

Mini-Micro Systems

A CAHNERS PUBLICATION

SEPTEMBER 1985

Software simplifies micro-to-mainframe connection

Pharmacies process prescriptions by micro
Networking software fires LAN market

3270-PLUS - 3.7

Specify terminal and user parameters
Specify source data or output listings
Create or change source data
Perform utility functions
Enable language processors in foreground
Cancel job for language processing
Enter TSO command or CLIST
Perform dialog testing
Replicates Primary Option Menu
Display summary of changes for this release
Available information about 3270/PLUS
Terminates 3270 using log and list defaults

3270-PLUS - 3.7

LU# 16 LU# 16 LU# 16

3270-PLUS - 3.7

3270-PLUS - 3.7

Online Change Menu

KEY	ACTION	DESCRIPTION
PF 1	Head Ahead	Change Read Ahead Parameters.
PF 2	Screen to File	Change Screen to File Parameters.
PF 3	Screen to Printer	Change Screen to Printer Parameters.
PF 4	Output	Change Output Parameters.
PF 5	Record Input	Change Record Input Parameters.
PF 6	Keyboard	Change Keyboard Definition File.
PF 7	Browse	Change Browse Parameters.
HELP	Help System	Enter the RABBIT's Help/Tutorial System.

3270-PLUS - 3.7

LU# 16 LU# 16 LU# 16

3270-PLUS - 3.7

3270-PLUS - 3.7

SCREEN TO FILE

THIS SPECIAL FUNCTION copies 3270 screens to a local data to local files for local processing.

the SCREEN TO FILE key.

TO MODIFY the ScreenToFile parameters in the Terminal output path of this function. They may be modified in the Change Menu for Terminal options.

SEE THE RABBIT'S 3270 USER GUIDE, Chapter 4.0, for modification information.

ENTER
CLEAR Exit Return to 3270 Session.

3270-PLUS - 3.7

3270-PLUS - 3.7

3270-PLUS - 3.7

Multisession Interface

LU	Status	Suspend Date/Time	Screens Received During Suspend
3	Suspended	Wed Sep 19, 1984 10:00 AM	0
4	Active		

Desired Option with the Function Keys:

46556 NOTRAVHLLR04/ 01
507 11 2 F 4 GIK 4597
R HELLENTHAL APROF
NOTRE DAME UNIV
BIOLOGY DEPT
NOTRE DAME IN 46556





Some companies consider board assembly child's play.

There are a lot of little board companies out there vying for your business. And while they're probably not having children build boards during recess, chances are you'll have to hold their hand throughout the entire process anyway.

Well, at Systech, we know the last thing you want to do is babysit a board company. Especially since your first concern is getting your product out the door fast.

So to help you do just that, we've built ourselves a good, responsive support staff. One that can guide you

through the integration process. And can help you with system testing to make sure our boards will do exactly what you expect. The first time around.

Of course, you can be sure our products will keep on working, too. Because we test them all under the most stressful situations imaginable.

First we burn them in for 72 hours. Then we zap them with a few volts. And then, for good measure, we do it again. All of which lets us boast close to a zero defect rate.

And when you do need our help, we have a customer support

department on call 24-hours a day, everyday. Plus technicians that'll even come to you for on-site help.

So when you're tired of playing games with other companies, give us a call. Because when it comes to boards, we don't kid around.

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



SYSTECH
Our reputation isn't built in a garage.

CIRCLE NO. 1 ON INQUIRY CARD



**If you have one of these,
Infotron can have you
communicating data
in just 48 hours.**

**Modems and stat
muxes, to go.**

Infotron offers a complete line. And now, with our unique distributor warehousing program, we can have any of them on your doorstep within 48 hours of your call. 48 hours, max. Just say the word.



Full system flexibility.

Infotron modems combine advanced features and inherent reliability.

Our statistical multiplexers handle from 4 to 32 channels in a range of models—with full provision for expansion.

All with the same high quality that earns us top marks in performance and reliability from our present users.

Add competitive pricing, and we start making real sense. Then add our 48-hour delivery,

and we're awfully hard to beat.

1-800-345-4636

To find out more.

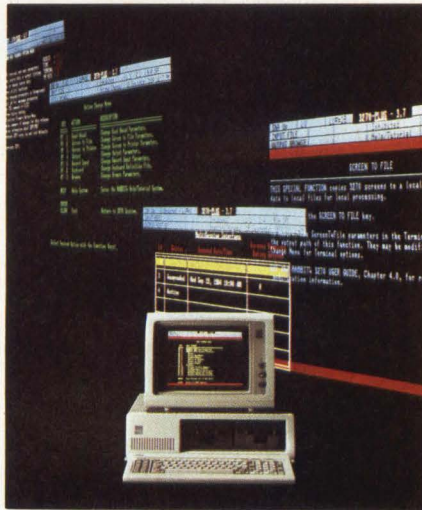
Your Infotron distributor.

There are Infotron distributors nationwide, ready to give you more information, provide equipment and offer expert advice on the best way to meet your needs. For the name of the distributor near you, dial toll-free 1-800-345-4636 and ask for ISO. Or write Infotron Independent Sales Organization, 9 North Olney Avenue, Cherry Hill, NJ 08003.

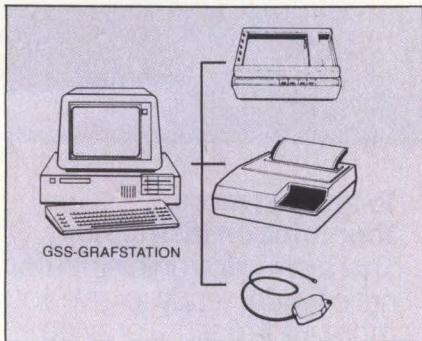
**Infotron. First in
performance and reliability.**

 **INFOTRON** SYSTEMS

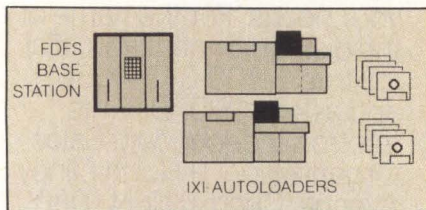
CIRCLE NO. 2 ON INQUIRY CARD



p. 106 Software simplifies micro-to-mainframe connections. Art direction and design by Impact Marketing and Communications. Photography by Steve Grohe. Courtesy of Rabbit Software Corp.



p. 36 Exploiting PC dominance



p. 67 Duplication cuts costs

NEWS/INTERPRETER

IBM offers System/36 PCs as economical mini entry	33
UNIX software vendors exploit PC dominance	36
Computer Associates sets pace in site licensing	38
Publicity is key tactic in ADAPSO's war on pirates	41
ATTIS reaches out to IBM's SNA network	42
Pacific Perspective: Japan defines a market for machine language translation	46
European MAP group augurs worldwide approval	49
AT-compatibles fight for share of new standard	50
Jazz and Excel: Can the Mac now get down to business?	53
Heard on the Hill: Semiconductor group asks help in selling to Japan	56

*EUROPEAN NEWS

Switch to digital exchanges boots Europe's first ISDN	E3
Norsk Data extends fault tolerance	E4

* Appearing in the European edition only

VERTICAL MARKET INTEGRATOR

Pharmacists nationwide order drugs by computer	59
OEM incorporates software duplication	67

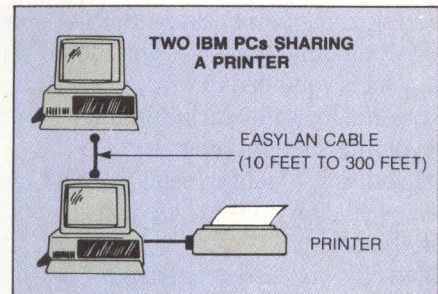
MINI-MICRO SYSTEMS (ISSN 0364-9342) is published monthly (with 4 special Digest issues) by Cahners Publishing Company, Division of Reed Holdings, Inc., 275 Washington St., Newton, MA 02158. Norman L. Cahners, Chairman; Saul Goldweitz, President and Chief Executive Officer; Ronald G. Segel, Executive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

FEATURES

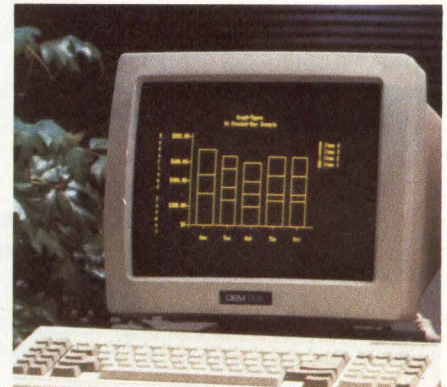
Feature Highlights	79
Network software rejuvenates LAN market	81
Increased competition in LANs and new networking alternatives create diverse choices for VARs	
Protocols compete for LAN market	95
Ethernet technologies dominate the present local area network, but ISO standards will govern future workstation communications	
Software speeds access to mainframe (Cover story)	106
Overcoming limitations of conventional 3270 emulators, 3270-Plus simplifies the micro-to-mainframe connection by permitting direct communications between networked devices	
Options multiply for PC, PC-AT integrators	117
A growing bus-based infrastructure offers integrators new opportunities in multiuser systems and high-performance workstations	
Top 32-bit buses claim multiprocessing edge	129
Backers of Multibus II and VMEbus concede little merit to each other's systems in asserting multiprocessing superiority based on operation modes and arbitration methods	
Lan software links diverse machines, OS's	141
System integrators can build inexpensive LANs with PC/NOS, a communications software package that acts as a network operating system.	

DEPARTMENTS

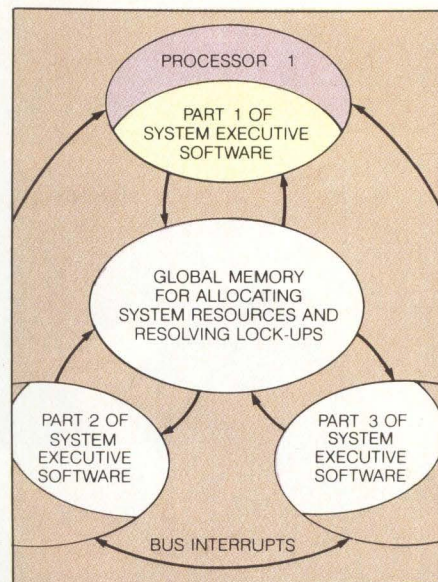
Editorial Staff	4
Editorial	11
Letters	16
Breakpoints	23
New Products	149
Calendar	168
Career Opportunities	171
Classified Advertising	174
System Integrators' Notebook	175
Index to Advertisers	176
Market Track	177
Artful Intelligence	178
Mini-Micro Marketplace	179



p. 81 Networking software



p. 117 .. Integrator options multiply



p. 129 Computer buses: Part II

270 St. Paul St., Denver, CO 80206. MINI-MICRO SYSTEMS is circulated without charge by name and title to U.S.- and Western European-based corporate and technical management, systems engineers, and other personnel who meet qualification procedures. Available to others at the rate of \$65.00 per year in the U.S.; \$70.00 in Canada and Mexico; \$95 surface mail in all other countries; air mail surcharge, \$35.00 (16 issues). Special DIGEST issues, \$15.00. Single issues \$5.00 in the U.S.; \$6.00 in Canada and Mexico; \$7.00 in all other countries.

1985 by Cahners Publishing Company, Division of Reed Holdings, Inc. All rights reserved.



Dual's new Supermicro Support Package for VARs: The slant is on performance.

We know how tough it is to land those big systems contracts. That's why Dual proudly introduces its Supermicro Support Package (SSP)—the VAR program that gives you the selling tools you need to win.

Powerful tools that include attractive volume discount programs. Co-op advertising. Qualified sales leads. Even evaluation units to help you close the deal.

With SSP, you also get in-depth documentation. Nationwide field support through Braegen Corporation. Quick access to our software and applications engineers. And a link to our electronic SSP bulletin board, a new service that enables you to exchange information about Dual systems with other VARs.

Dual's 83/80: When the bottom line is high performance.

Our 83/80 is one of the fastest, most versatile UNIX* supermicros on the market.

For instance, it features an SMD disk controller that reads and writes data at sustained speeds of 800KB/sec. and 560KB/sec. respectively. (Peak speeds are even higher.)

Plus serial ports that permit transmission rates up to 38.4K baud.

In addition, there's a 10MHz MC68000 CPU that runs the new UNIX system V. And main memory capacity for up to 6.5MB.

All this and much more make the 83/80 ideal for most office automation, medical, scientific, or analytical applications.

For details about the SSP program and our 83/80, call or write Dual today. Because it's time to look at UNIX systems from a different angle.

DUAL

Dual Systems Corporation
2530 San Pablo Avenue
Berkeley, CA 94702
(415) 549-3854

*UNIX is a trademark of AT&T Bell Laboratories

STAFF

Vice President/Publisher
S. Henry Sacks

Editor-in-Chief
George V. Kotely

Managing Editor
James F. Donohue

Assistant Managing Editor
Bruce J. MacDonald

Senior Western Editor: **Jerry Borrell**
San Jose, (408) 296-0868
Senior Projects Editor: **Rick Dalrymple**

Western Editor: **Carl Warren**
Irvine, (714) 851-9422
Senior Associate Editor: **David Simpson**
Associate Editor: **Frances T. Granville**
Associate Editor: **Lynn Haber**
Associate Editor/Research: **Frances C. Michalski**
Associate Western Editor: **Mike Seither**
San Jose, (408) 296-0868
Associate Editor: **Gregory Solman**
Associate Editor: **Michael Tucker**
Associate Editor: **Jesse Victor**
Assistant Editor/New Products: **Eileen Milauskas**
Assistant Editor/Research: **Pamela Gorski**
Assistant Editor/Research: **Megan Nields**

Contributing Editors

Raymond C. Freeman Jr.
Freeman Associates
Taiwan: **Charles Hintermeister**
London: **Keith Jones**, (011-441-661-3040)
Tokyo: **Ichiro Kakehashi**
Data Communications: **Walter A. Levy**
Washington, D.C.: **Stephen J. Shaw**
(202) 387-8666
Gene R. Talsky
Professional Marketing Management Inc.

Editorial Production

Senior Copy Editor: **Arsene C. Davignon**
Production Editor: **Mary Anne Weeks**
Assistant Copy Editor: **Sharon Hassell**

Editorial Services

Carey Highley, Terri Geligos

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

Executive Editor,
Cahners Computer Publications
Alan R. Kaplan

Art Staff

Art Director: **Vicki Blake**
Assistant Art Director: **Cynthia McManus**
Artist: **Anne Tregay**

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

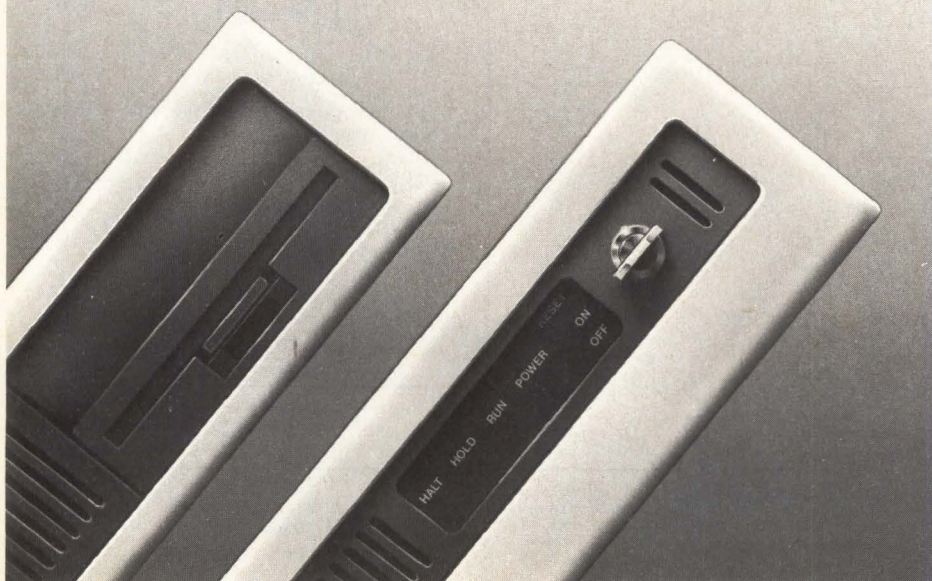
Production Staff

VP Production: **John Sanders**
Supervisor: **William Tomaselli**
Production Manager: **Susan Shaver**
Composition: **Diane Malone**

Editorial Offices

Boston: 275 Washington St., Newton, MA 02158, (617)964-3030. **Irvine:** 2041 Business Center Dr., Suite 109, Irvine, CA 92715. **Los Angeles:** 12233 W. Olympic Blvd., Los Angeles, CA 90064. **San Jose:** 3031 Tisch Way, San Jose, CA 95128. **London:** P.O. Box 37E, Worcester Park, Surrey, KT4 8RQ, England.

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



At Last! Communications Processors For DEC Computers That You Can Program

The Simpect ICP1600 Family of Intelligent Communications Processors

can offload your host system because they're versatile enough to handle the toughest communication tasks and are compatible with VAX and PDP-11s

Use your host system utilities and our software tool kit to create your custom protocols, or let our communications specialists help you develop them.

X.25 software is available from Simpect now, and more standard packages are on the way.

256 Kbytes on-board memory to store downloaded programs and buffer data

High-speed DMA transfers with host processor

Eight programmable, serial communications ports (expandable to 20) support multiple asynchronous and synchronous protocols at speeds up to 612 Kbaud

15 Kbytes PROM contains Boot Loader, Self-Test routines and Debugging firmware

DEC MICRO/T-11 processor engine executes the PDP-11 instruction set

Single hex-size card plugs into any UNIBUS slot *

* Four-port Q-Bus module available now!

DEC, PDP, MICRO/T-11, UNIBUS and VAX are trademarks of Digital Equipment Corporation

© 1984 SIMPECT ASSOCIATES, INC.

Discuss your requirements with us. Call today: (619)565-1865, ext. 246

or write to:

simpect
ASSOCIATES, INC.

5520 Ruffin Road
San Diego, California 92123

CIRCLE NO. 4 ON INQUIRY CARD

**THERE'S A LOT OF POTENTIAL
LOCKED INSIDE EVERY
MICROVAX II.**

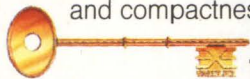


AND EMULEX HAS ALL THE KEYS.



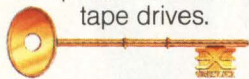
Our complete line of high performance storage and communications products unlocks the processing power of DEC's new MicroVAX II.

