment would be swapped to the next higher level until it reached the top. Along the way, it would cross the boundary between 15- and 7-bit representation and then the boundary between 7- and 3-bit representation.

The major advantages of the Huffman model are its simplicity and the fact that it does not require much memory to implement. The fact that it can only represent single characters one-for-one, rather than a string of characters, limits its data compression ability. A model that can process a string of characters at one time is Lempel-Ziv.

Lempel-Ziv varies the string

Unlike Huffman, which uses a fixed table to convert each of the 256 ASCII characters into a corresponding compressed-bit pattern, Lempel-Ziv uses a table of variable size to express combinations, or strings, of characters of varying length.

Lempel-Ziv works by building strings of variable lengths and assigning string numbers to them. All one-character strings (i.e., the members of the ASCII character set) are predefined in the table. The string number of each ASCII character is preset to its number within the ASCII set. For example, the string number for "a" is 97, "b" is 98 and so on.

As soon as the software begins to see, so called "virgin" strings, i.e., strings that haven't yet been stored in the table, it begins writing these strings to a table and referencing them with string numbers. For instance, suppose we were sending the entire ASCII character set again and again through the model. Each of the ASCII characters would already be assigned string Nos. 1 through 256.

As we first start to send the alphabet through, the first virgin string encountered would be "ab." (Because "a" is known but "ab" is new). Accordingly, this string would be stored in the table and assigned string No. 257. As the table entry for "ab" is created, the string number for "b" is sent so that the receiver knows that the second letter being sent is a "b." In the future, when "ab" is sent, the receiver will know that 257 means "ab" and so the string number will be sent instead.

The next virgin string identified would be "bc" when the software encounters the "c." This time the string number "67" is sent so the receiver knows that the third character in the stream is a "c." Both sender and receiver assign a string number (258) to the new string and put the string in their tables. The next time the software sees the string "bc" the number 258 will be sent instead of the ASCII value "bc."

Virgin strings always consist of a string known to the table plus one additional character which, when added to the known string, makes the string unfamiliar. For example, on the second reading of alphabet, the string "ab" will be known but the string "abc" will not. Therefore, the sender transmits the string number of the known part of the string (257) so that the receiver will also know that the string sent is 'ab." Then the sender

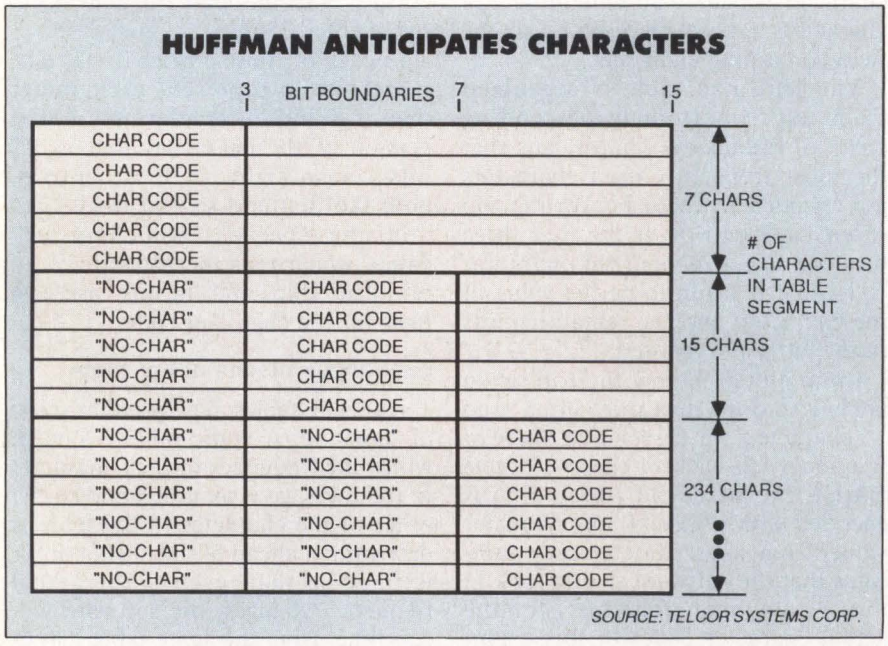


Fig. 1. The Huffman table *is organized from top to bottom in descending order of frequency. Each entry could consist of, say, 15 bits divided into three fields of three, four and eight bits. Seven characters can be represented in the field containing three bits (plus the "non-character" code). Fifteen characters can be represented in the field containing four bits (plus the non-character code).*

assigns a string number for the "abc" string and goes on to take the "c" as the first character of the next string. Since "c" is known, the software goes on to consider the next character, "d." Since "cd" is known, the software considers the next character, "e." Because "cde" is a virgin string, the "cd" gets sent in the form of its string number to the receiver. A string number (514) is then assigned by the sender to "cde."

Strings begin to pile up

The receiver now knows that the character after "ab" was "c" and is also able to assign a string number to "abc." Because string numbers are always assigned in the same order at both sender and receiver, the string numbers always agree.

However, one distinguishing performance feature of Lempel-Ziv is that, even if the input to the model is a steady stream of characters—"a, b, c, d, e" and so on—the output will soon become bursty. In our example, once we get past the first 256 strings, the output of the model is "ab, cd, ef" and so on. When we get past the 768th character, the output is "abc def efg" and so on. Between the character groupings time is spent by the software in searching the table, assigning string numbers, and filling (or reading) transmission containers. The bursty nature of Lempel-Ziv results in the "jerky screen" effect that mirrors the start-stop pattern of the transmission stream.

Another limitation of Lempel-Ziv is the so-called boundary problem. That problem occurs when portions of the same string occur over and over again in the table, even though, logically, it would make sense to have only one copy of a string occupy space. Take, for example, the string "there." Embedded within this string are also the strings "here" and "ere," which may very well have their own string number assignments taking up space in the table.

The issue of table capacity and efficiency is important for Lempel-Ziv. Typically, what happens when the size of the table reaches its prescribed limit, and the software cannot find a location for a string number it wants to assign, is that the table collapses and the software starts over, constructing a new one. The result of this rebuilding process is that highly efficient string number assignments are temporarily lost, greatly reducing data compression. Typically, Lempel-Ziv must rebuild its table about every 3,000 characters, which in most cases is every few seconds.

It is possible in some versions of the model to "freeze" the table once it has been built and simply reuse the same assigned string numbers on new data. To do so, however, takes the risk that the new data will reflect the same frequencies of character-pattern usage as the old data. If, in fact, the data were suddenly to go from uppercase and lowercase letters to, say, all uppercase, the model would become horribly inefficient, unless it could build a new table.

Telcor converts ASCII

The Telcor model combines concepts from both Huffman and Lempel-Ziv. Like Huffman, Telcor uses a fixed table size to convert single ASCII characters into compressed codes for transmission. Like Lempel-Ziv, the Telcor model uses the fact that certain character strings appear more frequently in a data stream than do other strings. Like Huffman, Telcor adapts so that the more frequently a character is used, the greater the degree of data compression that is achieved.

Telcor uses up to 2,048 tables for data compression. Each table contains up to 16 different characters. Fig. 2 shows how four of these tables might look.