Emulex products operate transparently to MicroVMS so as to permit ease of implementation and use. Furthermore, thanks to our accomplishments in advanced VLSI technology, you get superior performance and compactness.

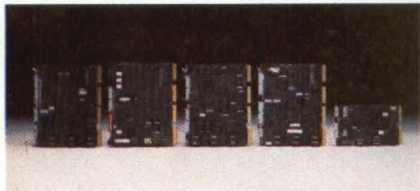


THE KEY TO MICRO PERIPHERALS. The new Emulex QD01/D disk controller is a dual size board that's packed with capabilities. And with it, you get all the features of Mass Storage Control Protocol (MSCP). It controls up to two ST506 drives with a 2MB peak Q-bus transfer rate. Features include a 10K Byte data buffer, 22-bit addressing and 1:1 interleave.

The Emulex QT12 tape controller is also dual size and ideal for backup of micro peripherals. Through firmware, it operates transparently to the driver. It has a QIC2 interface to operate with 5¼" footprint ¼" tape drives.

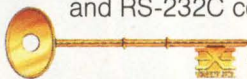


THE KEY TO COMMUNICATIONS. Emulex delivers an edge in Q-bus communications



Shown, left to right: SC03/MS disk controller, UC03 host adapter, TC03 tape controller, CS02 communications multiplexer and QD01/D disk controller.

multiplexers. Our high-performance CS02 doubles line capacity by putting 16 async lines in the space DEC uses for eight. The CS02 runs at up to 38.4 K baud per line and incorporates a 256-character FIFO buffer for fast, sure data transfers. For flexible configuration, the CS02 is RS-423 and RS-232C compatible.



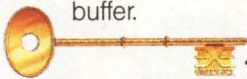
THE KEY TO LARGE PERIPHERALS. Emulex's SC03/MS disk controller incorporates a fully transparent set of firmware which has the features of MSCP. It interfaces to industry-standard SMD drives, handling disk transfer rates of up to 1.8MB/sec.

Our tape drive story is equally impressive. Three Emulex controllers—TC02, TC03 and TC05—are fully compatible with DEC TS drivers.

With the TC02, you can take advantage of start/stop drives and streamers with 1600 bpi at 125 ips, or up to 6250 bpi at 25 ips. Formats available include NRZI, PE., and GCR. Data rates can be as high as 200,000 characters/sec.

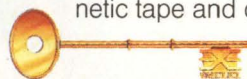
The new TC03 tape controller has all the features of the TC02 and also offers a large (3.5 KB) data buffer and block mode DMA for increased data throughput. It's also compatible with up to four Pertec industry-standard drives.

The TC05 handles 55 ips tape speeds, 8000 bpi densities on a Sentinel drive, and features a 3.5KB buffer.



THE KEY TO SCSI-BASED MICRO PRODUCTS. For a choice of micro storage products, start with the Emulex UC03 host adapter to interface your MicroVAX II with SCSI-based micro controllers. The UC03 supports multiple peripherals simultaneously through a

complete family of Emulex micro controllers. These include disk, magnetic tape and optical disk.



THE KEY TO PACKAGED SUBSYSTEMS. Emulex's unique solutions for MicroVAX II extend to packaged micro subsystems.

The Emulex Decathlon can accommodate three 5¼" peripherals in rack-mount or tower packages. It provides a selection of both Winchester drives from 36-110MB (formatted) and ¼" tape streamers up to 60MB. The Emulex Medley incorporates a Winchester (up to 110MB) and back-up streamer (up to 70MB) in a rack-mount compact package. Whatever storage medium you choose, Emulex has the perfect package for you.

EMULEX. YOUR KEY RESOURCE. We can unlock the power of DEC's MicroVAX II. And our broad product line can also add new power to your high end LSI-11, Micro PDP-11, PDP-11 and VAX systems. Improved performance and unique features are yours in a full range of DEC system storage and communications enhancements.

Unchain DEC's machines for enhanced capabilities now. For product or sales information, call toll-free 1-800-EMULEX3. In California, call (714) 662-5600. Or write: Emulex Corporation, 3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, CA 92626.



The genuine alternative.

CIRCLE NO. 5 ON INQUIRY CARD

DEC, Q-bus, MicroVAX II, TS, MicroVMS, VAX, LSI-11, PDP-11 and Micro PDP-11 are trademarks of Digital Equipment Corporation. Sentinel is a trademark of Control Data Corporation.

U.S. Regional Offices: Anaheim, CA (714) 385-1685; Schaumburg, IL (312) 490-0050; Roswell, GA (404) 587-3610; Nashua, NH (603) 882-6269. **International Offices:** Australia, Eastwood, N.S.W. (02) 858-4833; Canada, Mississauga, Ontario (416) 673-1211; France, Montrouge (1)735-7070; United Kingdom, Bracknell, Berkshire (344) 484234; West Germany, Munich (089) 304051.

**IS YOUR
PRESENT
DISK DRIVE
SUPPLIER
GIVING YOU
ANYTHING TO
LOOK FORWARD
TO?**

Let's hope so.

Because your systems depend on disk drives. So it's important to have a disk drive supplier you can depend on.

And that's where NEC comes in.

At NEC, we're always driving ahead.

With newer drives. Drives with more storage capacity. More reliability. Drives that keep pace with the latest technology.

How do we do it?

With more experience. We've been designing disk drives a long time. Way back in 1959, we were one of the first to develop magnetic recording devices.

Plus, we've got plenty of other



Our 5 1/4" drive gives you more capacity in less space, for less money.

can be sure there will be more.
Drive into the future with NEC.
You have a lot to look forward to with NEC.

NEC 3 1/2" floppy drives are ready for delivery.

NEC 5 1/4" half-height Winchester provide 12.91-25.83MB.

NEC 5 1/4" floppies offer up to 1.6MB capacity.

NEC 8" flexible drives are compact and have 24000 MTBF.

NEC 8" Winchester store up to 167.7MB.

NEC 9" Winchester has a 15 millisecond seek time.



resources. We're an \$8 billion company. And that means we're in this business for the long run.

We just doubled the capacity of our 5 1/4" half-height drives.

No one thought we could improve on our 5 1/4" Winchester half-heights. But we did. We doubled our efforts. And we ended up doubling the tracks on our 5 1/4". The result?

You guessed it. 25.83MB instead of just 12.91MB.

If you need other disk drives, we also make a new 3 1/2" floppy, 8" Winchesters and floppies, and 9" Winchesters. And you

To find out more just call 1-800-343-4418. (In Massachusetts call 617-264-8635.) Or fill out the coupon below.

And find out why more and more OEM's are saying, "NEC and me."

Please send me more information on:

Floppy Drives

- 3 1/2"
- 5 1/4" half-height
- 8"

Winchesters

- 8"
- 5 1/4" half-height
- 9"

Name _____

Title _____

Company _____

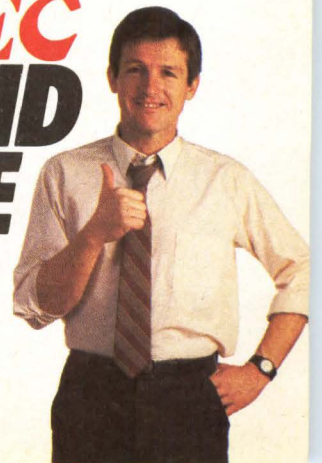
Address _____

City _____

State _____ Zip _____

Tel () _____

**NEC
AND
ME**



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

MMS985

CIRCLE NO. 6 ON INQUIRY CARD

PCOX is all you need to turn your IRMA board into a 3270 PC.

Its full name is the PCOX™/3270 PC Upgrade (that's pronounced "peacocks").

But you'll pronounce it "terrific."

First of all, it's available today. Not next week, not next month. Now.

Second, it costs just \$395. And since it upgrades the IRMA™ board you already have, you can protect your investment. And still get the IBM™ 3270 PC capability you really want.

Third, you can be sure this software's reliable because we've been shipping it for more than a year in our own PCOX/3270 PC.

PCOX is a trademark of CXI, Inc. IRMA is a trademark of Digital Communications Associates, Inc. IBM is a registered trademark of International Business Machines Corp. © 1985 CXI, Inc.

Finally, like all PCOX products, the PCOX/3270 PC Upgrade is backed by our proven track record in micro-to-mainframe connectivity. Which you'll be hearing more about in this series.

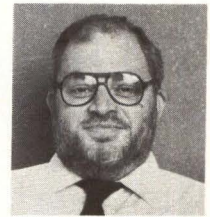
But back to the PCOX/3270 PC Upgrade. For immediate delivery call (800) 225-PCOX. In California, (415) 424-0700. Or write CXI, Inc., 3606 West Bayshore Road, Palo Alto, CA 94303, Telex: 821945.

And turn the IRMA board you have into the 3270 PC you want.

We don't have all the answers, just more of them.

CXI

EDITORIAL



WORDS OF CAUTION ABOUT TAX REFORM

Many system integrators think President Reagan's tax reform proposal will benefit the computer industry. The tax rate on capital gains would be cut, you see, and that's supposed to help the fast-growth, high-tech entrepreneurial companies which supply computer systems. Well, fine. We hope that's right. System integrators and their suppliers are in the same boat on the same stormy sea. What helps one is likely to help the other. Unfortunately, there's a case to be made that the tax reform proposal could do system integrators and their suppliers a lot of damage.

For the next year or so, system integrators will want to invest in communications equipment. One of the reasons given for why the computer industry has fallen on hard financial times recently is this: System integrators have quit buying hardware and software until they get a communications system installed for the equipment they already have. But communications is a capital-intensive business, and the Reagan tax-reform plan seems likely to cut the cash available for capital investment of all kinds. The estimates of lost revenues to U.S. industry if the investment tax credit is repealed are staggering. One comes from financial analyst Chase Econometrics, Bala Cynwyd, Pa.: \$48 billion over two years.

If there's less money for capital investment, then system integrators will buy that critical communications gear over a longer period of time, and that will just delay the recovery of the entire computer/communications industry.

There's more. The fears now are that tax reform could create a \$60 billion revenue shortfall for the government, already bedeviled by deficits. If that happens, warns Ward H. White, vice president for government and public affairs with the United States Telephone Association, Washington, the Treasury Department will target business for more taxes, "and the place where they're going to look first is at the depreciation allowance." Computers carry

a beneficial five-year depreciation allowance under current law, better than that for a lot of other equipment, including most communications hardware. Since computers have a better deal in the depreciation sweepstakes, says USTA's White, that means, "Computers could become a target when the tax people start looking for revenue." If the depreciation period for computers goes to seven years, or even to 10 years, that could further trim money available to system integrators for new investment.

There's another side to the tax-reform debate, of course. Richard G. Darman, deputy Treasury secretary, says tax reform will increase efficiency, lead to higher growth for the entire economy and "encourage more productive investments." Many economists agree, but they see these as long-range benefits. They see trouble short range. Former presidential advisor Alan Greenspan says, "More efficient allocation of capital investment, which may occur in the years ahead, is irrelevant in the short run. In the short run, even inefficient capital investment boosts production and generates jobs. If these investments are shut down, the level of economic activity overall falls."

Meanwhile, the USTA and other communications-industry groups have mobilized battalions of lobbyists to work the Hill, especially in support of keeping the investment tax credit alive. So far, no computer-industry association has gotten into the act, although some industry giants, including IBM Corp., have testified to the benefits of investment tax credits. Whether or not there is organized computer-industry action on the Reagan reform package, it makes sense for system integrators and their suppliers to keep a wary eye on the proposal as it makes its way through Congress.

A handwritten signature in cursive script that reads "James F. Donohue".

James F. Donohue
Managing Editor

**WE CAN
MAKE YOU
THE
BIGGEST
EASIEST
TOUGHEST
GUY
ON THE BUS
TODAY**

High Performance Disk, Tape and Communications Controllers, MULTIBUS™ and VMEbus.

When a company says it is going to make you the biggest, fastest, and toughest guy on the bus today, it better be a leader to start with. INTERPHASE Corporation is.

INTERPHASE has more than a decade of leadership in the design and manufacturing of sophisticated, high-speed, high-performance micro-computer products across a spectrum of bus architecture. MULTIBUS, VMEbus, even the IBM® PC bus.

OUR FIRSTS MAKE YOU FIRST

INTERPHASE has always been first-to-market to give you the competitive advantage:

- First MULTIBUS SMD disk controller.
- First MULTIBUS SMD controller with CACHING...our SMD 2190.
- First ESDI Winchester controller for ANY bus.
- First multi-tasking disk/tape controller for MULTIBUS...our Storager™
- First MULTIBUS token passing network controller...our LNC 5180.
- First SMD controller for the IBM® PC...our Maverick.™
- First 32 bit VMEbus SMD disk controller...our V/SMD 3200.
- First full function, single board computer with built-in VMEbus expansion...our BASEboard.™
- AND NOW...the first 32 bit, VMEbus 1/2" Tape Controller...our V/Tape 3209.

EXCELLENCE BY DESIGN

Our Design Assistance Group will

provide immediate support as you first develop your system design, and work with you at every step to completion. And our Applications Engineering Group can save you valuable time and resources as you integrate our high-performance products into your systems.

OUR FAMILY OF PRODUCTS

SMD 2190 MULTIBUS DISK CONTROLLER

Provides your Multibus system with the SMD disk controller power, flexibility and ease of use you need. The SMD 2190 offers

such benefits as UNIX™ optimized firmware, intelligent caching, 24 bit DMA addressing and Extended SMD data rates up to 20 megabits.

STORAGER MULTIBUS DISK / TAPE / FLOPPY CONTROLLER

Offers high-performance finesse with force for MULTIBUS on ST506, and ESDI Winchester disks, 1/4" tape drives and floppy disks drives. Storager's unique 68000 based Virtual Buffer Architecture speeds up your system by eliminating unnecessary disk latency and allowing concurrent disk / tape operation.

V/SMD 3200 VMEbus DISK CONTROLLER

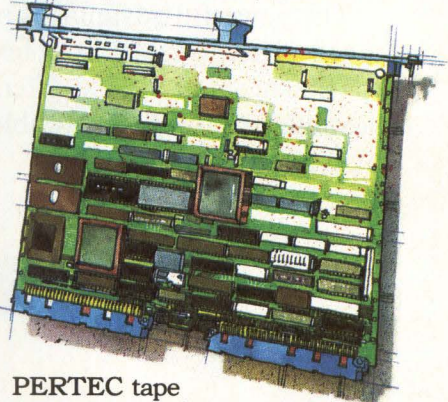
The first high-performance SMD controller which allows you to exploit the full potential of the 32 bit VMEbus. The

V/SMD 3200 supports two SMD disk drives at up to 20 megabits and above. Imagine... multitasking 68000 power with Virtual Buffering for UNIX optimized intelligent caching, and zero latency reads and writes. The V/SMD 3200 is the essential

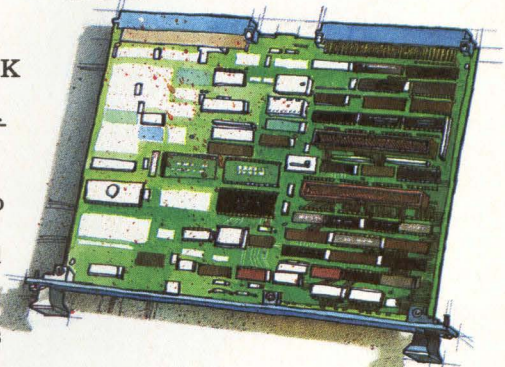
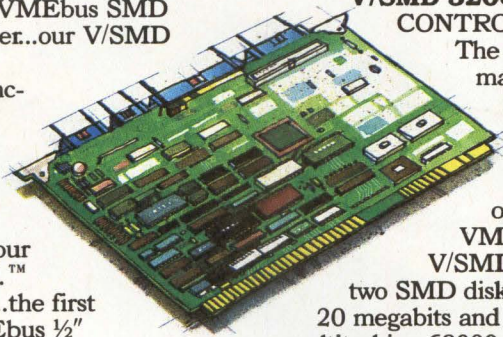
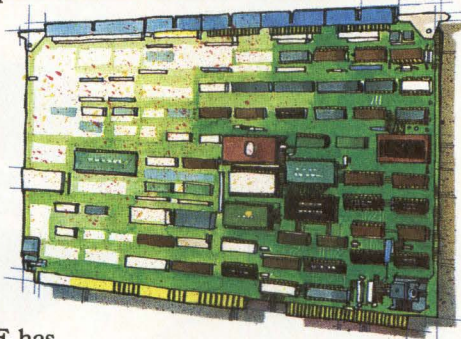
element to your VMEbus system performance.

V/TAPE 3209 VMEbus TAPE CONTROLLER

INTERPHASE's latest VMEbus product is a companion to the V/SMD 3200, and opens new VMEbus design options for you. The V/Tape will control up to 8, 9 track, 1/2 inch



PERTEC tape drives for start / stop and streaming applications. The V/Tape also supports GCR as well as 1600 bpi operations and has ultra fast bus transfer rates at up to 200 ips. Advanced features like 128KB Tape Cache and an on-board 68000 family processor mean it can communicate directly with the INTERPHASE V/SMD 3200 disk controller...cutting your BUS usage in half.



FIND OUT MORE: INTERPHASE is ready to help you get that project up and running...NOW. Call us today to get information about our NO RISK, First Time User Program. (214) 350-9000.



INTERPHASE
corporation

2925 Merrell Road • Dallas, Texas 75229 • Telex: 9109976245 NASDAQ-NMS: INPH

MULTIBUS is a trademark of INTEL Corp.
Storager, Maverick and BASEboard are trademarks of INTERPHASE Corporation.
IBM is a registered trademark of International Business Machines.
UNIX is a trademark of AT&T Bell Labs.

MINI-MICRO SYSTEMS/September 1985

CIRCLE NO. 8 ON INQUIRY CARD

13

The write light

The affordable state-of-the-art LBP from Hitachi

The powerful advantages of a laser beam printer are clear: high speeds, letter quality, both text and graphic capabilities.

Hitachi's new SL-100 offers all these advantages *plus* the profitable edge of cost-effective printing.

NEW

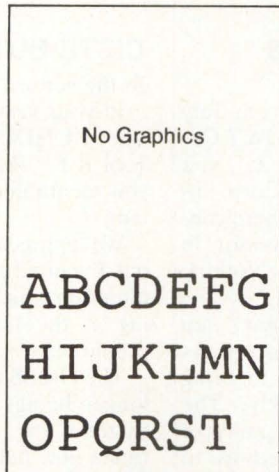


SL-100

OEM



Matrix Dot Printer



Daisy Wheel Printer



SL-100

The immediate facts

The SL-100 has a smaller footprint so it saves space and fits on any desk. Operating buttons are up front for convenience. The cartridge holds 200 sheets and these are printed at 10 pages per minute face down so you don't have to reverse-sort them later. Since the sheets come out on top, there's no copy tray sticking out in the back and this saves considerable space. With a resolution of 300 x 300 dots per inch, true letter quality is assured. And you are also assured of an end to printing headaches because the SL-100 is quite quiet: under 53 dB.

The long range facts

Hitachi's superiority is evident not only in the quality performance we've just detailed above but in the long term reliability and user maintenance that have been built in. This is the reason why the Hitachi LBP is an excellent investment.

Here is how Hitachi engineers have attained a low cost per page. Each component has been carefully designed for long life. Best of all, each component is user-replaceable. This makes a big difference.

Each component is cartridge user-replaceable

The drum, for example, normally lasts 6 to 8 times longer than the toner. But on some LBP printers, you cannot replace only the toner. You are forced to replace a number of components as a package. Hitachi has eliminated such wasteful expenditure and allows individual user-replacement of drum, developer, and toner. Replacement is simpler, less expensive and results in a far lower cost per sheet. Hitachi's proven reliability makes certain you can use the SL-100 for at least 300,000 sheets.

And while the SL-100 has an MCBJ of 5,000 sheets, there will be times when you have to open her up. That's why the Hitachi has a clam shell construction. It also opens from either the front or back. The point is down time is radically reduced.

A video interface is standard and there are other interface possibilities.

If you are looking for a quality LBP that offers your customers quality over the long term and the highest cost efficiency, Hitachi's SL-100 is a choice that is demonstrably wise.



Hitachi America, Ltd.
Office Automation Systems Division
50 Prospect Avenue, Tarrytown, N.Y. 10591-4698,
Tel: (914) 332-5800

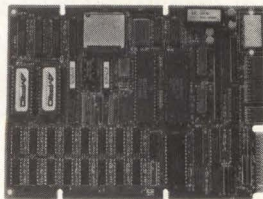
**Available, Reliable,
Affordable Solutions
for Computerization**

Little Board™/186 . . . \$499 with (128K)

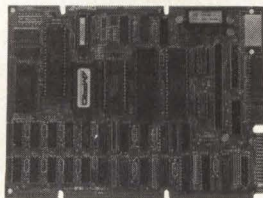
Single Board 16-Bit Computer
with SCSI/PLUS™ Bus

- Data and file compatible with IBM PC
- Three times the COMPUTING POWER of a PC
- Boots PC-DOS 2.10, 3.00
- Runs most MS-DOS generic software
- Mounts directly to a 5-1/4 inch disk drive
- Includes: 8 MHz 80186 CPU, 128K or 512K RAM, 16K-128K EPROM, 2 RS232C Serial Ports, Centronics Printer Port, Floppy Disk Controller, SCSI/PLUS™ Multi-Master bus for: hard disk / networking / I/O expansion
- Available with 512K RAM

NEW
for
PC-DOS



NEW
for
CP/M



Little Board™/PLUS . . . \$349

Single Board 64K CP/M Computer
with SCSI/PLUS™ Bus

Same as Little Board/186 except:

- 4 MHz Z80A (8-bit) CPU
- 64K RAM, 4K to 16K EPROM
- CP/M 2.2 included

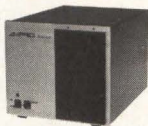
Little Board™ the (original) **now \$289**

same as Little Board/PLUS
except no SCSI, 4K EPROM

Bookshelf™ Series

Cost Effective, Compact, Versatile
computer systems

Choice of Little Board
CPUs, 1 or 2 floppy drives
(48 or 96 tpi), 10MB
internal hard disk option.
6½" high, 7¼" wide,
10½" deep, 12½ lbs.



DISTRIBUTORS

Argentina-Factorial, S.A.	1-41-0018
Australia-ASP Microcomputers	613-500-0628
Belgium-Centre Electronique Lempereur	041-23-45-41
Canada-Dynacomp	(604) 872-7737
Denmark-Danbit	03-66-20-20
England-Quant Systems	01-534-3158
Finland-Symmetric OY	358-0-585-322
France-EGAL*	1-502-1800
Israel-Alpha Terminals	03-491695
Spain-Xenios Informatica	3-593-0822
Sweden-AB AKTA	08-54-20-20
USA:	CALL AMPRO

IBM is a registered trademark of Intl. Bus. Mach.
MS-DOS is a registered trademark of Microsoft.
Z80A is a registered trademark of Zilog, Inc.
CP/M is a registered trademark of Digital Research.

AMPRO
COMPUTERS INCORPORATED
67 East Evelyn Ave. • Mountain View, CA 94041
(415) 962-0230 • TELEX 4940302

CIRCLE NO. 10 ON INQUIRY CARD

LETTERS

MISTAKEN INTENTIONS

To the editor:

A gross error was made in your July issue when, in your article on AT&T Co. 32-bit chips (MMS, July, Page 35), you state that Flexible Computer Corp. intends to replace the National Semiconductor Corp. 32032 microprocessor in our Flex/32 Multicomputer. Nothing could be further from the truth.

The 32032 and its complementary chip set have been fine performers for us. As a young company, we needed to bring our product to market quickly. The 32032 offered us a complete family of system capabilities that allowed us to develop the Flex/32 in 10 months, two months ahead of schedule. The technical and marketing support supplied by National Semiconductor has strengthened our relationship, and we are distressed by any suggestion that we are anything but very pleased to be working with National Semiconductor. In fact, we are looking forward to the forthcoming extensions of the 32032. We expect our relationship with National Semiconductor to be long and fruitful for both of us.

Your reporter's error may have come from a misunderstanding of the nature of the Flex/32 Multicomputer. We do not replace microprocessors in our system. We add microprocessors as they are demanded by the market. In the Flex/32, it is possible for a 32032-based computer to operate alongside of, and with the same software as, a computer based on any other microprocessor. It is our stated policy to implement state-of-the-art microprocessors in the Flex/32 as they are demanded by the market.

We expect the 32032 and other microprocessors to be state-of-the-art products for years to come. By offering heterogeneous microprocessors in the Flex/32, we will be offering our customers the best the industry has to offer, including the 32032.

Nicholas Matelan
President and Chief Executive Officer
Lawrence B. Samartin
Chairman and Executive Vice President
for Marketing
Flexible Computer Corp.
Dallas, Texas

DISTRIBUTOR SWITCH

To the editor:

In your very informative February article, "UNIX Emerges As A Universal Tool Kit," (MMS, February, Page 149) you mentioned the Oasis operating system.

We appreciate your including Oasis, but I wanted to bring something to your attention which you had no way of knowing at the time the article was being prepared.

The Oasis8 and Oasis86 systems are no longer being distributed by Phase One Systems Inc. The exclusive marketing rights now belong to Oasis Technologies Inc.

Pieter D. Van Zandt
Senior Vice President
WesCom Associates Inc.
Public Relations
San Jose, Calif.

KUDOS FOR TUCKER

To the editor:

I'd like to thank you for the very favorable, and yet completely truthful, press you gave Inspiration Systems Inc. and Prevail in your recent article. (MMS, April, Page 95).

The "Integrated Software Spurs Mini Market" article is a well-written, carefully researched story. Author Michael Tucker's viewpoint—that multiuser systems mean minicomputers, not necessarily UNIX—confirms my recent research into how and why people are purchasing multiuser software.

Patricia D. Shannon
Marketing Communications Specialist
Inspiration Systems Inc.
Sewickley, Pa.

NEXT MONTH IN MMS

The October issue of Mini-Micro Systems spotlights software standards and portability.



If you're a major league VAR, we want you on our team.

IBM is scouting for the most valuable of VARs: those with outstanding new ideas and a great batting average.

If you're one of them, you could become a Value Added Remarketer of IBM products. And what could that mean to you?

First, IBM can add clout to your marketing efforts. For example, we can help with product literature, direct mail and business show support. To add to your skills, IBM offers a wide range of professional classes for VARs.

Furthermore, thanks to the online referencing system used by our own sales force, we can direct prospects with special needs right to VARs with appropriate solutions.

And, as one of the finest of VARs, you'll be selling the finest equipment: some of IBM's most competitive products. Our VARs can apply for the IBM 4300 systems, Series/1, System/38, System/36 and the IBM personal computers.

To find out more about the advantages of becoming an IBM VAR, simply send in the coupon below or call 1 800 IBM-VARS, Ext. 96.

If you think your company can qualify, now's the time to touch base.



Paula Palmer
IBM Distribution Channels
P.O. Box 76477
Atlanta, GA 30358

96/9-85

Please send me your free booklet, "Looking for Leaders."

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Product Interest _____

CIRCLE NO. 11 ON INQUIRY CARD

According to Guinness, printer set a new world's

close more

Printer sets record, makes Guinness Book

A Mannesmann Tally printer set a new world's record for computer printers in March, 1985.

The printer produced 681.5 million characters of output in 57 days, printing around the clock. The last record was 622 million characters achieved in 120 days.

The record was established by EDP specialist Rudolf Hiener in Basel, Switzerland. According to Hiener, the goal was to beat the previous record in half the time.

When the goal was exceeded three days early by nearly 60,000,000 characters, Hiener ended the run by turning off the printer.

Three-quarters of a ton of paper was necessary to set the new world's record which was certified and will be entered into the Guinness Book of Records in autumn of this year.

fits slip a'

a Mannesmann Tally record before it stopped.

According to our engineers, it should still be going.

For our engineers, it was a bitter-sweet experience.

Yes, the printer set a new world's record in less than half the previous time.

But was that enough? Not for these engineers.

Admittedly, it was a pretty good start. But when the old record was decisively shattered, the printer was simply turned off.

A failure, the engineers maintain, of the human element.

Coming from them, that's no surprise.

It's simply one more demonstration of the dedication to long lasting, rock-solid performance they apply to every Mannesmann Tally printer.

The latest example? The \$1995, 400 cps MT490.

It's the latest generation 400 series: a serial printer with unequaled throughput and workload capacity in its price range.

It's fully IBM compatible. And noise levels drop down to 57 dB(A).

Pacific Game Robinson will close more retail food stores.

Printer sets record, makes Guinness Book

A Mannesmann Tally printer set a new world's record for computer printers in March, 1985.

The printer produced 681.5 million characters of output in 57 days, printing around the clock. The last record was 622 million characters achieved in 120 days.

The record was established by EDP specialist Rudolf Hiener in Basel, Switzerland. According to Hiener, the goal was to beat the previous record in half the time.

When the goal was exceeded three days early by nearly 60,000,000 characters, Hiener ended the run by turning off the printer.

Three-quarters of a ton of paper was necessary to set the new world's record which was certified and will be entered into the Guinness Book of Records in autumn of this year.

Profite clip et

You have modular interfaces that snap in and out quickly. Fewer friction points in paper handling. And an 18-needle print head instead of 9.

The smaller needles improve print resolution. So NLQ is up to 150 cps in one pass. That's three times faster than the average daisy wheel.

Still, the best thing about the MT490 is that it's a Mannesmann Tally.

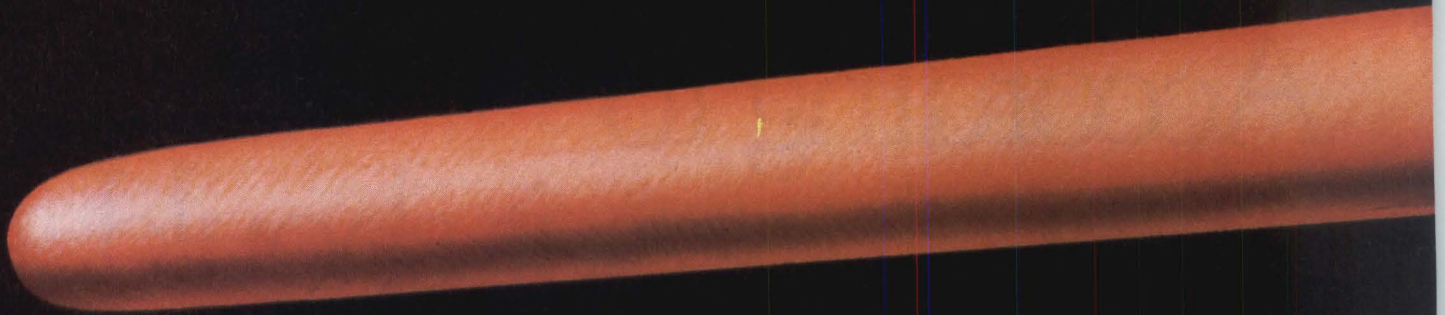
Because you know that somewhere, somehow, even a MT490 is going to stop.

But our engineers never will.



The new MT490 from Mannesmann Tally
\$1995

CIRCLE NO. 12 ON INQUIRY CARD

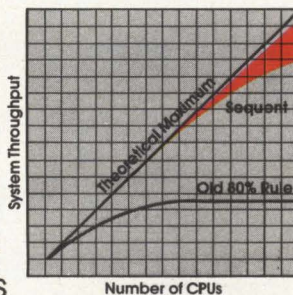


It's hard to believe all those people who say they have an easy-to-use, inexpensive parallel computer.

That's probably because they don't. But we do.

The Practical Parallel™ from Sequent.

We're shipping a true parallel computer that starts at — are you ready for this — fifty grand. It'll do 1 to 9 MIPS with 2 to 16 real 32-bit processors.



**HOW WE MADE IT
AROUND THE CURVE.**

It's based on standard UNIX.™ And it's totally transparent to existing applications, while allowing access for large and fine grain parallel processes.

Best of all, you don't have to be one of the lunatic fringe to be crazy about it.

We already have sixty Practical Parallels up and running at places like Hughes Aircraft Company. And Dataproducts. And Ampex. And Lawrence Livermore Labs.



**“SURE, WE HAVE
AN EASY-TO-USE
PARALLEL COMPUTER
RIGHT NOW.”**

They're doing simulation, text processing, microprocessor development, ATE, data base management, image rendering, software engineering.

And they're reporting price/performance gains as high as 50x!

Okay, we know all this is hard to believe.

But if you really can build a family of products based on one expandable computer, or expand a single system as your needs grow, without ever changing software, literature, spares, or training, isn't that worth a phone call?

The number is 800-854-0428. Or write to Sequent, 14360 N.W. Science Park Dr., Portland, Oregon 97229. (In Europe, call EMS Ltd. at 01-499-6746.)


We've got a truly practical parallel computer. And we've got it now. Honest.



SEQUENT

The parallel computer you can believe in.

CIRCLE NO. 13 ON INQUIRY CARD



The terminal
on the right
outperforms the
competition.
And costs less.

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



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

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

CIE Terminals has a video terminal that'll make you both happy. The CIT-220+.

It's a remarkably reliable piece of technology that yearns to show its stuff as much as the computer it's hooked up to. Something they'll both get plenty of chances to do. That's because the 220+ is so reliable, it's always up and running. Which

means your computer is, too.

The 220+ is compatible with the DEC VT220. But it's not comparable. That's where the plus is. You'll find no less than 20 improvements and additions that make the most of your computer.

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

CIT 220+, contact your distributor or CIE Terminals at 2505 McCabe Way, Irvine, CA 92714-6297 (800) 624-2516.



CIE TERMINALS
A C.I.T.O.H. ELECTRONICS COMPANY

© 1985 CIE Terminals

Because your computer is only as good as its peripherals.

CIRCLE NO. 14 ON INQUIRY CARD

BREAKPOINTS

SYSGEN READIES FULL SCSI DISK/TAPE CONTROLLER BOARD

Evaluation units of the model SI-536 controller will be shipped this month by Sysgen Inc. of Fremont, Calif. Priced at around \$400 and offering complete implementation of the small computer systems interface command set, including disconnect/reconnect with arbitration, the board can handle both rigid disk drives and quarter-inch tape. In order to achieve commonality of system commands, the controller translates standard disk commands to work with the tape system.—*Carl Warren*

VCRs FIND A NEW ROLE—MICRO DATA STORAGE

Alpha Micro Systems claims that video cassette recorders (VCRs) are used to back up data on 90 percent of its installed base of multiuser systems. Beginning this month, the Santa Ana, Calif., company wants to try that idea on another installed base—IBM Corp.'s PC/AT and XT and compatible microcomputers. For \$795, Alpha Micro will provide a controller and software to convert digital data to analog for backup on VCRs with Beta, VHS or European formats. Backup can be either by disk image or file-by-file. Alpha Micro claims the system is less expensive and slightly faster than streaming tape.—*Mike Seither*

DATAMART OPENS FOR BUSINESS IN SAN FRANCISCO

Datamart, the nation's second major all-in-one computer market, opens in San Francisco this month, hoping to offer the computer industry an alternative way of reaching customers by leasing part of its 175,000 square feet of flashy showroom space to manufacturers. Like Infomart, which opened in January in Dallas, DataMart will sponsor seminars, conferences and shows. Its promoters hope that value-added resellers will set up shop there, too. What's Datamart's VAR pitch? A stream of potential buyers, like the ones expected at a two-day conference on computers in finance beginning Sept. 16.—*Mike Seither*

JVC TO DEBUT COMPACT OPTICAL DISK

A 5¼-inch, compact optical disk designed specifically for data storage is expected shortly from JVC Electronics Ltd. of Tokyo. The CD ROM reportedly has a capacity of 700M bytes and will incorporate an embedded small computer systems interface with full arbitration. Data delivery will be 10M bits per second.—*Carl Warren*

MOTOROLA FOUR-PHASE RESHAPES UNIX INTERFACE

Motorola Inc. Four-Phase Systems, Cupertino, Calif., has replaced UNIX commands with a set of menus to run integrated office software on its Series 2000 and 6000 multiuser systems. The Business Assistant UNIX umbrella covers word processing, database management, spreadsheet calculation, electronic mail and calendaring. Configured with those

applications, the software is priced at about \$5,200 per CPU. Other available modules include graphics, information retrieval and project management. Value-added resellers can choose the software modules they need or add their own applications built around the menu system.—*Mike Seither*

SUN WORKSTATIONS CONNECT WITH IBM'S SNA

Sun Microsystems Inc., Sunnyvale, Calif., has entered IBM Corp.'s Systems Network Architecture (SNA) world with a gateway that allows Sun workstations to run IBM mainframe applications. The \$2,000 SunLink SNA 3270 Gateway software runs on either a standard Sun workstation or one equipped with a Sun communications coprocessor. The gateway connects with remote IBM 3705 or 3725 front-end communications processors by dial-up or leased lines. The workstation then emulates IBM 3278 terminals. Another software package, the \$1,500 SunLink BSC RJE, lets Sun machines, acting as IBM 2780 or 3780 terminals, exchange files and execute remote programs with IBM's Binary Synchronous Communications and Remote Job Entry environments.—*Mike Seither*

OREGON SOFTWARE'S PASCAL COMPILER MEETS ISO STANDARD

Portland-based Oregon Software Inc.'s Pascal-2 development system is the first Pascal compiler produced in the United States to be validated as conforming to the International Standards Organization Level 1 and ANSI/IEEE standard Pascal. The validation—which requires a compiler to correctly process a suite of 740 test programs—was performed by the Federal Software Testing Center with assistance by the British Standards Institute.—*Carl Warren*

START-UP ZVERT CORP. OFFERS LASER PRINTER PROTOCOL EMULATORS

Up to three users can take advantage of the Hewlett-Packard Co. Laserjet printer with Zvert Corp.'s new ZVT series of laser printer protocol converters/sharers, which also provide Diablo Systems Inc. 630 and Epson America Inc. FX printer emulation. The Los Angeles company offers the standalone ZVT-100 3-port sharing unit for \$299; 630 and XT emulation is available for \$100 each on the model ZVT-800. Each port supports from 9,600 baud to 19.2K baud and X-on/X-off and DTR flow control.