The key to the Telcor model is that, what almost always gets sent across the line is the number of the character position in a table. Further, that position is never more than six bits since we only need to identify 16 positions. As it never takes more than six bits to indicate the postion of a character in a table (usually only one or two), Telcor provides efficient data com-

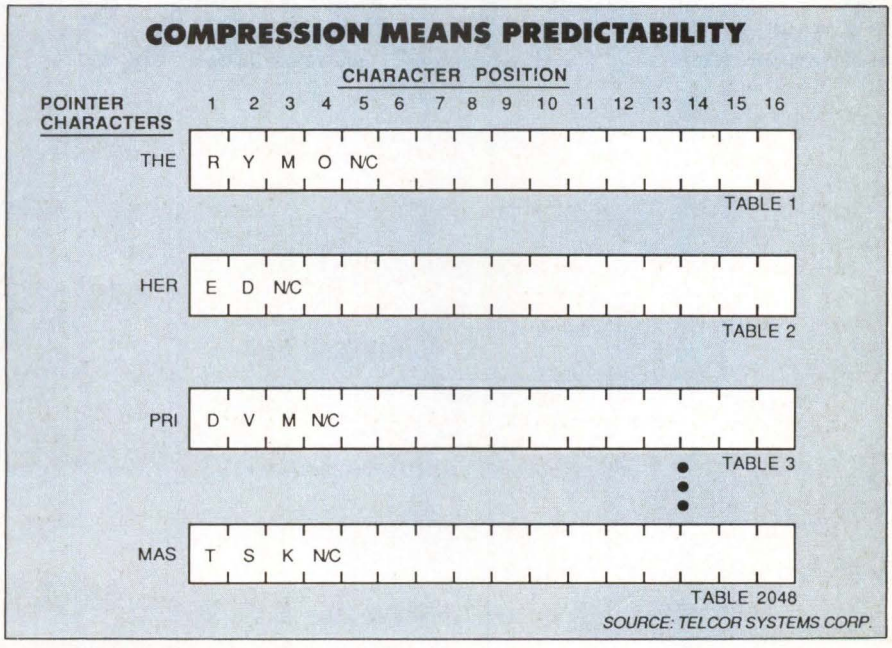
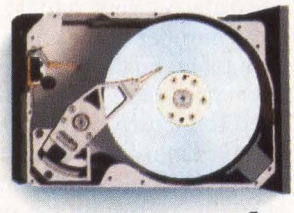


Fig. 2. Telcor's data compression *technique uses up to 2,048 tables, each with up to 16 different characters. For example, in sending the "y" in the word "they" using the tables listed here, the letters in the pointer to Table 1 are the t, h and e.*

WHAT DRIVES  A LEADER?

You do.

We do.

On one hand, there's your drive to find new applications and new markets. On the other, there's our drive to meet your needs.

And as partners, we both end up in the lead.

You give us the impetus to stay a generation or more ahead of the competition. And we give you the products to do the same.

Like our high-performance, high-capacity Winchester drive families, from 85MB to 760MB. And our first high-capacity optical product, a 5¼-inch, 800MB WORM drive.

So keep pushing us.

Because the further you drive Maxtor, the further we'll drive you.

Maxtor Corporation, 211 River Oaks Parkway, San Jose, CA 95134, (408) 432-1700, TELEX 171074.

Maxtor

CIRCLE NO. 38 ON INQUIRY CARD

Sales offices: Atlanta (404) 455-4226, Austin (512) 345-2742, Boston (617) 872-8556, New Jersey (201) 747-7337, Orange County (714) 472-2344, San Jose (408) 435-7884, Woking, England (44)/4862-29814, Tokyo, Japan 81-3-431-8940.

Distributed by Anthem Electronics, (714) 768-4444, (408) 295-4200, (617) 657-5170, Future Electronics, (514) 694-7710, Pioneer Standard Electronics, Inc., (216) 587-3600, (301) 921-0660, Quality Components, Inc., (214) 733-4300, Storex Corporation, (617) 769-3400.

© 1987 Maxtor Corporation

WHERE TO FIND A LEADER.

For more information on high-capacity Maxtor disk drives, contact our distributor in your area.

ALABAMA
(205) 837-9300 (P)
(205) 830-1881 (Q)

ARIZONA
(602) 966-6600 (A)

CALIFORNIA
(818) 700-1000 (A)
(714) 768-4444 (A)
(916) 922-6800 (A)
(619) 453-9005 (A)
(408) 295-4200 (A)

COLORADO
(303) 790-4500 (A)

CONNECTICUT
(203) 853-1515 (P)
(203) 237-2282 (A)

FLORIDA
(305) 834-9090 (P)
(305) 428-8877 (P)

GEORGIA
(404) 448-1711 (P)
(404) 449-9508 (Q)

ILLINOIS
(312) 437-9680 (P)
(312) 640-6066 (A)

INDIANA
(317) 849-7300 (P)

KANSAS
(913) 492-0500 (P)

MARYLAND
(301) 921-0660 (P)
(301) 995-6640 (A)

MASSACHUSETTS
(617) 861-9200 (P)
(617) 657-5170 (A)
(617) 769-3400 (S)

MICHIGAN
(313) 525-1800 (P)
(616) 698-1800 (P)

MINNESOTA
(612) 944-3355 (P)
(612) 944-3045 (A)

MISSOURI
(314) 432-4350 (P)

NEW JERSEY
(201) 575-3510 (P)
(201) 227-7960 (A)

NEW YORK
(516) 921-8700 (P)
(516) 273-1660 (A)
(607) 722-9300 (P)
(716) 381-7070 (P)

N. CAROLINA
(704) 527-8188 (P)
(919) 876-7767 (Q)
(919) 544-5400 (P)

OHIO
(216) 587-3600 (P)
(513) 236-9900 (P)

OKLAHOMA
(918) 664-8812 (Q)

OREGON
(503) 643-1114 (A)

PENNSYLVANIA
(412) 782-2300 (P)
(215) 674-4000 (P)
(215) 443-5150 (A)

TEXAS
(512) 835-4000 (P)
(214) 386-7300 (P)
(713) 988-5555 (P)
(214) 733-4300 (Q)
(512) 835-0220 (Q)
(713) 240-2255 (Q)

UTAH
(801) 973-8555 (A)

WASHINGTON
(206) 881-0850 (A)

CANADA
(403) 235-5325 (F)
(403) 438-2858 (F)
(514) 694-7710 (F)
(613) 820-8313 (F)
(416) 638-4771 (F)
(604) 294-1166 (F)
(204) 339-0554 (F)

(A) = Anthem Electronics
(P) = Pioneer
(Q) = Quality Components
(S) = Storex
(F) = Future Electronics, Inc.

Maxtor

TELCOR ON COMPRESSION

pression. Four-to-one is typical.

Knowing the position of a character within a table does no good unless the correct table is also known. Telcor uses a table pointer to identify the table containing the character at the specified position. That pointer is created from the three characters that immediately preceded the current character in the stream. Using those three characters, the pointer consists of the following bits: the least significant seven bits of the character immediately preceding this one and the two most significant bits of each of the two other characters. This is an 11-bit pointer that can address up to 2,048 different tables.