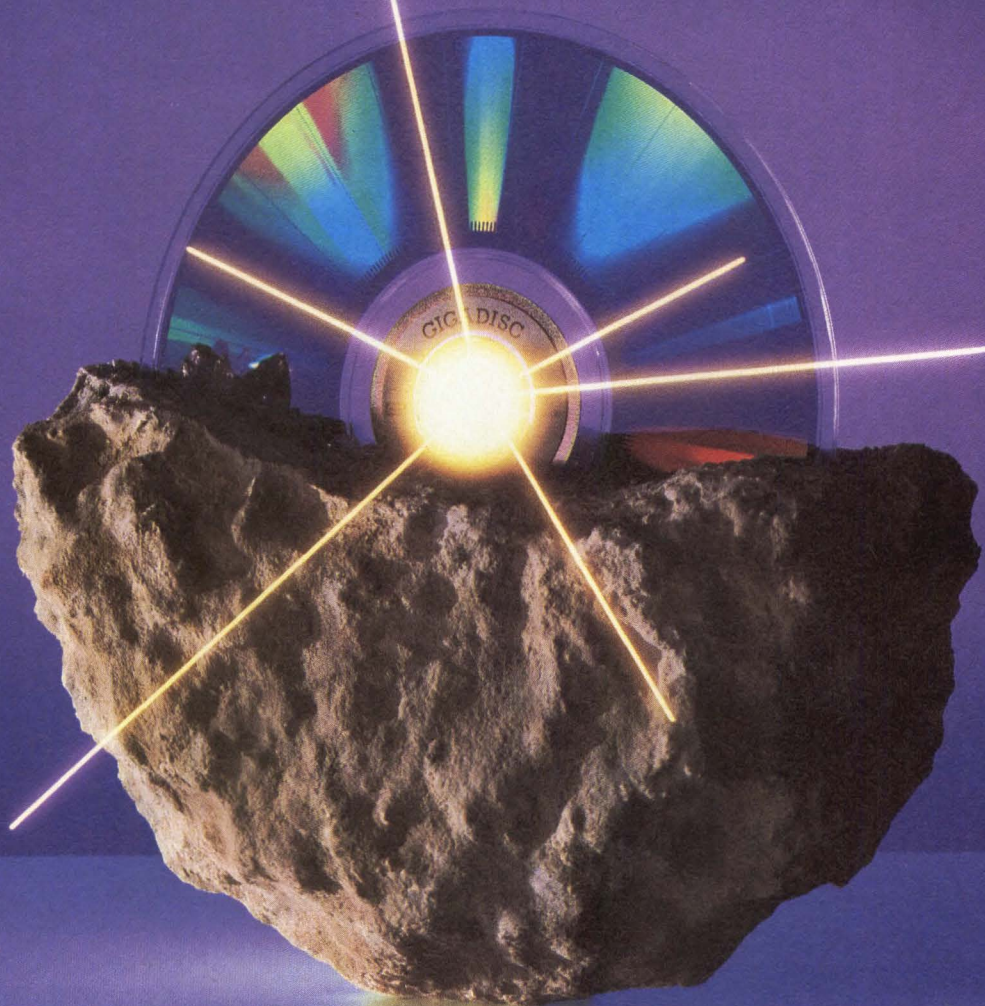
—*Carl Warren*

DEC PACKAGE LENDS A HAND TO OFFICE USERS

A comprehensive portfolio of integrated hardware and decision-support software, VAX Information Center from Digital Equipment Corp. has been designed to help information system departments facilitate end-user computing. Components of the package include VAX Toolbox, personal computing interconnection products, connection between DECnet and IBM Corp.'s Systems Network Architecture, training and seminars.—*Lynn Haber*

GIGADISC

DIRECT ACCESS TO MEMORY POWER



The GIGADISC laser optical disk system is built rugged enough for many industrial applications... smart enough for the sophisticated office-automation and EDP environments.

GIGADISC's high-capacity storage capability will allow you to utilize laser optical disk technology in any application speci-

fying low-cost mass storage. Today's requirements in the medical, military, office-automation and EDP environments demand efficient, easy-to-access data storage with reliability only GIGADISC Memory Power can provide.

Call us before you design your next system.



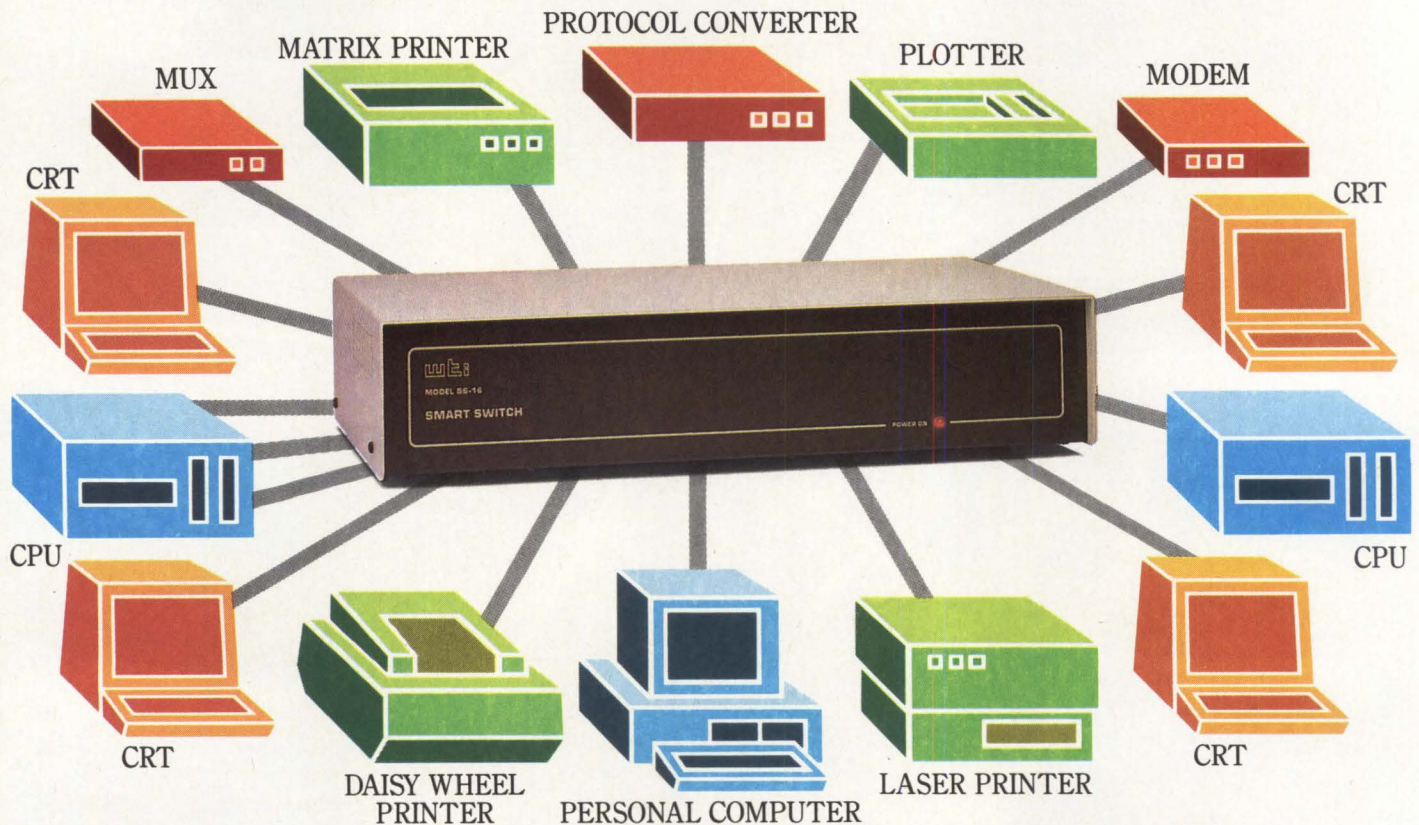
GIGADISC

US Headquarters:
210 Avenue I, Suite D
Redondo Beach, CA 90277
(213) 543-5537

European Headquarters:
In France Call: (1) 630.24.72

CIRCLE NO. 15 ON INQUIRY CARD

TIE IT ALL TOGETHER WITH THE ANY-PORT-TO-ANY-PORT SMART SWITCH. \$1895.



Here's an affordable way to switch up to sixteen RS-232 ports in any interconnection. It's called the Smart Switch™ controller.

The SS-16 accommodates any peripheral: terminals, printers, CPUs and modems. Any port can select any other port. With up to eight pairs of ports communicating at the same time.

Create your own local network. The SS-16 is ideal for computer port expansion, computer sharing, engineering work clusters, and much more.

Each port has its own spooling buffer. So any baud rate can

communicate with any other baud rate. Anywhere in the system.

You can name your ports. Like "PRINTER," "MODEM," or whatever. Or give multiple ports the same name, like "CPU," and the SS-16 will connect you to the first "CPU" port available.

A battery backup system ensures your system configuration and port names are maintained anytime the system is shut off.

A special supervisory port lets you monitor any other port. Connect ports together. Broadcast messages. Or designate the same supervisory power to other ports.

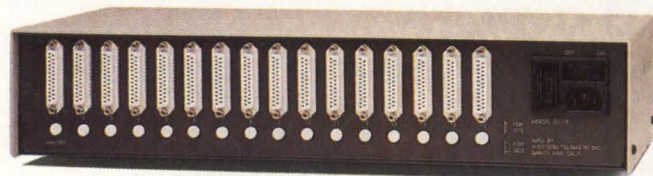
You'll also find the SS-16

user-friendly. It tells you when your selected port is busy. Sends a "port available" message if you choose to wait. And optionally times-out ports not in use. There's even a HELP command.

And for quick and easy installation, a push button defines each port for either DTE or DCE.

So if you need an intelligent, affordable way to link your RS-232 system, you're ready for WTI's Smart Switch.

For more information on the SS-16, or our other RS-232 switches, call Western Telematic toll-free at (800) 854-7226. In California call (714) 979-0363. Or write WTI, 2435 South Anne Street, Santa Ana, California 92704. Or telex 467741.



wti western telematic inc.

PERKIN-ELMER'S 'CRUNCHER' EMERGES FROM THE PIPELINE

Perkin-Elmer Corp., which introduced two members to its 3200 MPS family of multiprocessing systems this year, will round out its parallel processing line with the launch this month of its high-end 3280 MPS. Code-named "Cruncher," the new machine employs pipeline processing and is reported to perform faster and cost less than Digital Equipment Corp.'s top-of-the-line VAX 8600.—*Lynn Haber*

MICRO DBMS USES ARTIFICIAL INTELLIGENCE

Belmont, Calif., start-up Ansa Software introduces this month its Paradox relational database software for microcomputers, said to be faster than most other high-end databases yet offering the ease of use of low-end file-management systems. Using machine-reasoning concepts from artificial-intelligence research, Paradox automatically writes programs to find answers when the user types in an example of what he is looking for. Consequently, there is no need for the user to learn a programming language and then write applications. The package uses a Lotus Development Corp. 1-2-3-like interface; requires two floppy disks, 512K bytes of RAM and MS-DOS 2.0 or above; and runs on IBM Corp. PC-compatibles. For complex turnkey applications, the program also comes with a full-function programming language. Suggested list price is \$695, with availability next month.—*Bruce MacDonald*

TECH FILES: A QUICK LOOK AT INDUSTRY DEVELOPMENTS

Chip-set and controller manufacturer **Adaptec Inc.**, Milpitas, Calif., recently announced the first commercially available, fully programmable, 24-MHz storage controller chip, the AIC-010. Full programmability allows it to work with all major disk and tape drive interfaces—including ST506/412, storage module device, enhanced small device interface and QIC-36—as well as a variety of encoding schemes such as 2,7 RLL and MFM. The AIC-010 will be available in the first quarter of 1986; 5-, 10- and 15-MHz versions are available now.—*David Simpson*

Multibus I users now have a clear upgrade path to 32-bit Multibus II applications with the \$1,225 LNK/001 interface board from **Intel Corp.**, Hillsboro, Ore. Converting Multibus I interrupts into Multibus II interrupt messages, LNK/001 permits Multibus II users to address as much as 16M bytes of Multibus I memory and as much as 32K bytes of Multibus I I/O. Multibus II systems can access data in the board's 128K-byte, dual-port dynamic RAM without having to arbitrate for control of a Multibus I system bus.—*Jesse Victor*

Look this month for a new switch interface for VAX systems from **Emulex Corp.**, Costa Mesa, Calif. The as-yet-unnamed board uses 2901 bit-

BREAKPOINTS

slice technology to combine 48 asynchronous lines on the the VAX to a single cable connected to the communications switch. The company says the board not only replaces 48 separate lines from the VAX to the switch but also takes the place of three boards in the VAX. It will be priced at less than \$7,500.—*Carl Warren*

A four-channel multiplexer for Multibus developers is now available from **Systech Corp.**, San Diego. The Model DCP-8804-512 has 550K bytes of buffer memory for the four lines. In addition to a complete development-software package for the board, Systech offers an X.25 software package that provides the necessary hooks to the system and has been certified for major networks. In quantities of 100, the DCP-8804-512 is priced at \$2,365; the X.25 is priced at \$825 for binary license.—*Carl Warren*

Digital Equipment Corp.'s introduction of the MicroVAX II has encouraged **Jupiter Systems Inc.** of Alameda, Calif., to repackage the



display components of its Jupiter 12 graphics terminal. VAX II users can now buy a three-card set in two configurations: as three cards for \$15,000 or bundled in a pedestal chassis, ready for connection to the MicroVAX II, at a cost of \$20,000. Because the Jupiter's cards are already on the Q-bus used by the VAX line, they can use direct-memory access transfer rates across the Q-bus—about 2M bytes a second.—*Jerry Borrell*

NOTES FROM OVERSEAS: A family of supercomputers priced at around \$1 million will be jointly launched within three years by **Norsk Data A/S**, Oslo, and **Matra Datasysteme**, Bois d'Arcy, France. One of the first groups of products to emerge from Eureka, the European cooperative R&D initiative, the machines will achieve speeds of approximately 100 million floating-point operations per second (megaflops) and will be optimized for mathematical computation. They will also be compatible with Norsk Data's existing ND 500 family of 32-bit minicomputers and will run a version of UNIX.
—*Keith Jones*

We'll keep you out of a compromising situation.

Why should you compromise, when you can have it all for \$599?

Big 14" tilt/swivel screen. 132-column capability. Adjustable keyboard. Small footprint. Full software and hardware compatibility with most computer systems. The WY-50 is fully loaded in every way but price.

That probably explains why it's the best selling display terminal in the ASCII marketplace. And it's probably a good reason to check with us before you pay more for a terminal that does less.

See us at Info/85 Booth #3401

WYSE
| | | |

Regional Sales Offices: Northeast (201) 725-5054; Southeast (305) 862-2221; Midwest (313) 471-1565; Southwest (818) 340-2013; Northwest (408) 559-5911; OEM Inquiries (408) 946-7115.

CIRCLE NO. 17 ON INQUIRY CARD

If all you want is
a disk drive,
you're looking at
the wrong ad.

At long last, a few companies have figured out how to make Winchester drives like Maxtor's. But they still haven't figured out how to duplicate the company that makes Maxtor drives.

Which makes all the difference.

You see, every drive we sell comes with a partnership. We work with you as your product takes shape. Your requirements become ours. Your deadlines become our deadlines. Even our new products are developed in response to your expressed needs.

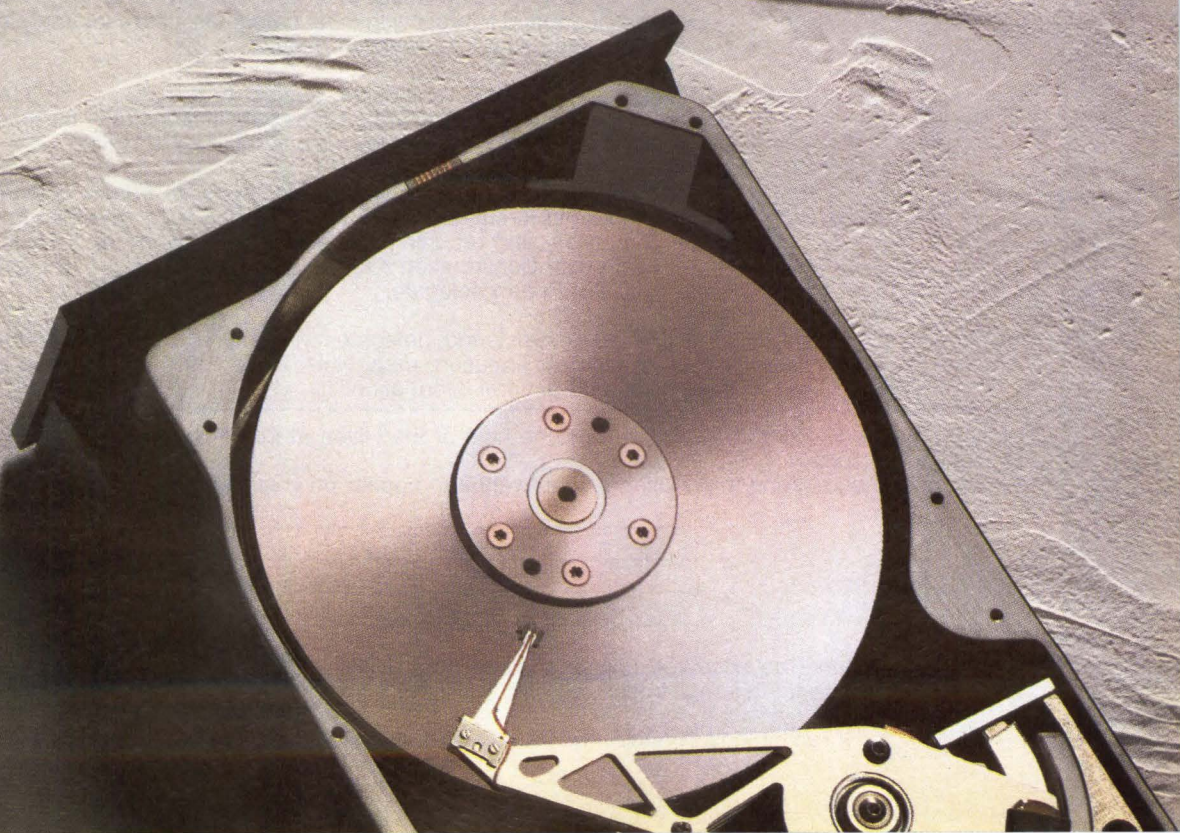
That's how we became the leading manufacturer of the highest quality, highest capacity 5¼-inch drives. And that's how we'll keep our lead. Because what you're buying isn't just a disk drive.

It's a company.

Maxtor Corporation, 150 River Oaks Parkway, San Jose, California 95134, (408) 942-1700, TELEX 171074. Eastern Regional Sales Office: (617) 872-8556. Southwest Regional Sales Office: (714) 859-3100.

Maxtor

CIRCLE NO. 18 ON INQUIRY CARD





PRESENTS

SCSI FORUM/ BOSTON '85

After two successful conferences in Palm Springs, the SCSI Forum is planning to move east this fall with a 2-1/2 day technical program devoted to discussing SCSI issues, hearing about the latest SCSI developments, learning about SCSI, and promoting industry standardization.

WHERE Hilton at Merrimack, Exit 8, Everett Turnpike, Merrimack, New Hampshire

WHEN October 8-11, 1985.

- TOPICS/ISSUES**
- What is the market for SCSI products?
 - Who is using SCSI?
 - What is the status of SCSI with ANSI, ECMA, and ISO?
 - How does SCSI compare with IPI?
 - Is there any way to reduce the number of SCSI flavors?
 - How is SCSI being used?
 - What is the status of synchronous SCSI?
 - Embedded or separate SCSI controllers?

WORKSHOP In addition to covering "leading edge" SCSI topics, delegates will have the opportunity to attend an optional 2-1/2 hour SCSI Principles Workshop scheduled for the eve of the Forum so that attendees may derive more benefit from the technical sessions to come.

RECEPTION Delegates will also have an opportunity to see the latest in SCSI products during the Exhibitors Reception scheduled for Wednesday evening.

The SCSI Forum is sponsored by Technology Forums and the SCSI Forum Advisory Board which consists of the following companies: Adaptec, Adaptive Data Systems, Emulex, Fujitsu America, NCR, SMI/OMTI, and Xebec.

FEE The registration fee of \$795 for the 2-1/2 day SCSI Forum covers attendance at all scheduled sessions, a Delegate's Information Binder containing the speakers' presentations and other material, luncheon on Wednesday and Thursday, the Welcome Reception on Tuesday evening, the Exhibitors' Reception on Wednesday, refreshments at the start of each day and during breaks, gratuities, and taxes.

ATTENDANCE Since attendance will be limited in order to preserve an appropriate atmosphere within which to learn and interact with other delegates, it is recommended that your registration form and payment be mailed early.

CANCELLATIONS Registration fees are refundable, subject to a 10% service charge, if cancellation occurs before September 17th, 1985. Substitutions may be made at any time at no charge. Cancellations and substitutions must be in writing.

HOTEL ACCOMMODATIONS A block of rooms has been set aside for SCSI Forum delegates at the Hilton at Merrimack in Merrimack, New Hampshire. It is recommended that you register early by completing and returning the Hotel Reservation Form which you will receive by mail with your Confirmation Kit, or by calling (603) 424-6181 and identifying yourself as an SCSI Forum delegate.

CONFIRMATION KIT Shortly after registering, delegates will receive a Confirmation Kit by mail, containing registration confirmation, map, Hotel Reservation Form, Hotel brochure, name tag, receipt, and general information.

Please register me for the SCSI Forum to be held at the Hilton at Merrimack in Merrimack, New Hampshire on October 8-11, 1985.

Please print the following information as you want it to appear on your name tag and on the list of delegates:

NAME _____

TITLE _____ **PHONE** _____

COMPANY _____

ADDRESS _____

Registrations cannot be accepted unless accompanied by full payment. Please make checks payable to SCSI FORUM, and mail with this registration form to:

Technology Forums 23409 Coyote Springs Drive Diamond Bar, CA 91765

CIRCLE NO. 19 ON INQUIRY CARD

IBM offers System/36 PC as economical mini entry

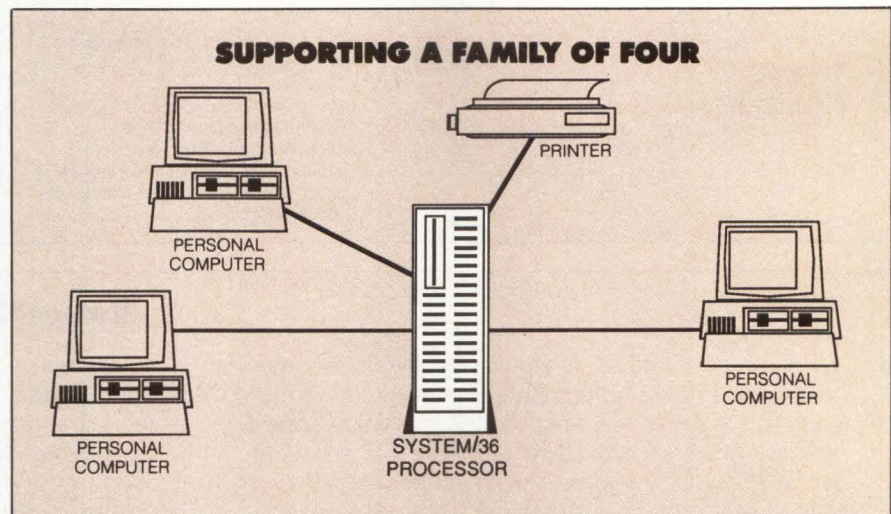
Lynn Haber, Associate Editor

IBM Corp.'s recently introduced System/36 PC "desktop" version of its System/36 minicomputer threatens to take users one turn deeper into the gyre of product confusion. With a plethora of powerful, multiuser super-microcomputers hitting the market—including IBM's own PC-AT—one is forced to ask: Does the S/36 PC fill an obvious need?

According to IBM, it does. For those who haven't been able to justify purchasing one of the larger 5360- or 5362-processor-based System/36s, Big Blue has pared them down to an entry-level system targeted for use in small companies or departments of large organizations.

For a base price of \$5,995, a user receives a 5364 processor with 256K bytes of memory, a 40M-byte Winchester disk drive, cable to attach a required PC, PC/XT or PC-AT (priced separately), a driver card and a driver program for the directly attached PC. IBM's proprietary System/36 System Support Program (SSP) operating system must be purchased separately at a one-time-per-release charge of \$995.

While the multiuser S/36 PC can support up to four workstations—including the directly attached PC acting as the system's control unit—one slot is likely to be designated as a system printer. This configuration, therefore, really allows a maximum of three users—a feature some industry analysts consider a major drawback. Additional PC workstations can be at-



IBM's S/36 PC allows a maximum of three users if a printer is attached—a feature some analysts consider a major drawback.

tached to the 5364 via coaxial cable and operate in a 5250 emulation mode. Thus, the individual PCs require terminal-emulation packages.

The S/36 PC gives users the option of running most PC application software, in addition to access to most of the approximately 4,000 business-oriented programs written for the System/36, such as the Manufacturing, Accounting and Product Information and Control System (MAPICS), the Communications Oriented Product Information and Control System (COPICS), the Distribution Management Accounting System (DMAS) and the Construction Management Accounting System (CMAS). The new computer, however, reportedly does not support popular integrated PC software

packages such as Ashton-Tate's Framework and Lotus Development Corp.'s Symphony, nor IBM's own Topview operating environment. According to IBM, the 5364 processor can run System/36 programs while PC workstations run PC applications. But, when a user switches from PC mode to System/36 mode, the PC job gets suspended until the user switches back to PC mode.

Objections voiced

William Zachmann, vice president of office technology assessment at International Data Corp. (IDC), Framingham, Mass., says the S/36 PC does not satisfy any obvious need. "I think this product is a cripple version of the System/36. It seems that as IBM gets

more desperate to increase revenues, they introduce new products, an approach which basically says, 'let's throw everything up against the wall and see what sticks.'"

Relative to other System/36 products, says Zachmann, the new model is priced low. But, put side by side with multiuser microprocessor-based systems, the cost is high.

For example, IBM's own PC-AT multiuser supermicrocomputer, which uses the powerful Intel Corp. 80286 32-bit chip, is priced from \$3,995. This includes 256K bytes of memory and a 1.2M-byte floppy disk. The PC-AT runs PC/DOS 3.0 and Microsoft Corp.'s XENIX multiuser operating system. It can be used as a standalone machine, a multiuser system—supporting three users—and can also operate with IBM's PC Network that enables PC users to share programs, information and peripherals.

A PC-AT user could not run System/36 application programs, but micro-to-mainframe links are available if users want to access corporate database information from an IBM host. Zachmann contends that there is a multitude of PC software to meet the needs of most end users.

Industry analyst Sandra Gant of InfoCorp, Cupertino, Calif., concurs.

A LOOK AT THE SYSTEM/36 MINICOMPUTER FAMILY

Processor	Base price (\$)	No. of users
System/36 (5360 processor)	37,000-87,100	data-processing functions only: 25-32 combined data processing and word processing: 15-25
"Baby"/36 (5362 processor)*	10,000-25,000	data-processing functions only: 15-22 combined data processing and word processing: 8-16
S/36PC (5364 processor)	5,995-8,090	fixed disk, 40M bytes-80M bytes 3-6* users

*with 512K bytes (1M byte now available. According to IBM, with 1M byte the 5362 processor can handle a number of users 'comparable to' the 5360 processor).

*The S/36PC supports four locally attached workstations. Additionally attached devices are remote workstations. According to IBM, with an 80M-byte disk the S/36PC can comfortably support up to six workstations.

Remarketers face big challenge

The threat of heavy discounting, software that may be too expensive and an altered relationship with IBM Corp. are a few of the new realities that value-added resellers (IBM refers to VARs handling IBM products as "value-added remarketers") must accept if they want to sell the new System/36 PC that IBM began shipping this summer.

At first glance, it would seem that the S/36 PC should open up new markets for VARs. Software they have developed for the larger System/36 can run on the smaller machine. And with a price tag of \$5,995, IBM's latest offering may appeal to buyers who couldn't otherwise afford a larger System/36 minicomputer. "For a minicomputer that sits on a table, it's a phenomenal price, even in spite of its limitation to three users," says Jan Lewis, a former analyst with InfoCorp, the Cupertino, Calif., market research concern.

But IBM plans to make the S/36 PC available only to those VARs who can qualify as IBM value-added dealers. That has disgruntled some remarketers like Frank McCracken, president of McCracken Computer Inc. of Lexington, Mass., a System/36 house that specializes in insurance and banking. "I'll have to sign up with IBM as a value-added dealer to sell the 36 PC," says McCracken. "To become a VAD, you have to provide a service facility and commit to the volumes."

Nevertheless, says a spokesman from IBM's Information Systems Group in Rye Brook, N.Y., Big Blue expects that many of the 200 or so System/36 VARs will qualify as VADs. Besides marketing the S/36 PC through its own VADs, national accounts and marketing divisions, IBM plans to make the machine available through large retail outlets like ComputerLand Corp. and Entré Computer Centers Inc.

Even the attractive low price, coupled with IBM's discounts ranging from 12 percent for seven machines to 36 percent for 100 machines or more, may turn out to be a stumbling block for the qualified VADs. That's because, according to McCracken, IBM won't allow the VADs to combine S/36 PC sales with those of larger System/36s in order to gain the discounts.

That creates the chief concern of some VARs that retailers dealing in big volumes will practically give the machine away. "If the ComputerLands are offering discounts in excess of 30 percent, what's left?" wonders Joseph Goldsmith of Para Research, a Gloucester, Mass., System/36 remarketer. "You're in a market with no margin built into it."

Another problem for remarketers, should they become S/36 PC VADs, is justifying the relatively high cost of their software compared with the price of the machine. For instance, Goldsmith says that Para Research sells a typical accounting package for about

"If IBM positions this product as an upgrade path from the PC and talks the multiuser game, there are technologically better products, with better price/performance, better options that tell a better story within the box compared to the System/36 PC," she states.

Gant believes IBM's best strategy would be to position the S/36 PC as an applications box because of the bulk of business software available for the System/36.

IBM puts limits on the S/36 PC

While IBM touts the S/36 PC as an entry into the company's System/36 minicomputer system, the upgrade path to the larger System/36 machines is not cheap. IBM admits it has priced the S/36 PC substantially lower than other 36 models because the user does not get automatic upgrades. Moving up to the mid-range, 5362 pro-

cessor-based (known as the "Baby 36") or the top-end, 5360 processor-based System/36 involves new hardware, not to mention additional, more expensive software. The benefit to the user of staying within the 36 family is consistent user training, interfaces and applications.

"IBM's overall strategy for the S/36 PC," says InfoCorp's Gant, "is to position the machine as an entry-level system for users who want to move into the company's proprietary operating system and for PC users who are looking to move up." But, she adds, "IBM was careful to set limitations on the S/36 PC so it wouldn't pirate Baby/36 users and sales."

Gant believes the S/36 PC is a relatively cheap entry to the IBM minicomputer family. "But this scenario is better news for IBM than for customers because, if a user wants to get into the company's proprietary operating

system, then IBM's got them," she maintains.

Marketing strategy set

Myron Kerstetter, program director for small computer system service at the Gartner Group, Stamford, Conn., says that IBM's targeted lower-end business market is a new one for the computer giant, whose traditional customers have been the Fortune 500 companies.

"Overall, large organizations won't find a need for the S/36 PC," contends Kerstetter. "I don't think this machine is appropriately configured for departmental use. Where large organizations may find it useful is within individual company entities such as in a warehouse or distribution organization," he adds.

Kerstetter believes that qualified IBM value-added dealers will be most successful in marketing the new de-

selling System/36 PC

\$13,000, with a complete turnkey System/36 going for between \$60,000 and \$70,000. He says that if his company decides to sell the S/36 PC—and it hasn't yet—some new software pricing strategy will be necessary.

But, as industry analyst Lewis sees it, "Value-added remarketers should be able to market the System/36 PC cleverly enough to hide the seeming discrepancy between the software and hardware cost." She says the key is to bundle a system and position it in a way that shows what it will do for the customer, whether it's a quick payback, improved profitability or better productivity.

IBM has recognized the pricing quandary and has reduced the price of System/36 software that will run on the smaller machine. For instance, IBM's Business Management Accounting System, consisting of several modules, sells for \$1,800 per module for large System/36 processors. The same system costs \$995 per module for the S/36 PC. IBM has made a similar price reduction for its Business Report and Application Development System, from \$2,025 to \$1,250. According to IBM, however, those less expensive programs will not run on large System/36s, only on the PC version. On the other hand, a utility is available to port software already developed for large System/36s over to the 5¼-inch disk format for the S/36 PC.

Another software difference between the big and small systems has to do with the System Support Program (SSP) operating system. Besides a price differential—\$4,000 for the large-system SSP vs. \$995 for the System/36 PC—those who buy the PC version will not receive operating system upgrades. That lack of support, says IBM, is the main reason the S/36 PC's operating system is four times cheaper.

With competition from IBM's internal sales organization and retailers with mass-merchandising know-how, many remarketers are skeptical about how much business the S/36 PC will bring them. "We're not about to jump on it with all four feet," says Rico McGhee of Jaycore Systems, a Marietta, Ga., remarketer that services medical, distribution and construction markets. "We'll continue to evaluate it, although it seems like a commodity product."

Value-added remarketer McCracken admits that even if he became a VAD in order to handle the new system, his company probably wouldn't sell that many. But he wishes IBM would still allow remarketers to handle the machine. "It would be nice to have them in your bag," he says. "For some customers with branch offices, it would be an alternative to a communication line to the main system."

—Mike Seither, Associate Western Editor

vice. "I think the retail market will be reluctant to handle this product because it's perceived as being much more complex than the PC," he says. "In addition, retailers are wary of related product-support requirements."

Industry analysts agree that product competition for the S/36 PC will come primarily from manufacturers of multi-user systems, such as Altos Computer

Systems, Compaq Computer Corp., TeleVideo Systems Inc. and Texas Instruments, to name a few.

Kerstetter also sees direct competition coming from Digital Equipment Corp.'s PDP minicomputer products, as opposed to the recently introduced MicroVax II, which he feels is geared more towards the engineering and scientific market. □

UNIX software vendors exploit PC dominance

Michael Tucker, Associate Editor

Software developers working with AT&T Information Systems' UNIX System V are designing products that exploit, rather than compete with, the IBM Corp. PC. A host of new products has come to market which link machines, pipe data, translate information or otherwise connect UNIX with PC-DOS. This means UNIX software vendors have significantly modified their conception of that operating system's role in computing. They now envision UNIX-based machines as servers in distributed computing networks.

Vendors recently introducing new, or retooling existing, UNIX products for a PC-dominated world include Computerized Office Services Inc. (COSI), Ann Arbor, Mich.; Graphic Software Systems Inc. (GSS), Wilsonville, Ore.; Interactive Systems Corp., Santa Monica, Calif.; Relational Technology Inc., Alameda, Calif.; and several others.