If, for example, you were sending the "y" in the word "they" using the tables listed in Fig. 2, the letters used to construct the pointer to Table 1 are the t, h and e. The Telcor model would have created a pointer based on these letters, which in this example is assigned to Table 1. As in the case of the other models, both the sender and receiver construct their tables and pointers in sync. This is done by first sending the uncompressed version of a letter and only then performing synchronous encoding on both ends.

Once the Telcor pointer has been created and identified as being present within the current bit stream, what comes next in the bit stream will be read by the receiver as a character-position value. The bit pattern resident at that position will in fact be the "decompressed" ASCII character.

In our example, the receiver's pointer is pointing toward Table 1 because the letters "the" were the last three received. Now the sender emits a single binary "1," indicating the second bit position in that table is the one with the desired character. One bit has thus taken the place of eight.

The Telcor model, therefore, takes advantage of the fact that certain characters are more likely than others to follow certain three-character strings. For example, r, y, m and n are more likely to follow "the" than will x, !, or %. This allows short numbers to be used as table character positions and a high average degree of data compression.

As in Huffman, the Telcor model calls for the creation of a special "non-character" value to signal when a character is not in the table. The sender will know if a letter to be sent is new to the table and will, accordingly, send the position of the "n/c" character to the receiver. The sender will also assign the new character to the next available position in the table. At the receiving end, the software sees that what is being referenced is a non-character position. Following transmission of the "n/c" character position, the sender emits the full ASCII bit pattern of the new character. Both sender and receiver update their tables by putting the character in the next available position, just ahead of the "n/c" character.

As new three-character strings present themselves in the data stream, both sender and receiver will also construct new table pointers, using the new string created by the occurence of a new character and assign that pointer to the next table not currently addressed by a pointer. If all the tables have pointers, the software will create a new pointer and overwrite the table that has been least frequently referenced.

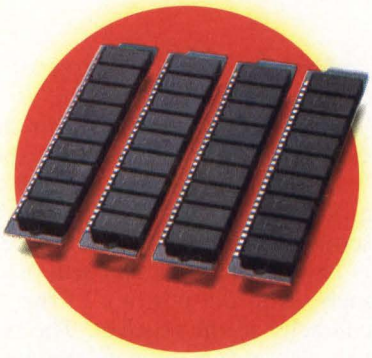
Predictability reduces redundancy

Each time a character that already exists in a table is referenced, it exchanges places with the character immediately to its left. This means that the most frequently referenced characters in a table will require the least number of bits, thus increasing the data compression ratio even more.

Besides achieving the fastest effective data transmission rate of any data compression technique, Telcor has a number of other major advantages over both Huffman and Lempel-Ziv. Unlike Huffman, Telcor achieves significant compression with almost all characters, not just those handful in a select "top tier." □

Interest Quotient (Circle One)
High 492 Medium 493 Low 494

SUN 3/60
Compatible Memory



Available Now Only from Clearpoint
1-800-CLEARPT

Let your Sun 3/60 reach for the stars. Upgrade your system to the system maximum of 24 MB with high reliability Clearpoint memory. Each one megabyte SIMM is packed with eight 1 megabit DRAM DIPs, plus a megabit DRAM to support parity. Buy a set of four SIMMs and meet the basic Sun 3/60's 32-bit performance. Add five SNX60 SIMM sets to your system—your Sun 3/60 can rival its higher-end family products at much less cost but with Clearpoint's uncompromising quality.

All Clearpoint products come with a Lifetime Warranty, full Product Support, trade-ups credits when you upgrade... and competitive pricing that's out of this world.

Write or call for Clearpoint's SUN family literature, our 1987/88 Catalog and the New Designer's Guide to Add-in Memory.

Sun is a trademark of Sun Microsystems. Clearpoint is the registered trademark of Clearpoint Research Corporation.

CLEARPOINT

99 South Street • Hopkinton, MA 01748-2202
U.S.A. 1-800-CLEARPT Telex: 298281 CLEARPOINT UR
Massachusetts 617-435-5395/435-2301
Europe: Clearpoint Europe b.v.
Tel: 31-23-273744 Telex: 71080 CLPT NL
Canada: Clearpoint Canada Tel: 416-620-7242
Japan: Clearpoint Asia
Tel: 03-221-9726 Telex: 32384

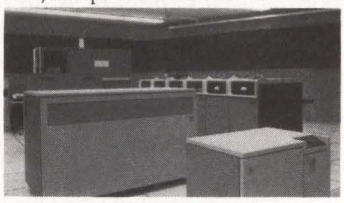
CIRCLE NO. 39 ON INQUIRY CARD

Quiet your hardware with our soft ware.

SONEX Sheets

SONEX 1

SONEX acoustical foam eliminates annoying computer noise. Period. Its patented anechoic wedge design absorbs, deflects, and dissipates the disturbing din of motors, fans, and printers. SONEX or flame-resistant SONEX 1 — the only soft ware that quiets **any** computer environment.



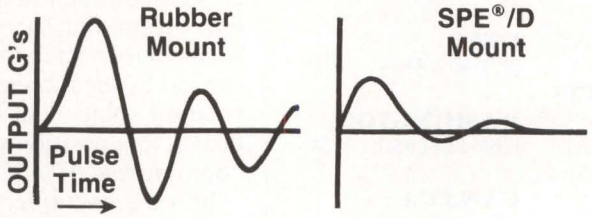
For your free color brochure, call or write: 3800 Washington Ave. North, Minneapolis, MN 55412. (612) 521-3555.

illbruck

CIRCLE NO. 40 ON INQUIRY CARD

Super Shock Protection

New! **SPE®/D Mounts make the difference**



- **Economical high damped rubber.**
- **Low transmissibility (T = 2.5 - 3.5) for good vibration control.**
- **Require minimum sway space.**
- **Standard and custom SPE/D mounts available.**

Call your nearest Lord Representative

Lord Corporation
Industrial Products Division
2000 West Grandview Blvd.
Erie, PA 16514-0038
814:868-5424

LORD®
Industrial Products

8049

CIRCLE NO. 41 ON INQUIRY CARD

NEW PRODUCTS
SYSTEMS

Megan Nields, Staff Editor

Expanded series leads with 386

- Five models
- MS-DOS compatible
- disk-caching software

Five computer systems added to HP's Vectra PC series include two based on Intel's 80386 microprocessor and an entry-level 8088 model. Models RS/16 and RS/20 386 MS-DOS-compatible computers focus on CAD and LAN applications. The 16-MHz RS/16 includes 1M byte of main memory and a 40M-byte rigid disk drive. The 20-MHz RS/20 has 2M bytes of RAM and either one 103M-, 155M- or 310M-byte rigid disk. Both systems' memory can be expanded to 16M bytes. Vectra ES systems feature an 80286 microprocessor operating at 8 MHz on the ES PC and 12 MHz on the ES/12 PC. They support 20M- or 40M-byte rigid disk drives. The Vectra CS PC entry-level system has built-in terminal-emulation software, a 360K-byte flexible disk drive and support for a 20M-byte rigid disk drive. $6,495 to $11,995, RS/16 and RS/20; $2,595 to $4,195, ES PC and ES/12 PC; $1,195 to $1,895, CS PC. **Hewlett-Packard Co.,** 3000 Hanover St., Palo Alto, Calif. 94304 (415) 857-1501

Circle 541

Portable furnishes PC/AT compatibility

The Portable Office, an IBM PC/AT-compatible system, weighs 20 pounds and has a 40M-byte rigid disk drive. The unit features an Intel 80286 microprocessor and a softkey-selectable system clock, seven-channel DMA, a 16-level interrupt and CMOS memory to maintain system configuration. It also supplies 1M byte of RAM, six expansion slots, an LCD screen and a 180W power supply. $3,295. **IMC International Inc.,** Northwood Executive Park, 10 Northern Blvd., Amherst, N.H. 03031 (603) 595 2336.