UNIX expectations altered

UNIX's partisans had originally hoped to make their operating system the OS of choice at the desktop level. That proved impossible, however, because the desktop market was already densely populated with IBM PCs and other microcomputers based on Microsoft Corp.'s MS-DOS or its close cousin, PC-DOS, which Microsoft developed for IBM. Now, UNIX software

vendors are designing products to farm that population rather than replace it.

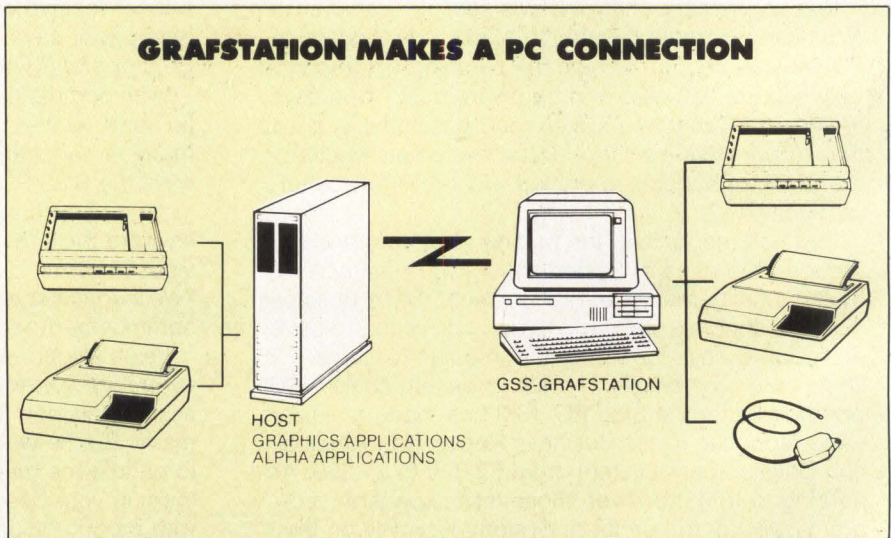
COSI is among the first to do so, with a program called Communiqué which allows the IBM PC to share data with UNIX-based hosts. Combining terminal emulation with file-transfer capabilities, Communiqué links host and PC by means of a standard modem. UNIX is the dominant partner in the relationship, essentially taking control of the PC and using it to provide local files or run MS-DOS and PC-DOS applications.

Critics of Communiqué claim that

it's little more than a terminal-emulation program that happens to be specifically designed to communicate with UNIX. But whatever the product is technologically, its marketing appears important for the industry. Early this year COSI reached an agreement with ATTIS, and Communiqué, renamed "Tango," will be sold under the ATTIS label.

A second UNIX-to-PC communications product is the Interactive Corporate Communications Systems (ICCS) from Interactive Systems. Introduced last January, ICCS allows users to build networks of PC-DOS and UNIX-based machines. Essentially, ICCS provides a combination of emulation and file-transfer services that allow a UNIX host to treat the IBM PC as a terminal, or—if one is a clever enough programmer to take advantage of multiprocessor problem-solving techniques—as a coprocessor. The product also offers several network services: electronic mail, text processing and so forth.

ICCS is of mixed parentage—Interactive is the same company that developed PC/IX, the variant of UNIX that IBM runs beside PC-DOS as the co-resident operating system of the



Grafstation, from GSS, allows an IBM PC to act as a graphics terminal for a UNIX-based host. It's one of several new software products that allow UNIX machines to exploit the business community's vast installed base of PC-DOS microcomputers.

UNIX completes a connection

Just how closely UNIX and the IBM Corp. PC are being fused may be best shown in "The Connector," from Uniform Software Systems, Santa Monica, Calif. It performs a communication function within an individual machine.

UNIX implementations for the IBM PC have historically been coresident systems, with PC-DOS running along with a UNIX variant of some sort—such as Microsoft Corp.'s XENIX or Unisource Software Corp.'s VENIX. Unfortunately for software developers, it's difficult to link an application running under one operating system to software running under the other.

The Connector provides a bridge between the two operating systems and allows files to be exchanged between them. With it, a PC-DOS program becomes a UNIX process, meaning that popular IBM PC applications like Lotus Development Corp.'s 1-2-3 could be accessed from a UNIX environment.

In effect, software developers are dealing in programs that make UNIX, MS-DOS and PC-DOS increasingly difficult to tell apart. Some analysts, notably Peter Marvit, manager of laboratory sciences for Yates Ventures Inc., Los Altos, Calif., actually argue that "the term 'operating system' is becoming obsolete." (MMS, February, Page 149.)

PC/XT. As a result, it has a sort of hybrid vigor. In addition to the simpler terminal emulation, it can also link IBM PC/XTs directly to another UNIX system via their common level of software.

Utility and development software vendors, meanwhile, are also adding UNIX-to-PC links to their products. GSS, for example, announced in June Grafstation, software that allows a single-user microcomputer to function as the graphics workstation of a multiuser host.

Essentially, Grafstation turns an IBM PC into a very intelligent graphics terminal emulator. It provides both a UNIX host and the workstation with a common layer of software—the virtual device interface proposed as a graphics standard by ANSI. It then unloads graphics tasks to the single-user computer while reserving everything else for the multiuser machine. The two interconnect via standard RS232C cable.

Grafstation's obvious targets are computer-aided design, engineering, modeling and other applications where number crunching must be combined with visual output. While GSS is not talking about Grafstation exclusively as a UNIX-to-PC product, the company does admit that the link will probably be a major market.

Meanwhile, there are even individual application programs that exploit a UNIX-PC-DOS connection. For some years, Relational Technology has been

selling Ingres, a popular database manager for UNIX-based minicomputers and mainframes. Last April, the company announced a new variation on the theme, Ingres/PCLink.

Ingres/PCLink allows Ingres running on a UNIX-based host to connect to software running on an IBM PC via RS232C cable or Ethernet. In other words, users could tap into a corporate database, extract only what information they needed and then perform calculations on that data with a PC-DOS program like Lotus Development Corp.'s 1-2-3.

By like token, developers designing

Ingres applications can do so from the comfort of their desktop IBM PCs and then upload them to the host. Either way, users have the advantage of working with UNIX applications in a familiar, desktop environment.

What all of this means is that UNIX vendors have abandoned their original, grandiose aim of making UNIX the standard operating system of the computer industry. Instead, they are going after an entirely new market niche—distributed computing. They are attempting to make UNIX the glue that holds different processors together. □

TALLGRASS DEBUTS GRASSHOPPER

Tallgrass Storage Devices, Boulder, Colo., the OEM subsidiary of subsystem manufacturer Tallgrass Technologies Corp., is preparing to introduce its Model MC10/20 Grasshopper—a 3½-inch, ¼-inch cartridge tape drive—to OEMs and system integrators. Capable of storing 11.95M bytes on a 3M Corp. D-1000 cartridge or 22.10M bytes on a 3M D-2000 cartridge, the file-oriented drive comes with an embedded controller/interface and a tape operating system. The drive employs group coded recording for greater density and the Tallgrass PC/T format to establish file formats and directory information.

LINKWARE TALKS TO DEC, IBM

File-server software from Linkware Corp., Waltham, Mass., is now available for IBM Corp.'s MVS/TSO environment and Digital Equipment Corp.'s VMS host environment. Linkware also recently announced personal computer support for Data General Corp.'s DG/One and Wang Laboratories Inc.'s Personal Computer. The Linkware integrated family of information-transfer products is based on a proprietary virtual-server technology and runs on a variety of computers.

Computer Associates sets pace in site-licensing

Mike Seither

Associate Western Editor

Software site-licensing has been a way of doing business in the mainframe and minicomputer worlds for years. One copy of a program is licensed to run on one multiuser machine at one site for one fee. The deal usually includes all program revisions, updates and support.

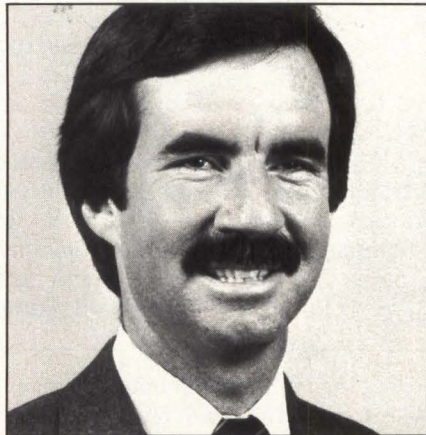
But only recently—and with some reluctance—have microcomputer software vendors begun to entertain the notion of site, or “corporate,” licenses for companies whose offices are littered with hundreds, even thousands, of personal computers. Computer Associates’ Microcomputer Products Division (formally Sorcim/IUS Micro Software, San Jose, Calif.) is emerging as a leader in the trend.

From a corporation’s point of view, there are good reasons to clamor for site licenses—most notably, savings on the cost of every copy of a program the company uses. In the case of Lotus Development Corp.’s 1-2-3, every copy costs about \$500. A company’s other concerns include controlling the duplication of programs, assuring that company personnel have up-to-date versions, training users and getting support from the software publisher.

But the dollar issue, according to many industry observers, is the primary reason that software companies have been dragging their feet over site licenses. “Pricing on a per-user basis is something that this [microcomputer software] industry has managed to perpetuate,” says an OEM software sales director. “It’s finally waking up to the needs of the corporate community because it’s being forced to.”

VARs in on sales

Some software companies are waking up earlier than others. This summer, for instance, Microcomputer Products unveiled a corporate site-license program that it hopes will satisfy



Computer Associates’ Microcomputer Products’ Michael Crosno says his company’s site plan will keep microcomputer software vendors, dealers and corporate customers happy.

all parties involved—itsself, the buyer and the dealer—and tackle the thorny issue of illegal copying.

“Corporations have centralized purchasing, and the buyers are now management-information-system (MIS) and data-processing people, not users,” says Microcomputer Products marketing vice president Michael Crosno.

Under its program, Microcomputer Products will leave direct sales to dealers or value-added resellers who complete the company’s training session. For selling such Microcomputer Products programs as SuperCalc and EasyWriter, dealers get a 10 percent to 12 percent commission on the license fees. Licenses vary according to the number of copies and the selection of programs a corporation needs. Fees range from \$293 to \$7,800, depending upon the number of copies and the combination of programs.

Microcomputer Products doesn’t make the copies but instead sends out master disks which the customer uses for duplication. The master has a counter that numbers each copy and identifies the customer on the pro-

gram’s splash screen. Once the licensed number of copies has been made, the master self-destructs.

Since Microcomputer Products doesn’t copy-protect its software, it’s possible that more than the licensed number of copies could be made by reproducing duplicates. But if that happened, says Crosno, at least the company would know where an in-house duplicate came from because it would be numbered. If pirated and used outside, the Microcomputer Products customer would at least have the satisfaction of knowing that, whenever the program was booted, the company’s name would appear on the screen.

Under Microcomputer Products’ support program for licensees, customers receive up to 150 free sets of documentation—\$25 per set thereafter—or they can pay \$3,500 for master sets for unlimited duplication. An optional maintenance program, free for the first six months and \$1,500 annually after that, provides program updates and enhancements, a telephone hot-line and free documentation.

More to come

Compared with other software vendors’ attempts at site-licensing, Microcomputer Products’ is perhaps the most comprehensive and flexible, and it keeps dealers and VARs in the sales loop. By contrast, Summa Software, Beaverton, Ore., sells its Select word-processing program directly and lets customers make as many copies as they want for a flat fee of \$7,000.

Another vendor, Multimate International Corp., East Hartford, Conn., the maker of the MultiMate word-processing program for IBM Corp. PCs, gives customers the option of either buying ready-made copies or making duplicates from masters provided by Multimate. Depending on the number of copies purchased, a customer can receive discounts of up to 50 percent. A Multimate license for 500 copies, for example, costs \$10,000, or \$200 a copy. The program regularly lists for \$495.

Two of the major players in microcomputer software markets, Ashton-

Introducing Human Designed Systems' HDS200 Display Terminal Family



EASY ON YOUR EYES

Ended December 31, 1984 1983

Statement Data:

Revenues	\$145,200	\$104,558
Income	14,003	10,266

ings per common share:

132-col. characters actual size

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

EASY ON YOUR SPACE

A small, one-square-foot footprint lets the HDS200 terminal coexist comfortably with all your desktop tools. A far cry from other 15" displays that dominate your desk.

EASY ON YOUR BUDGET

In addition to the high resolution and small footprint that identify all terminals of the HDS200 family, each display has a unique set of advanced capabilities. The HDS200 ANSI/DEC-compatible terminal — 80/132 columns, 50 user-defined non-volatile keys, smooth scroll, double-high/-wide lines, four pages of memory (optionally eight), windows, viewports, multiple character sets and multiple computer networking. And only \$995.* The HDS200G graphics terminal — all the above plus 720 x 350 high-resolution screen, Tektronix 4010/4014 emulation (also Retro-Graphics, Visual, and others), local printer support with large buffer, and more. For only \$1295.* And there are advanced APL models also.

*Single quantity price. Significant quantity discounts available.

HDS

human designed systems, inc.

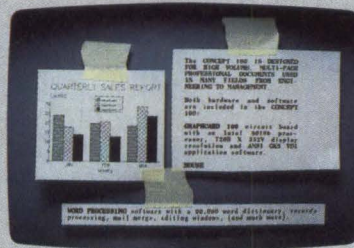
3440 Market Street □ Philadelphia, PA 19104
215-382-5000

It's easy to get your hands on a HDS200 Display Terminal. Call 215-382-5000 or Atlanta: 404-391-9763, Boston: 617-449-6446, Detroit: 313-471-2807, Los Angeles: 213-410-9454, New York Metro: 201-624-1372, Philadelphia: 215-382-5000, Upstate NY: 716-223-4490, San Francisco: 415-692-4184, Toronto: 416-362-1063 or Washington, DC: 301-670-1813 for a free trial in your office.

CIRCLE NO. 20 ON INQUIRY CARD

TEXT PLUS GRAPHICS, MINUS SCISSORS AND PASTE: THE \$2195 PC SOLUTION!

Now you can produce full-function text-and-graphics for reports, manuals, color overheads and slides right on your PC XT/AT. All you'll cut out is the scissors and paste! The CONCEPT 100 System lets you create text on a Wang-like word processor, complete with 90,000-word dictionary and list processing. You can easily create charts and drawings. Or import text or graphics from other systems. Then, use electronic cut-and-paste to combine them on-screen just as you'll see them in hard copy. CONCEPT 100™ is based on the ANSI GKS* standard



using the Virtual Device Interface. It offers Tektronix terminal emulation and output options like the ConceptWriter™ or Lasergrafix laser printers. In short, it's a personal publishing system at an unprecedented low price. Now available from your local distributor.

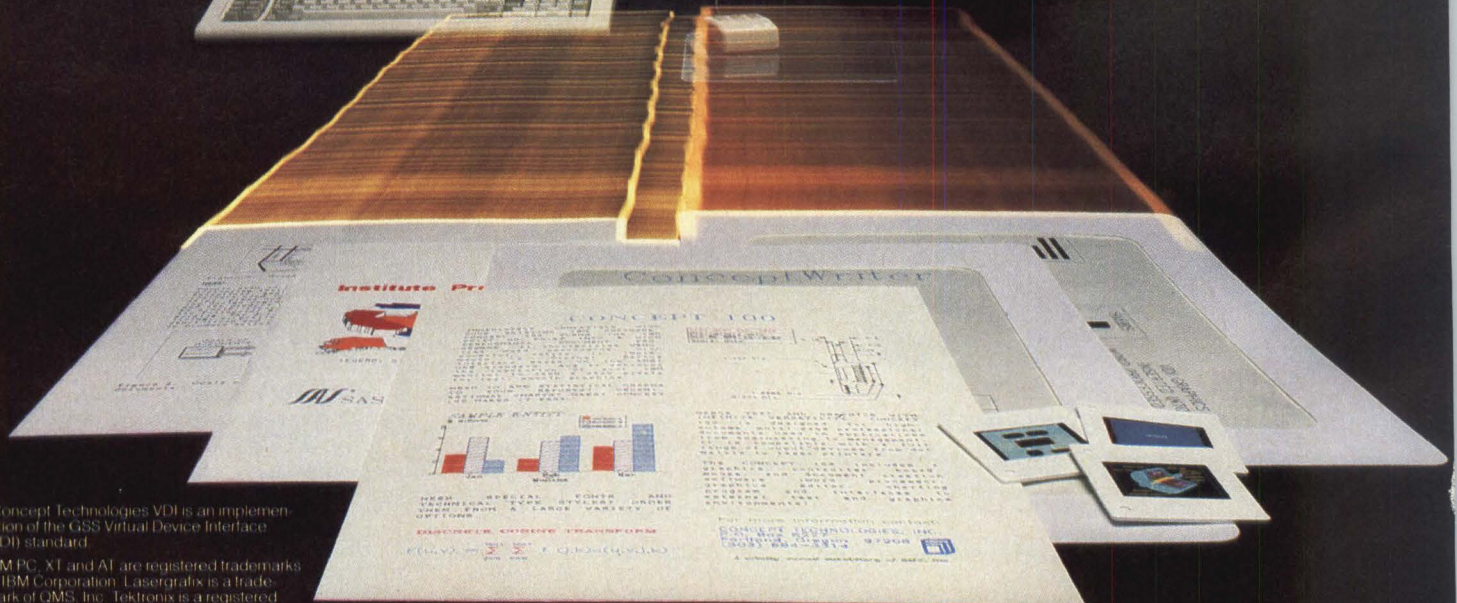
Call 1-800-631-2692 for more information.



CONCEPT TECHNOLOGIES, INC.
A QMS Company

P.O. Box 5277, Portland, OR 97208

THE DOCUMENT PROCESSORS®



*Concept Technologies VDI is an implementation of the GSS Virtual Device Interface (VDI) standard.

IBM PC, XT and AT are registered trademarks of IBM Corporation. Lasergrafix is a trademark of QMS, Inc. Tektronix is a registered trademark of Tektronix, Inc.

CIRCLE NO. 21 ON INQUIRY CARD

Tate, Culver City, Calif., and Lotus, Cambridge, Mass., have not made any significant moves toward site-licensing. Both have paid it lip service, but neither has come up with a plan.

Edward Esber, Ashton-Tate's president and chief executive officer, this summer toured a number of Fortune 100 companies and afterward described their unanimous plea for site licensing as a "primal scream." However, Esber says site licensing means

different things to different people, and Ashton-Tate is still trying to understand what those things are.

Until recently, Lotus had consistently said it would not implement a site-licensing program, but a company spokeswoman says that stance has changed. "Lotus is looking for solutions to site-licensing and actively studying corporate needs," she says. "We want to be pro-active, not re-active."

Robert Lefkowitz, director of software services at InfoCorp, the Cupertino, Calif., market research company, believes that Lotus and Ashton-Tate will hold out as long as possible on site licensing but eventually will give in to demand from corporate MIS departments that are used to such deals. "Their single-CPU licenses continue to make money for them," Lefkowitz says. "There's no need yet to give discounts or offer a lot of support." □

Publicity is key tactic in ADAPSO's war on pirates

Stephen J. Shaw
Washington Editor

Round One has ended in the fight against software pirates with the software industry winning on points. In late May, the Association of Data Processing Service Organizations (ADAPSO), a trade association that counts many software developers as members, announced that it had settled its piracy lawsuit against American Brands Inc. and subsidiary Wilson Jones Co. for an undisclosed amount of cash. But according to some observers, money was not the issue.

"The real objective of the lawsuit was deterrence—get some publicity, raise the awareness level to the problem and discourage the rampant copying of programs within corporations," speculates one computer industry analyst who asked to remain anonymous.

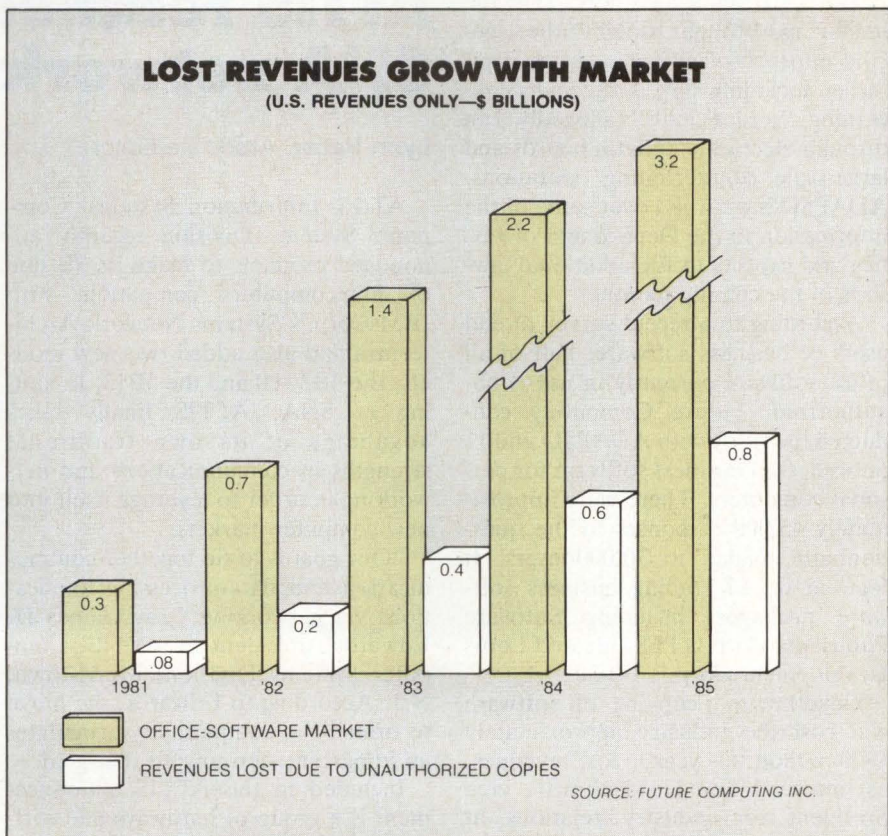
ADAPSO alleged in its lawsuit that the companies had illegally copied the MailMerge, SpellStar and WordStar programs produced by MicroPro International Corp., San Rafael, Calif. American Brands admitted that the programs had been improperly duplicated by employees of its subsidiary, but it said such duplication was performed without the knowledge or acquiescence of American Brands or its executives.

American Brands stated that it and Wilson Jones agree with ADAPSO and

MicroPro that software products should not be duplicated improperly, adding that the two companies "have agreed that appropriate procedures

will be instituted to insure against such improper duplication."

"We got everything we wanted," comments David Sturtevant, ADAPSO's public communications director. "There was no need to take it through the litigious process." ADAPSO, say industry observers, carefully orchestrated its piracy lawsuit with public-



Piracy cost the office-software industry nearly \$1.3 billion in lost revenues between 1981 and 1984; the industry expects to lose \$800 million in 1985.

awareness and advertising campaigns aimed at software end users.

The increased attention on software piracy may heighten demand from corporate users for protected programs or for some form of site-licensing agreements, speculates Pam Park, a computer industry analyst with research organization Future Computing Inc., Richardson, Texas.

One result of the lawsuit has been an increase in the number of companies writing internal policies that specifically prohibit copying of software packages, says Sturtevant. The ADAPSO spokesman adds that the association has received approximately 5,000 inquiries from companies, educational institutions, government agencies and individuals requesting more information about the legality of software copying. "We're seeing a new level of understanding," asserts Sturtevant.

The spokesman also notes that the lawsuit has brought to light other specific information about additional pirating, including signed affidavits concerning "piracy mills" allegedly run through electronic bulletin boards and large-scale counterfeiting operations. ADAPSO has turned over some of the information to the Department of Justice and expects to file additional lawsuits in the coming months.

According to a recent survey of end users of business software, half of all office software currently in use is unauthorized. Future Computing conducted the study with ADAPSO and 11 publishers of business software for personal computers. There were approximately 45,000 responses to the questionnaire mailed to 70,000 users. It focused on 12 leading business software packages, including Software Publishing Corp.'s PFS:File and Lotus Development Corp.'s 1-2-3.

Unauthorized copying of software will cost the industry approximately \$800 million this year in lost revenues, estimates Marv Goldschmitt, vice president for industry relations at Lotus, Cambridge, Mass.

According to Goldschmitt, 90 percent of the software houses are not in good financial shape right now. The

lost revenues are coming right out of their potential profits and are the difference between survival and death for these software companies.

Goldschmitt is chairman of ADAPSO's software protection committee, a group devoted to developing a hardware-based standard for protection against software piracy. The committee is designing a key system that would require an add-on device containing a user-identification number. A software program would be locked under the user's number when it is first installed on his system. Without the key device and the correct ID number, the program will not execute on the user's microcomputer. Goldschmitt says adoption of a hardware-key standard could happen this year. However,

Goldschmitt admits that any type of hardware-based encryption system will make the software harder to use.

Industry analyst Park says some software companies may not go along with protection schemes for fear of alienating users. They'll put achieving maximum market penetration ahead of protecting revenue. "Some software houses want to see their packages copied just to get the programs out there," she says.

Despite the initial success against pirates represented by the settlement of ADAPSO's lawsuit against corporate software copiers, the software industry still has a long way to go in its effort to stanch the flow of lost revenues. A battle may have been won, but the war promises to be a long one. □

ATTIS reaches out to IBM's SNA network

Lynn Haber, Associate Editor

AT&T Information Systems' Computer Systems Division recently announced products to make its 3B line of minicomputers compatible with IBM Corp.'s Systems Network Architecture and also added two new models, the 3B2/400 and the 3B15. In aiming at SNA, ATTIS finally takes advantage of its own traditional strengths in communications and networking in order to leverage itself into new computer markets.

"Our goal is to tie together communication and data-processing applications via networking," says James D. Edwards, president of ATTIS' Computer Systems Division, Morristown, N.J. According to Edwards, the move to offer SNA compatibility articulates an important step toward that goal.

Included in the ATTIS announcement is a group of hardware and software products that will allow users to integrate microcomputers, minicomputers and mainframes, as well as to access other AT&T network products



James D. Edwards, president of ATTIS Computer Systems, sees his company's move toward IBM SNA as a major step in tying communications to data processing.

such as the Dataphone II Network Management System.

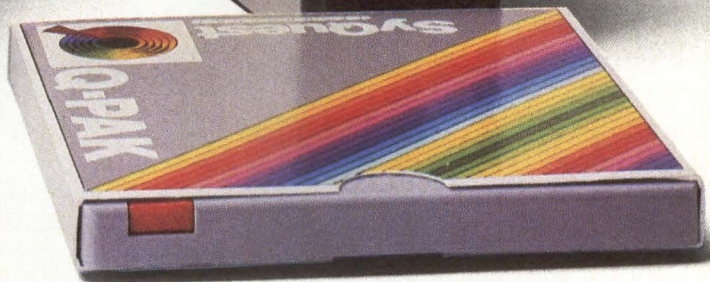
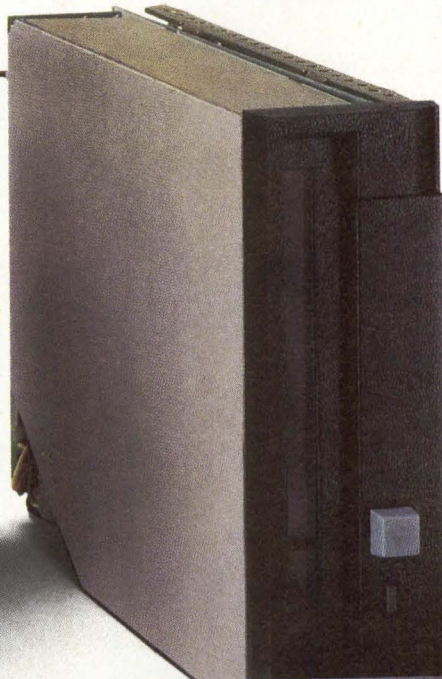
ATTIS recognized that 70 percent of the mainframe environment is dominated by IBM. So, it targeted IBM in offering the following four host connectors: SNA/3270 Emulator+, BSC/3270 Emulator+, 3270 Application Program Interface and the Communi-

SyQuest- the best in Winchester. Inside and Out.

Fixed



Removable



When you've already done the impossible in Winchester design and production, doing the difficult is no problem. That's why SyQuest can lay claim to the top quality half-height Winchester disk drives—removable *and* fixed.

SyQuest 6.38 and 12.76MByte removable cartridge Winchester, the product many said couldn't be done, are setting the standard of the industry in quality, reliability and performance. Only 4.8 inches wide and 1.625 inches high, they can be configured for a sub 5¼-inch or standard 5¼-inch half-height footprint. More than 60,000 of these drives have been delivered to date for on-line, random access storage. Combining a unique stepper motor positioner with servo control and the ultrareliability of graphite-sputtered, plated media, SyQuest half-height cartridge drives make the impossible possible.

SyQuest half-height fixed disk drives give 25.5 and 38.2MBytes of data storage with the same innovative, yet conservative, design concept. Like our cartridge drives, they are tested and qualified far beyond industry standards. What other manufacturers are finding difficult, SyQuest can deliver today.

So when you need Winchester in a 5¼-inch footprint or smaller—come to the leader. SyQuest, the best in Winchester—inside and out.

SyQuest Technology, 47923 Warm Springs Blvd., Fremont, California 94539. (415) 490-7511, TWX 910-381-7027.

Model	Fixed/Removable	Unformatted	Formatted
SQ306RD	Removable	6.38MByte	5.00MByte
SQ312RD	Removable	12.76MByte	10.00MByte
SQ325F	Fixed	25.50MByte	20.00MByte
SQ338F	Fixed	38.20MByte	30.00MByte



SyQuest
TECHNOLOGY

Winchester at its best.

CIRCLE NO. 22 ON INQUIRY CARD

TEMPLATE. We're offering more than precision visuals.

There's more to engineering and scientific graphics software than pretty pictures. At TEMPLATE® we build quality functionality into graphics software tools.

That makes us feel so good about our family of products that we're offering you our \$300 MICRO TEMPLATE® package free, just for seeing the rest of our show.

Surprised at our generosity? You shouldn't be. Who more than TEMPLATE is committed to providing you high-technology graphics and sensible software solutions?

Whether you're a sophisticated user, or just starting out, our product family—including TEMPLATE, 2D TEMPLATE®, CONTEMPLATE™, DIMENSION-GKS™, MICRO TEMPLATE and a variety of options—is designed to address your specific problems. And solve them.

TEMPLATE people know this. They include specialists in dedicated device driver development and customer support. Hot-Line accessible and always professional. Together they provide technical expertise around the world.

Isn't this the blend of product and service you've been looking for? Precisely. So contact TEMPLATE. If you qualify, we'll bring you a free MICRO TEMPLATE package—compatible with IBM PCs, ATs, XTs and TI Professionals. Then we'll remind you of all we can offer. And what our competitors can't.

TEMPLATE
THE SOFTWARE DIVISION OF MEGATEK CORPORATION

The Innovators in Graphics Software.

9645 Scranton Road, San Diego, CA 92121 619/457-5359 TWX: 910-337-1270

TEMPLATE is a Registered Trademark of Megatek Corporation. CONTEMPLATE and DIMENSION-GKS are trademarks of TEMPLATE.

CIRCLE NO. 23 ON INQUIRY CARD



AT&T EXPANDS ITS 3B FAMILY

AT&T Computer System	Operating system	Hard disk (bytes)	Floppy disk (bytes)	Expansion slots	Processor	Performance (may vary with mix of 3B2 applications)	Asynchronous ports	Memory configuration (bytes)	Tape backup
3B2/400	UNIX System V, Release 2.03 supermicro	30 or 72M (max. 720M)	720K	12	WE32100	10-20 simultaneous users; max. 46 terminals; 1.1 MIPS	2 RS232C; max. 46 RS232C	1M; 2M; 3M; 4M	23M-byte streaming tape drive
3B2/300	UNIX System V, Release 2.0 supermicro	10M, 30M or 72M (max. 432M)	720K	4	WE32000	6-10 simultaneous users; max. 18 terminals; .6 MIPS	2 RS232C; max. 18 RS232C	½M; 1M; 2M	optional 23M-byte streaming tape drive
3B5	UNIX System V, Release 2.0 multitasking supermini	1.1G max. (models 101 and 301) 2.2G max. (model 201)		5 I/O (model 101) 15 I/O (models 201 and 301)	WE3200 (model 101); WE32000 high-speed version* (models 201, 301). *To be upgraded to WE32100 later this year.	16-32 simultaneous users (model 101); max. 48 simultaneous users (models 201, 301)	supports RS232, RS449 interfaces and variety of asynchronous terminals and printers		
3B15	UNIX System V, Release 2.1 multitasking supermini	max. 1.1G (model 101) max. 2.1G (models 201, 301)		5 I/O (model 101) 15 I/O (models 201, 301)	WE32100	20-48 simultaneous users (model 101); max. 60 simultaneous users (models 201, 301)	supports RS232, RS449 interfaces and variety of asynchronous and synchronous terminals and printers		

Processor. All the products except for the Communication Processor are available now.

According to ATTIS, the products are designed for distributed data processing in IBM's SNA/System Data Link Control and Binary Synchronous Communications protocols. Today, they provide compatibility with IBM's Logical Units (LUs) 1, 2 and 3. Within the next 12 months, ATTIS plans to offer compatibility with LU 6.2, which supports peer-to-peer communications.

The Communication Processor, a hardware interface providing support for groups of 3B computers, is priced at \$27,000 and will reportedly be available in the first quarter of 1986. The hardware, including the operating system, disk drive, memory, processor and special feature cards, is a node on the 3BNet network and links the 3Bs on that network to the IBM host.

ATTIS reportedly plans full support of IBM's Document Interchange Architecture/Document Content Architecture and Distributed Office Support System within the next year.

William C. Rosser, vice president at the Gartner Group Inc., a Stamford, Conn., market research company, thinks ATTIS' recent move will bring the company in line with what other

major computer manufacturers are already doing. "Basically, ATTIS is in a catching-up mode," he states. "They haven't been in the computer business long, and they're moving in the right direction. But overall the steps are a relatively simplistic approach to getting the job done."

ATTIS' computer marketing strategy is to target banking, brokerage, health and manufacturing, which it hopes to penetrate via strategic alliances with companies already positioned in those areas. One such agreement was recently made with Quotron Systems Inc., Los Angeles, which provides financial information to stockbrokers. ATTIS will furnish Quotron customers with their computers.

The new 3B2/400 supermicrocomputer is a full 32-bit multiuser machine based on the Western Electric (WE) 32100 microprocessor. The system can simultaneously support up to 25 users and runs the company's UNIX System V operating system. Features include one or two built-in 30M-byte or 72M-byte hard disk drives, a 23M-byte streaming tape back-up unit, an I/O backplane with 12 expansion slots, at least six RS232C ports, main memory configurations of up to 4M bytes and an optional floating-point math coprocessor. Base prices range from

\$19,950 to \$34,950. The product will be available in the third quarter.

The 3B15 superminicomputer is also a 32-bit device based on the WE 32100 microprocessor. Running under the UNIX System V operating system, the 3B15 supports up to 60 simultaneous users and has a main-memory expansion of up to 16M bytes. Prices range from \$54,500 to \$64,500 depending upon configuration. Availability is slated for the first quarter of 1986.

The company also announced price reductions for the 3B2/300 and 3B5 minicomputers, new modems and new application software for accounting and banking tasks.

Despite the acceptance of UNIX in the technical and scientific markets, the operating system has met resistance in transaction-processing application environments. To this end, the Computer Systems Division is promoting UNIX as an "enabler," rather than as "selling UNIX for UNIX," according to William O'Shea, a spokesman for the ATTIS software group.

Although the company continues to publicize the operating systems' strengths, such as multiuser and multitasking capabilities, portability and so forth, ATTIS is putting the accent on the networking aspect of system integration. □

PACIFIC PERSPECTIVE

Japan defines a market for machine language translation

Ichiro Kakehashi
Tokyo Correspondent

The challenges of writing a computer program to turn Japanese into English and English into Japanese have been addressed for about 30 years, but only in the last two have there been significant breakthroughs. Now, spurred by urgent international politics—trade conflicts, particularly—and encouraged by technical refinements in microelectronics, several Japanese companies are bringing machine translation to market. A few claim machine translation that will run on microcomputers.

The problems of translation for Japanese export trade are acute, as is obvious to anyone who has ever tried to decipher an English-language Japanese manual. You will find instructions such as, "Please fixing by referral to the followings your careful reading." Fujitsu Ltd. conducted a study of Japanese companies that use translation services and found that 56 percent of the documents involved are manuals, catalogs and other technical material for products shipped outside Japan.

On the market, or close to it, are a number of other systems:

- In September of last year, the Fujitsu ATLAS automatic translation system was released, and Fujitsu is using a version of it at its pavilion at Tsukuba Expo '85 at Tsukuba Science City, about an hour northeast of Tokyo.

- NEC Corp. is completing a mainframe-based system called VENUS that the company is also developing for microcomputers.