Circle 542

CIRCLE NO. 42 ON INQUIRY CARD

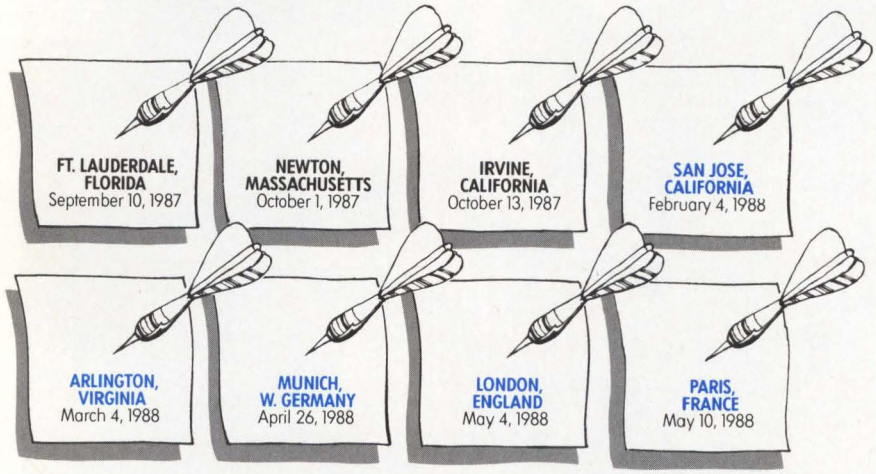
Converter links seven peripherals

- 45 terminal types
- 18 character sets
- Seven-color support

The SmartNet 5250/T Plus protocol converter connects up to seven asynchronous terminals, printers, personal computers and graphic devices to the twinax port of IBM systems 34, 36 and 38 minicomputers. Totally transparent to the host and the user, the device supports more than 45 terminal types. Features include 18 character sets, seven-color support and a dual processor. $2,595. **PCI Inc.,** 26630 Agoura Road, Calabasas, Calif. 91302-1988.

Circle 543

Target In On COMPUTER GRAPHICS



At the 1987/88 Computer Graphic Series of the Invitational Computer Conferences (ICC), computer graphic manufacturers will meet with a pre-qualified group of system integrators, OEMs and large end users throughout the U.S. and Europe.

If you're a computer graphic manufacturer, you can time and cost efficiently bring the latest technical information and products to where your volume buying prospects live and work—and support your regional sales force in their territory.

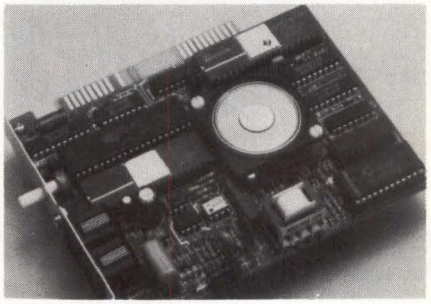
If you're a volume buyer of computer graphic products, you can locally attend technical product seminars and see the latest graphic products demonstrated. As invited guests of the exhibiting companies there is no admission charge to the seminars or product displays.

Manufacturers of workstations, image processors, CAD/CAM software, business graphics software, graphic enhancement boards, graphic displays/terminals, printers/plotters, laser and ink-jet printers, film recorders, input devices and other associated computer graphic peripherals—target your U.S. and Europe sales territories. And volume buyers—target the Computer Graphic ICC closest to you and call your local computer graphic supplier, or our offices, for an invitation.

In the U.S. contact: Invitational Computer Conferences, B.J. Johnson & Associates, Inc., 3151 Airway Avenue, C-2, Costa Mesa, CA, Tele.: (714) 957-0171—Telex: 5101002189 BJ JOHN.

In Europe contact: Invitational Computer Conferences, C.J. Nicholl & Associates, Ltd., 37 Brompton Road, London SW3 1DE, England—Tele.: 01-581-2326—Telex: 888068 CJNAD G.

Ask about the OEM Peripheral Series and the PC Reseller Series of the Invitational Computer Conferences.



Modem uses Hayes AT command set

- 2,400 bps
- Bell 212A compatible
- Four-port support

The Zoom/Modem HC uses the Hayes AT command set to supply data rates of 300, 1,200 or 2,400 bps. It works with the IBM PC/XT, PC/AT and compatibles and comes with proprietary communications software. The half-card unit provides four-port support, autodial and auto-answer capabilities and diagnostics. Protocol support includes Bell 103A, 212A and CCITT V.22 bis. $199. **Zoom Telephonics Inc.,** 207 South St., Boston, Mass. 02111. (617) 423-1072.

Circle 544

Controller suits IBM PC/XT, PC/AT

- Four I/O channels
- Over 1M bps
- 512K bytes of DRAM

A communications controller for the IBM PC, PC/XT and PC/AT, the ATcomm4 provides four programmable serial I/O channels. The device achieves data rates of over 1M bps. It supplies 512K bytes of dynamic RAM, an RS232C interface and bidirectional FIFO registers. $1,395. **Metacomp Inc.,** 9466 Black Mountain Road, San Diego, Calif. 92126, (619) 578-9840.

Circle 545

SOFTWARE

IBM OS/2 handles multiple jobs

IBM Operating System/2 Standard Edition 1.0 addresses up to 16M bytes of memory. It allows users to run multiple concurrent application programs through background processing and progam switching. OS/2 supports IBM PS/2 models 50, 60 and 80; and the IBM PC/AT and PC/XT Model 286 with 1.5M bytes of memory; but 2M bytes of memory are required to run both OS/2 and DOS applications. $325, one-time license. **IBM Corp.,** Information Systems Group, 900 King St., Rye Brook, N.Y. 10573, (201) 930-5231.

Circle 546

Color graphics package suits IBM

PagePerfect software integrates word processing with graphics-processing, file-management, typesetting and design tools in a "page-processing" method that allows document design. A file-management operating shell lets users move through document creation, graphics integration, layout, composition and printing. Text is entered and edited within a composed page at nine different view levels. The software handles documents of any length and features automatic pagination, a spell-checker and a thesaurus. It runs on IBM PS/2 computers. $495. **IMSI,** 1299 Fourth St., San Rafael, Calif. 94901, (415) 454-7101.

Circle 547

Spreadsheet handles multiple environments

Quattro: The Professional Spreadsheet, a single-user program, includes spreadsheet operations, graph-printing support, programmable application development, built-in macro development and debugging and file- and macro-level compatibility with Lotus 1-2-3 (release 2.01). Quattro is compatible with MS-DOS, OS/2 character-based, OS/2 Presentation Manager and OS/2 Extended Edition. It supports the LIM 3.2 and 4.0 specifications for use of expanded memory. $195. **Borland International**, 4585 Scotts Valley Drive, Scotts Valley, Calif. 95066, (408) 438-8400.

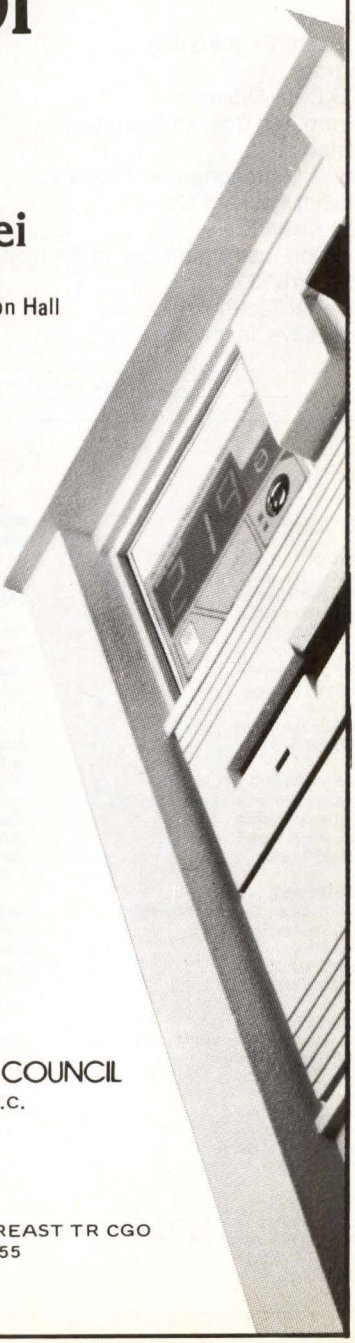
Circle 548

Graphics package upgrades features

Version 2.0 of Graph-in-the-Box, a graph generator for IBM PCs, PS/2 units, and compatibles, includes VGA and MCGA compatibility. It creates HPGL and Postscript files, full-page printouts, batch printing and sequenced slide shows. The program produces pie-chart routines 10 times faster than previous versions. It is also compatible with Ventura Publisher and PageMaker, requires 128K bytes of memory and stores on 3½- and 5¼-inch flexible disks. $99.95. **New England Software Inc.,** Greenwich Office Park 3, Greenwich, Conn. 06831, (203) 625-0062.

Circle 549

It's Taipei for Computers



Computex Taipei

June 6-12, 1988

Taipei World Trade Center Exhibition Hall

Taiwan has emerged as one of the world's most dynamic commercial centers for microcomputers, a wide range of peripherals, and other computer products. The latest offerings to stimulate world-wide buyer interest are newly developed 32-bit computers that represent an outstanding market value.

It's thus no wonder that Computex Taipei, with its nearly 500 exhibitors from among Taiwan-based and international manufacturers, attracts leading buyers from around the globe. You'll want to join them at this sourcing extravaganza.

To find reliable, new sources of supply, you may also be interested in visiting the Taipei Int'l OEM/Subcontracting Show, June 21-25, 1988.

For full details, contact the show organizer.

Organizers:

CHINA EXTERNAL TRADE DEVELOPMENT COUNCIL

5 Hsin Yi Rd., Sec. 5, Taipei (10509), Taiwan, R.O.C.
Tel: (02) 7251111
Telex: 28094 TPEWTC, 21676 CETRA
Fax: 886-2-7251314, 886-2-7168783

TAIPEI COMPUTER ASSOCIATION

Local Contacts:

Chicago: Tel: (312) 321-9338 Telex: 253726 FAREAST TR CGO
Fax: 312-321-1635 **New York:** Tel: (212) 532-7055
Telex: 426299 CETDC NY Fax: 212-213-4189
San Francisco: Tel: (415) 788-4304, 788-4305
Telex: 4974157 FETS SF Fax: (415) 788-0468

CIRCLE NO. 44 ON INQUIRY CARD

ADVERTISERS' INDEX

COMPANY	PAGE NO.	INQUIRY NO.
ADDS	18	12
Algo	88	207
Analog & Digital Peripherals	88	205
Anritsu America Inc.	36	19
Avis	61	31
B & B Electronics Mfg.	88	210
Best Power Technology	87	204
Cahners Exposition Group	69, 71	—, 35
China External Trade Development Council	85	44
Chinon America	23	14
Clearpoint	82	39
Computerwise Inc.	88	209
Concurrent Computer	2, 3	3
Datamedia	14	10
Digi-Board	56	29
Digital Equipment Corp.	12, 13	—
Diversified Technology	6	6
Facit	38	20
Flagstaff Engineering	87	202
Fortron	17	11
FTG Data Systems	88	206
Glenrothes Development Corp.	49	25
Grafpoint	88	208
Hayes Microcomputer Products	24	15
Hewlett Packard Co.	20, 21	13
Honeywell Bull	58	30
Houston Instrument Div. of Bausch & Lomb	4	4
Illbruck/USA	82	40
Imperial Technology Inc.	48	24
Innovative Technology	83	42
Interface Group	67, 73	34, 36
Interphase Corp.	C3	45
Invitational Computer Conferences	84	43
Ioline Corp.	28	17
KMW Systems Corp.	50	26
Lord Industrial Products	82	41
Macrolink	1	2
Maxtor Corp.	80, 81	38
Method Systems Inc.	88	211
Multi-Tech	54	27
NEC Information Systems Inc.	40, 62, 63	21, 32
Prentice Hall	75	101-113
Quality Micro Systems	76	37
Qualstar	87	203
Reliable Communications	42	22
Rockwell International	11	9
Rodime	3	8
Sigma Designs	46	23
Tektronix Inc.	27	16
TeleVideo/Terminals	65, C4	33, 46
Vectrix	57	28
Versatec Inc. (a Xerox Co.)	C2	1
Victory Enterprises	6	5
Wave Mate	87	201
Western Union EasylinK	31	18
Wyse Technology	7	7
Zericon	87	200

See P. 87-88 for Mini-Micro Marketplace

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

MINI-MICRO SYSTEMS REGIONAL SALES OFFICES

NEW ENGLAND

Len Ganz
National Sales Manager
275 Washington St
Newton, MA 02158
(617) 964-3030

John J. Fahey
Regional Manager
199 Wells Ave.
Newton, MA 02159
(617) 964-3730

NEW YORK/MID-ATLANTIC
Joseph T. Porter, Regional Manager
487 Devon Park Dr.
Wayne, PA 19087
(215) 293-1212

SOUTHEAST
Larry Pullman, Regional Manager
6520 Powers Ferry Rd.
Suite 395
Atlanta, GA 30339
(404) 955-6500

MIDWEST
Rob Robinson, Regional Manager
Margaret W. Donahue
Sales Coordinator
Cahners Plaza
1350 E. Touhy Ave.
P.O. Box 5080
Des Plaines, IL 60018
(312) 635-8800

SOUTHWEST
Don Ward, Regional Manager
9330 LBJ Freeway, Suite 1060
Dallas, TX 75243
(214) 644-3683

MOUNTAIN STATES
John Huff, Regional Manager
44 Cook St.
Denver, CO 80206
(303) 388-4511

SOUTHERN CALIFORNIA
Tim Eidson, Regional Manager
18818 Teller Ave.
Irvine, CA 92715
(714) 851-9422

NORTHERN CALIFORNIA/ NORTHWEST/NEVADA
Frank Barbagallo
Northwestern Regional Sales Manager
Sherman Building, Suite 100
3031 Tisch Way
San Jose, CA 95128
(408) 243-8838

BENELUX/UNITED KINGDOM
Jan Dawson
Tracey Lehane
Cahners Publishing Co.
27 Paul St.
London, EC2A 4JU, England
011-44-1-628-7030
Telex: 914911
Fax: 01-628-5984

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

ITALY/FRANCE/SPAIN
Alasdair Melville
Cahners Publishing Co.
27 Paul St.
London, EC2A 4JU, England
011-44-1-628-7030
Telex: 914911
Fax: 01-628-5984

JAPAN
Kaoru Hara
Dynaco International Inc.
Suite 1003, Sun-Palace Shinjuku
8-12-1 Nishishinjuku, Shinjuku-ku
Tokyo, 160, Japan
03-366-8301
Telex: J2322609 DYNACO

SCANDINAVIA
Martin Sutcliffe
Cahners Publishing Co.
27 Paul St.
London, EC2A 4JU, England
011-44-1-628-7030
Telex: 914911
Fax: 01-628-5984

TAIWAN
Donald Shapiro
Trade Winds, 2nd Floor
132 Hsin Yi Rd., Sec. 2
Taipei, Taiwan
3932718 & 3913251
Telex: 24117 FC Trade

WEST GERMANY/ SWITZERLAND/ AUSTRIA/EASTERN BLOC
Uwe Kretzschmar
Cahners Publishing Co.
27 Paul St.
London, EC2A 4JU, England
011-44-1-628-7030
Telex: 914911
Fax: 01-628-5984

Mini-Micro Marketplace/ Direct-Response Postcards/ Career Opportunities
Carol Flanagan
275 Washington St.
Newton, MA 02158
(617) 964-3030

Cahners Magazine Division
Terrence M. McDermott, President
Frank Sibley, Vice President
Computer Group
Tom Dellamaria, VP/Production

Promotion Staff
Katherine Doyle
Director, Marketing Services
Kathleen Hackett
Promotion Manager

Circulation
Denver, CO:
(303) 388-4511
Sherri Gronli, Group Manager

MINI-MICRO MARKETPLACE

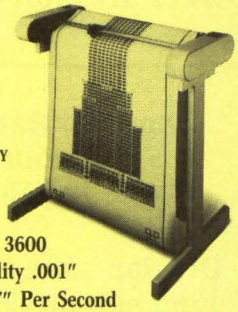
ATTENTION: BUYERS AND SELLERS OF PRODUCTS AND SERVICES IN THE COMPUTER SYSTEMS INTEGRATION MARKETPLACE:

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

"D" SIZE PLOTTER

$2295.00 RETAIL

$1,695.00 INTRODUCTORY OFFER



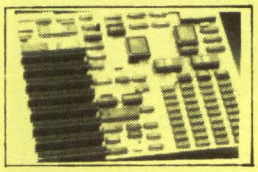
- Model PC 3600
- Repeatability .001"
- Speed at 7" Per Second
- Vacuum Paper Hold Down
- High Resolution Circles: Suitable for PCB Artwork

(415) 490-8380 **ZERICON**

Stevenson Business Park
Box 1669 • Fremont, CA 94538

CIRCLE NO. 200 ON INQUIRY CARD

OEMs, System Integrators, Clone Builders...
286 BOARDS: $149 OR LESS FOR QUANTITIES OF 40 / MONTH



Provide Your Customers With Over 5 Times The Power of 8 MHz 8088-2 Turbo XTs

Cut the cost of the world's best value in high performance, zero wait state, IBM-compatible motherboards. As a Wave Mate co-op manufacturer, obtain socketed boards, proprietary gate arrays, PAL sets, BIOS proms, and other components at special discounts to 79%, with very attractive inventory and credit arrangements. In addition, Wave Mate provides technical support, repairs, inventory repurchase, price guarantees, 2-year warranties, BIOS resident read/write disk caching software, and more.

The BULLET-286E board is a proven performance and quality winner world-wide. Why compromise with low quality clones when you can put the 80286 performance and compatibility leader in your own system products at the most favorable prices anywhere. [List price with zero RAM: $495. One unit for co-op manufacturing evaluation: $229].

WAVE MATE, INC.
2341 205th Street, #110
Torrance, CA 90501
Phone: 213-533-8190 Fax: 213-533-5940

CIRCLE NO. 201 ON INQUIRY CARD

Power Ensurance...
preventative medicine for computers.

FREE CATALOG
1-800-356-5794 Ext. 3014

Insurance is good for coming in after the damage has been done and trying to reimburse you for your losses. But you know how hard it can be to put a fair price on your equipment, programs, functions and lost data.

That's why you need computer ensurance in the form of a Ferrups® uninterruptible power system (UPS) from Best Power Technology. Prevent the causes of most down-time and data loss with a continuous flow of clean, computer grade power. Avoid the frustration and loss of major power failure with true, reliable uninterrruptible power.

Find out how Best became #1 in the world.* Send for our fact-filled catalog today. It's the first step in obtaining nonstop power ensurance for your computer.

Call 1-800-356-5794, ext. 3014
In Wisconsin call (608) 565-7200, ext. 3014

BEST®

Best Power Technology
P.O. Box 280, Necedah, Wisconsin 54646
"Advanced technology . . . for less"

*Best is the world's largest manufacturer of single phase UPS, based on KVA shipped.

CIRCLE NO. 204 ON INQUIRY CARD

9-TRACK TAPE • OCR SCANNING WORD PROCESSING CONVERSIONS

CONNECT your systems! We manufacture conversion systems for your PC/XT/AT. Our "DISKETTE CONNECTION" can read and write almost any WP or computer diskette. Our "SCANNING CONNECTION" captures text and images for your desktop publishing system. Our "TAPE CONNECTION" can read and write 800/1600/6250 GCR tapes. System prices start at $1195.

Flagstaff Engineering • 1120 Kaibab
Flagstaff, AZ 86001 • 602-779-3341

CIRCLE NO. 202 ON INQUIRY CARD

9-Track Tape Subsystem for the IBM PC/XT/AT

Now you can exchange data files between your IBM PC and any mainframe or minicomputer using IBM compatible 1600 BPI 9-Track tape. Unit can also be used for disk backup. Transfer rate is up to 4 megabytes per minute on PCs and compatibles. Subsystems include 7" or 10 ½" streaming tape drive, tape coupler card and DOS or XENIX compatible software.
Prices start at $2,995.

QUALSTAR®

9621 Irondale Ave., Chatsworth, CA 91311
Telephone: (818) 882-5822

CIRCLE NO. 203 ON INQUIRY CARD

To advertise in the Marketplace, call Carol Flanagan 617-964-3030.

IBM COMPATIBLE RS232 EASI-DISK 3½/5¼" FLOPPY DATA STORAGE & TRANSFER SYSTEMS

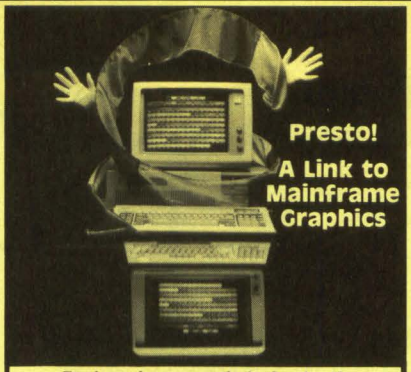
Information Transfer to/from Non IBM Compatible Systems to/from IBM systems: (Over RS232 or 488 Interface).

- Reads & Writes IBM DOS 3½/5¼" Disks
- RS-232C I/O or 488
- Rugged Portable Package/Battery Option
- ASCII or Full Binary Operation
- Baud Rates 110 to 38.4K Baud
- Automatic Data Verification
- Price $895 in Singles – OEM Qtys. 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

CIRCLE NO. 205 ON INQUIRY CARD



Find out how our whole family of EMU-TEK graphics terminal emulation software makes good sense for the work you do. Call today for more information.

FTG DATA SYSTEMS

(714) 995-3900
(800) 962-3900 (800) 972-3900 (Calif.)
10801 Dale St., Suite M-2
Stanton, CA 90680

CIRCLE NO. 206 ON INQUIRY CARD

Quit wasting workstation time with your plotter!

FD 1450 PlotDisK System

Operate your workstation independently from your plotter! The PlotDisK sends data via the RS-232 interface to most plotters, printers, laser printers, modems and other RS-232 devices.

Simplicity of operation was the byword while designing this ALGO product. Insert a diskette, set the locking mechanism and that's it. When the plot is complete, an alarm sounds.

Enjoy these important benefits:

- **Workstation is not slowed down by your plotter**
- **One plotter can be shared by other workstations**
- **A copy of the previous plotfile can be made while the operator is generating a different design**

Distributor inquiries welcome! Single qty price $840

ALGO INCORPORATED **1-800-252-ALGO**
TELEX 333405 ALGO COL (301) 730-7442
9198-C Red Branch Rd., Columbia, MD 21045

CIRCLE NO. 207 ON INQUIRY CARD

Get the whole story on graphics terminal emulation.

To find out more about software that lets your PC emulate TEKTRONIX™ 4105/6/7/9 and DEC VT100™ terminals, call or write:

GRAFPOINT

1485 Saratoga Avenue
San Jose, CA 95129
Tel. 1-800-426-2230
In CA, call 1-408-446-1919

CIRCLE NO. 208 ON INQUIRY CARD

$249. TERMINAL

Featuring
- Standard RS-232 Serial Asynchronous ASCII Communications
- 48 Character LCD Display (2 Lines of 24 Each)
- 24 Key Membrane Keyboard with embossed graphics
- Ten key numeric array plus 8 programmable function keys
- Optional RS-422 multidrop protocol mode
- Keyboard selectable SET-UP features—baud rates, parity, etc.
- Size (5.625"W x 6.9"D x 1.75"H). Weight 1.25 lbs.
- 5 x 7 Dot Matrix font with underline cursor
- Displays 96 Character ASCII Set (upper and lower case)
- Optional Bar Code Wand (shown)

COMPUTERWISE, INC.
302 N. Winchester • Olathe, KS 66062 • 800-255-3739 • TELEX 705337

CIRCLE NO. 209 ON INQUIRY CARD

Mini-Micro Systems Direct Response Cards

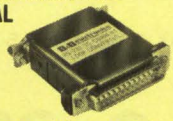
The Best Bargain for your Marketing Budget!

- Develop sales leads
- Find new markets
- Build your mailing list
- Test a new product

Call Carol Flanagan
(617) 964-3030

SAME-DAY SHIPMENT! MONEY-BACK GUARANTEE!

"RS-232C TO CURRENT LOOP BI-DIRECTIONAL CONVERTER" Model 232CL2
only **$39.95**



Interface your RS-232 port to existing current loop system. Model 232CL2 couples and isolates Transmit and Receive Data through high speed optical isolators. Powered from pins 4, 5, 6, 8 and 20 on the RS-232 side; one pin must be high, one must be low.

No power required if current loop port is active. Model 232PS-12V DC Power Supply required if current loop port is passive; only $14.95.

Order direct from manufacturer *TODAY* and *SAVE!**

Request your FREE copy of B & B ELECTRONICS' Catalog which lists a host of interface and monitoring equipment for RS-232 ports.

**Terms:* Visa, MC, cash orders postpaid; P.O.'s from qualified rated firms accepted. IL residents add 6¼% sales tax.

B&B electronics MANUFACTURING COMPANY
15068 Boyce Memorial Drive
P.O. Box 1040 • Ottawa, IL 61350
Phone: 815-434-0846

CIRCLE NO. 210 ON INQUIRY CARD

PROGRAMMABLE COMMUNICATIONS TRANSLATOR

The PCT-100 is an in-line, user-programmable RS-232 protocol and data translator. It can provide a simple, inexpensive solution to your communications and compatibility problems.

- Terminal & Printer Emulation
- Baud Rate Conversion (50 through 19.2 kbaud)
- Handshake Translations (XON/XOFF, CTS/RTS, ENQ/ACK)
- Code Conversions (ASCII, Modified ASCII, EBCDIC)
- Bidirectional Manipulation of Data Strings, Bytes, Bits
- User-Programmable
- User Programs are Easily Implemented
- Built-in Compiler, Editor and Debugger
- Programs via any RS-232 ASCII Device
- Only $495 (single unit quantities)
- User's Technical Manual $25

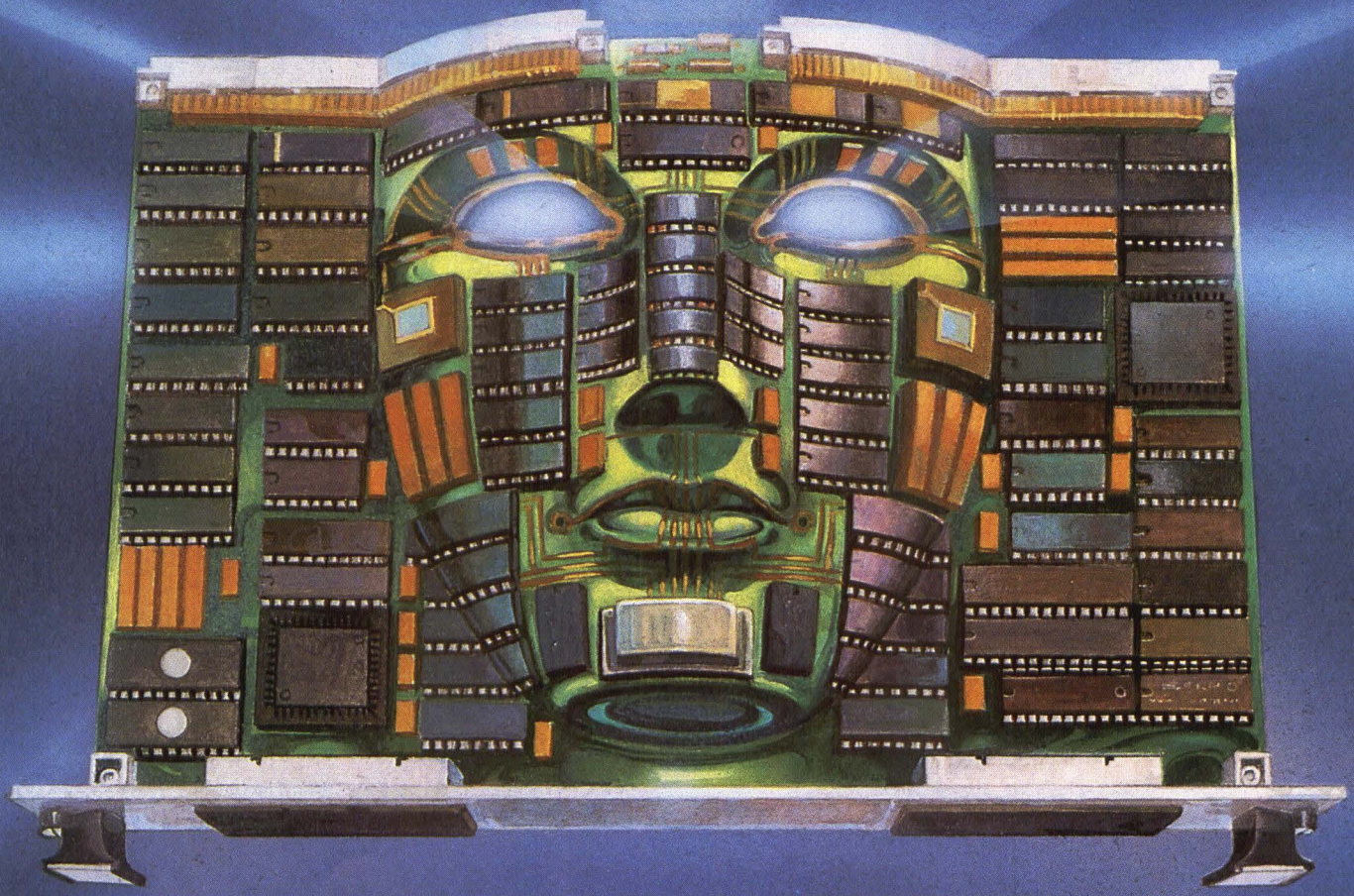
MSI
Method Systems Incorporated
3511 Lost Nation Road
Willoughby, Ohio 44094
Call Toll-Free 1-800-533-6116
In Ohio (216) 942-2100

CIRCLE NO. 211 ON INQUIRY CARD

Promote Your Literature in Marketplace

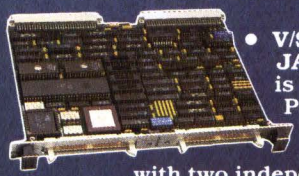
Distribute your catalog or literature right here in Mini-Micro Marketplace for $750 or less.

Call Carol Flanagan
(617) 964-3030

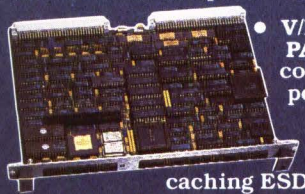


INTERPHASE
Changing The Face Of SCSI

SCSI never looked so good. Always a beautiful vision, early SCSI was not always a pretty sight. It was incompatible, incomplete and slow. Interphase is changing the face of SCSI by applying more than a decade of high-performance peripheral controller leadership to a range of new Ultra-Fast and full-functioned SCSI VMEbus host adapters.

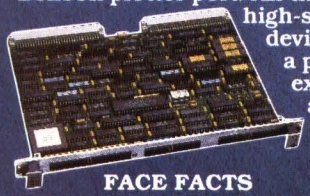


• **V/SCSI 4210 JAGUAR** is an Ultra-Performance caching host adapter with two independent and simultaneous SCSI ports and Command Queuing. It offers true Multi-Threaded control of any mix of up to 14 Synchronous and Asynchronous SCSI devices. Advanced systems concepts like disk striping and segregating high-end devices from slow or unbuffered ones become real. And Interphase's 30 MByte/s BUSpacket Interface℠ provides the industry's fastest VMEbus speed.



• **V/ESDI 4201 PANTHER** combines the performance advantages of a host resident caching ESDI disk drive controller with the flexibility of a full function SCSI port for backup, all in a single VME slot.

• **V/MIX 3210** is the unique combination of a SCSI host adapter, Centronics printer port, and Versatec or Benson plotter port. All three become high-speed DMA devices, and at a price you'd expect for any one function alone.



FACE FACTS

Interphase SCSI solutions achieve true VME system-level performance with existing SCSI devices and let you take advantage of the new generation of full-function SCSI devices as they are available. Don't let a "dumb" host adapter make you look bad. See the changing face of SCSI. Call Interphase today.

(214) 350-9000

INTERPHASE corporation

2925 Merrell Road • Dallas, Texas 75229 • Telex: 9109976245 NASDAQ-NMS:INPH

Interphase International

93a New Street, Aylesbury, Bucks. HP20 2NY, England (0296)435661 Telex: 826715 AERO G

Interphase is a registered trademark of Interphase Corporation. BUSpacket Interface is a service mark of Interphase Corporation.

CIRCLE NO. 45 ON INQUIRY CARD

An Incredible Display Of Power And Versatility.

For just $599,* the new 965 gives you ASCII, ANSI and IBM® PC compatibility in one terminal.

The new 965's versatility is unparalleled. It supports 23 terminal emulations, more than any other model in its class. You even get your choice of ASCII, ANSI or IBM Enhanced PC keyboard styles.

There's a 14" flat display in green or page-white with crisp, clear characters in a high-resolution 10x16 matrix. A 2-position keyboard with a true accounting keypad, 20 user-programmable editing keys, and 128 programmable function keys.

The 965 can display up to 49 data lines, enough to show large spreadsheets or two normal display pages of text at the same time. No other terminal this affordable can do that.

The 965's state-of-the-art single board design uses a 16-bit CPU and sophisticated gate array to give you a high-performance, very reliable terminal with a full one-year end-user limited warranty.

The 965. A whole new look in terminals from TeleVideo. Call us toll-free or write today for more information.

TeleVideo Systems, Inc., 1170 Morse Ave., Sunnyvale, CA 94088-3568.

CIRCLE NO. 46 ON INQUIRY CARD

TeleVideo®

THE VISION YOU NEED TO SUCCEED

Call 1-800-835-3228

© 1988 TeleVideo Systems, Inc. IBM is a registered trademark of International Business Machines Corporation. *Suggested Retail Price