- The Bravice Pak Japanese-English translation system was introduced just over a year ago by Bravice International Inc. of Tokyo. It runs on a Digital Equipment Corp. VAX II or 11/780.

- Sharp Electronics Corp. has sim-

plified English-to-Japanese translation to the point where it will run on a 16-bit desktop minicomputer, the Sharp OA-90DX.

- Hitachi Ltd. and the Market Data Center, an independent market-research company and database supplier, have recently codeveloped an English-Japanese translation system especially for economics.

- Finally, Toshiba Corp. demonstrated in June a mechanical translation system that uses a 32-bit minicomputer running under the UNIX operating system. The company expects to have a commercial version ready for market in December.

The objective of all these systems is to translate simple text from one language into simple text in the other. They are not expected to translate novels or poetry, but they are expected to provide syntactically correct translations of such things as manuals, catalogs, contracts and patent forms.

Fujitsu sells two ATLAS systems, ATLAS-I for English-to-Japanese translation and ATLAS-II for Japanese-to-English translation. In translating from English to Japanese, for example, the original sentence is first broken down into its component words and the words converted to Japanese by straight comparison via a 50,000-word dictionary.

Then the system identifies the elements of the original sentence, analyzes its syntax, establishes its grammatical structure and selects the appropriate interpretation. The operations are executed on the basis of stored rules. The system then sets up the modal elements of the sentence and assembles all of the elements to form a sentence in Japanese. The systems run either on a mainframe or superminicomputer.

In the NEC VENUS approach, the same machine-translation system handles both Japanese-to-English and En-

glish-to-Japanese translations. In research to date, the program only runs on a mainframe, but NEC is developing VENUS to run on a microcomputer.

To run on a microcomputer, however, the system must incorporate sufficient peripheral memory to handle the huge volumes of dictionary space required to store all of the standard and inference-reference entries for word meaning and grammatical distinction.

The Bravice Pak, the first commercial translation system available in Japan, was developed in cooperation with Weidner Communications Inc., Provo, Utah, to translate from Japanese into English. There are about 20 Bravice Pak systems in place. Users lease them for approximately \$2,000 per month, including software.

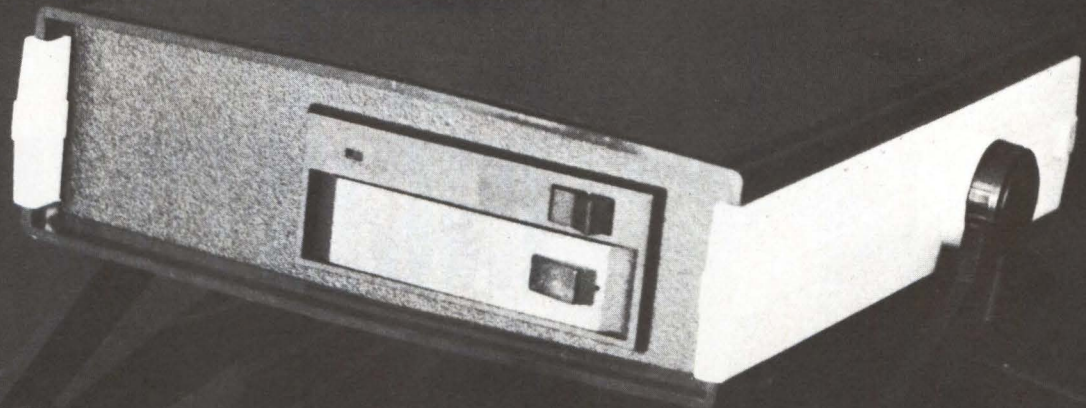
The system uses a prompting program and requires an operator-editor to smooth out the translation. The company claims an accuracy rate of 85 percent to 92 percent. Bravice is currently bringing the software into scale to run on personal computers.

The key phrase in Japan is, "Smaller is better," and at least one company is simplifying the machine translation process even further. Sharp's OA-90DX, introduced a year ago, uses a Motorola Inc. MC68000 microprocessor and runs under a UNIX-based operating system. It has 768K bytes of RAM, expandable to 1.28M bytes. It offers plenty of memory, too—40M bytes on a 5-inch hard disk.

Sharp claims that their system translates 5,000 words an hour, or about one page of English into Japanese every 5 minutes. That is about two to three times faster than a very good human translator can work, and the system provides the added bonus of legible, printed text.

A commercial version of the system, including hardware, software and a printer, will be available for about \$14,000.

Portable Tape Backup

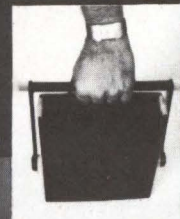


THE
MT10P ONLY
\$525

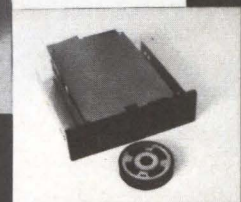
IT'S MORE THAN
A TAPE BACKUP!

One **MT10P** Portable Tape Backup is all your company needs. Simply disconnect the MT10P from the external floppy port of one IBM PC and connect it to the external floppy port of another . . . then "BACKUP." And even more incredible, the **MT10P** acts like a **FLOPPY** with the capacity of a **HARD DISK**. That's right! The **MT10P** can backup and retrieve "SPECIFIC FILES." It acts like a "D" "Floppy Drive" with 10 meg storage capacity. Be safe and backup with the incredible **MT10P**.

PORTABLE



DESK TOP MODEL



INTERNAL UNIT



OUTSIDE FLORIDA

1-800-228-0891



INSIDE FLORIDA

1-305-677-8333

1 YEAR WARRANTY, 30 DAY MONEY BACK GUARANTEE ON ALL OUR PRODUCTS



Micro Design International Inc.

6566 University Boulevard, Winter Park, Florida 32792 (305) 677-8333 TELEX 332559 MDII ORL UD

IBM is a Registered Trademark

CIRCLE NO. 24 ON INQUIRY CARD

INGENIOUSLY

NEW!

INCREDIBLY

700 cps for under \$2000.

FAST!

Now you can move mountains of data without paying a premium for a high speed printer. The new OT-700 matrix printer, priced amazingly low at under \$2000, prints at an incredible 700 characters per second. Effortlessly. The secret behind this speed breakthrough is a unique "shared resource" Tri-Head print technique.

A technique that delivers high throughput with minimal effort for high reliability, for around-the-clock trouble-free performance.

There's more. Dual pass correspondence printing at 350 cps. Two graphics modes. Front panel menu programming. Condensed or expanded print. Serial/parallel interface ports. And it's made in the U.S.A. Call or write for more information.



Distributed by:

CA Western Micro Syst. (415) 964-2050; Gemini (714) 891-1507, (619) 268-1181, (213) 594-9618
Western Micro Syst. (818) 700-9922 **FL** Input Syst. Assoc. (305) 724-4321 **IA** XLDP (515) 284-1428
IL Kaltronics (312) 291-1220 **MA** Eastern Micro (617) 480-0400 **MI** MCD Corp. (313) 924-1020
MN Kaltronics (612) 544-0494 **NJ** Gen. Business (609) 424-6500 **NY** Rudor (212) 582-7315,
R.G. Eng. (716) 424-7492 **OH** Swenson (513) 866-3233; R.G. Eng. (216) 292-6242
OR Western Micro Syst. (503) 635-1340 **PA** R.G. Eng. (412) 443-7670
TN Commercial Business Sys. (901) 382-3920 **TX** M-P Syst. (214) 385-8885
UT Computer Ware (801) 534-0337 **WA** Western Micro Syst. (206) 881-6737
CANADA CanaMicro (514) 737-3550; Peripherals Plus (514) 281-1306

NCR

Nationwide Service by NCR Corporation

48

CIRCLE NO. 25 ON INQUIRY CARD

OTC OUTPUT
TECHNOLOGY
CORPORATION

E. 9922 Montgomery
Spokane, WA 99206
(509) 926-3855 800-4-OUTPUT
Telex 15-2269 OUTPUTSPOK

MINI-MICRO SYSTEMS/September 1985

European MAP group augurs worldwide approval

Keith Jones, European Editor

Members of Europe's leading automotive and petrochemical companies are forming a user group in support of the Manufacturing Automation Protocol (MAP), General Motors Corp.'s standard communications specifications for the factory floor. The European MAP User Group, which will also include European vendors of MAP products, presents further evidence that MAP is well on its way to worldwide acceptance.

Michael Kaminski, MAP project manager at GM, predicts that some form of worldwide user group to guard against deviation from MAP standards may be forthcoming. He is sure that the structure of the user group will be influenced by the steering committee of the North American MAP User Group, and by that group's secretariat, the Society of Manufacturing Engineers, Dearborn, Mich., rather than by GM itself.

Kaminski says there is now also a growing interest in MAP in Australia, Japan and other parts of the Far East, in addition to North America and Europe. At least one European manufac-



GM's Michael Kaminski sees a burgeoning interest in MAP standards worldwide.

turer of MAP-compatible technology, the Energy and Automation Systems Group of Siemens AG, Munich, will participate in the next large public demonstrations of MAP, the manufacturing automation show Autofact, in Detroit, from Nov. 4 to 7. At Autofact, a local area network using MAP protocols to connect manufacturing workstations and devices will be demonstrated working with an Ethernet LAN configured with office-automation attachments.

In addition to users, MAP-product vendors and system integrators will be allowed to join the European MAP User Group, says Victor Gregory, con-

venor of the fledgling group's steering committee and manager of corporate projects at Unilever Plc., London, one of the world's largest household-products manufacturers.

Gregory says Unilever's numerous factories worldwide badly need a standard like MAP because they use computers and process controllers from more than 30 vendors. The company has to reconfigure its system each time different products need to communicate.

But Gregory stresses that like the North American MAP User Group, users, rather than vendors, will dominate the new group's steering committee. The interim secretariat, which may become permanent, is the European office of CAM-i (Computer-Aided Manufacturing International Inc., Arlington, Texas) in Poole, England. CAM-i is a worldwide non-profit organization that manages research and development projects for its member companies. Dr. Peter Bunce, CAM-i European technical manager, looks forward to a full user group meeting before the year-end.

Bunce observes that the adoption of MAP in Europe will be aided by conformance testing centers for computer standards now being established by the European Commission, the governing body of the European Economic Community. The standards to be tested include the open systems interconnection (OSI) standards being defined by the International Standards Organization. MAP will conform with the seven-layer structure of OSI.

A longer term goal for MAP is the interconnection of a broadband-bus backbone with multiple token-passing baseband buses, each running at 5M bits per second. The backbone will employ the existing MAP broadband transmission technology, where frequency multiplexing is used to transmit multiple signals simultaneously.

Testing of such a mixed broadband and baseband network was carried out last June at Eastman Kodak Co., Rochester, N.Y., notes Dittmar Janetsky, manager of the systems communications group within the Siemens systems engineering development divi-

HOW MAP LEADS TO OSI

Layers of the ISO's Open System Interconnection

OSI protocols implemented in Manufacturing Automation Protocol

7. Application	MAP includes the File Transfer Access Method and Common Application Service Elements (CASE) kernel. Added protocols include management/directory services and the EIA 1393 file-transfer specification for programming robots.
6. Presentation	As in OSI, MAP has no presentation layer yet established
5. Session	MAP uses the OSI kernel
4. Transport	MAP uses the OSI protocols
3. Network	MAP uses those OSI Network protocols designed for wireless communications
2. Data link	MAP uses the OSI Logical Link Controls
1. Physical	MAP uses the IEEE 802.4 token bus standard of OSI but elsewhere differs from other standards, including 802.3 CMA/CD Ethernet.

sion at Karlsruhe, West Germany. He says that the demonstration was staged in conjunction with two U.S.-based MAP equipment vendors, Motorola Inc., Schaumburg, Ill., and Concord Data Systems Inc., Waltham, Mass. Janetsky explains that IEEE 802.4 embraces token-passing buses employing broadband and baseband transmission.

Janetsky is a member of the IEEE 802.4 standards committee and is also involved with a standards body giving worldwide endorsement to the token-passing bus technology embraced by MAP. This is the Geneva-based International Electrotechnical Commission (IEC), which is preparing a worldwide manufacturing bus standard called

Proway. Janetsky, a member of the Proway working group, finds Proway to be compatible with IEEE 802.4.

Siemens' interest in MAP is mainly as a vendor of programmable logic controllers for machines like robots and numerical control equipment. But computer vendors in general are interested in MAP, observes Christopher Warham, technical networks marketing manager at Hewlett-Packard Ltd., Wokingham, England. He says that HP regards MAP as the linchpin of future factory-floor communication and over the next year will introduce a variety of hardware and software interfaces implementing MAP protocols for its computers and workstations. □

by the end of August. Along with these microcomputer makers, a number of other manufacturers, several of them foreign, have announced intentions to produce AT-compatible machines (MMS, August, Page 44).

IBM strengthens AT's presence

According to IBM, last year's announcement of the PC-AT was met with an overwhelming demand—one the company wasn't able to meet because of component shortages, primarily those for the fixed disk drive. Relying on Computer Memories Inc. and Seagate Technology to augment its own hard-file production, IBM reported twice as many PC-AT shipments from April to June 1985 than it had during the previous January-through-March quarter.

While IBM doesn't release specific information on PC-AT production, Norman Weizer, a consultant with Arthur D. Little's Information Systems Consulting Group, Cambridge, Mass., says that the backlog on AT orders currently might be about 1½ months, compared with a one-time high of nine months for large orders. (Some retail

AT-compatibles fight for share of new standard

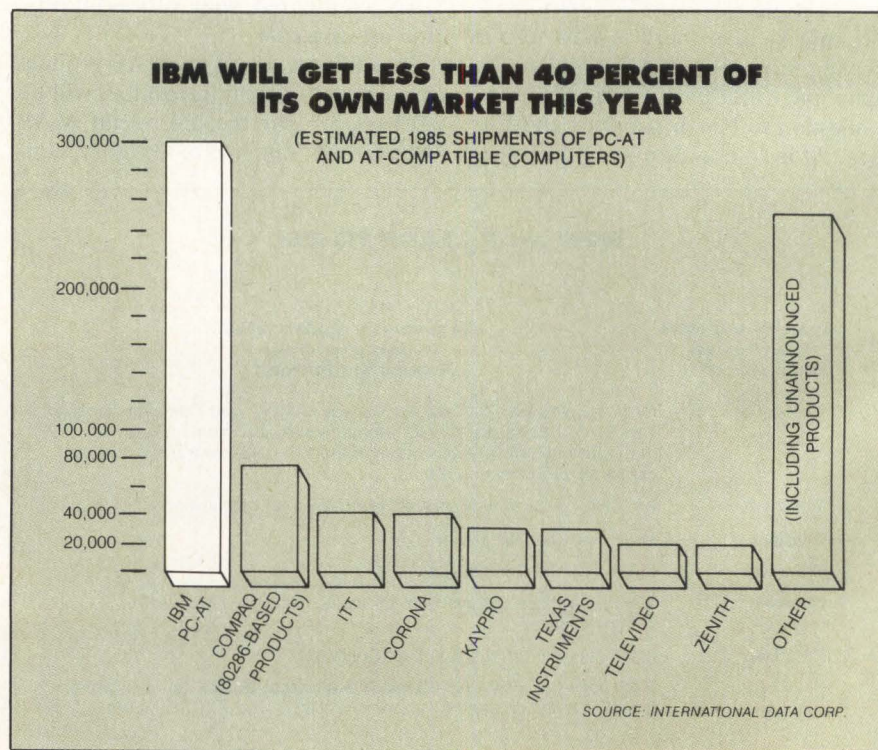
Lynn Haber, Associate Editor

The number of manufacturers who sell IBM Corp. PC-AT-compatible computers seems to grow every day. But the question is: Can all the vendors survive? Continued demand for IBM's PC-AT and AT-compatible products remains uncertain, and industry analysts suggest that the success of individual AT-compatible manufacturers will rest squarely on product integrity, not simply on the availability of the IBM product.

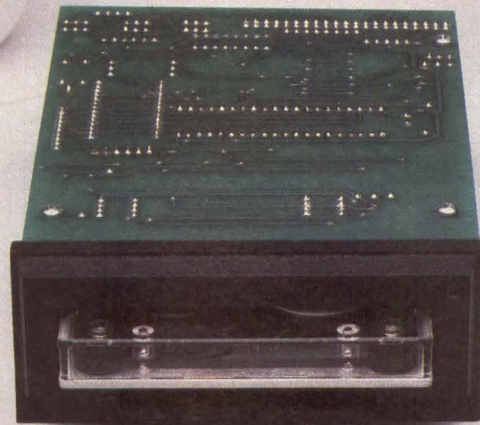
Aaron Goldberg, analyst with market research concern International Data Corp. (IDC), Santa Clara, Calif., estimates that PC-AT unit shipments in 1985 will reach 300,000, compared with 25,000 in 1984. Yet, Goldberg says, "The survival of AT clones will be based on the quality of a particular product and whether the manufacturer is responsive to his customers' needs. The fate of the compatible manufacturers won't rest with IBM but with their own management."

Five U.S. manufacturers are currently offering AT-compatible products: Compaq Computer Corp., Corona Data Systems Inc., Kaypro Corp.,

TeleVideo Systems Inc. and Texas Instruments. Additionally, NCR Corp. and Zenith Data Systems reportedly were to ship AT-compatible products



Introducing the little backup with the 20 megabyte appetite.



When Irwin came out with the Irwin 110 and 210 tape drives, both of which fit 10 megabytes of formatted capacity in a DC-1000™ cartridge, a lot of people said we bit off more than we could chew.

A lot of people ate their words.

Now we're backing you up with the Irwin 125 tape drive—20 megabytes of formatted data on a DC-1000 cartridge.

The Irwin Recipe: Simplicity, Reliability, and Ease of Use.

Because the Irwin 125 has a standard minifloppy interface, it daisy chains right onto your existing controller — without any additional cables, controllers or hardware. Add a simple software driver and an applications program for file transfer or streaming, and the Irwin 125 is ready to go.

And if you are PC DOS compatible we'll provide you with all the software required—without charge!

Irwin's closed-loop servo technology guarantees simpler operation, media interchangeability and greater reliability. With an error rate of 1 in 10^{11} and MTBF greater than

12,000 hours, the Irwin 125 is one of the most reliable, trouble-free back-up drives available anywhere today.

The Biggest Surprise is the Little Price.

Best of all, the cost of the Irwin 125 tape drive is about the same as a floppy disk drive. And it provides from 20 to 40 times the storage capacity on a single cartridge.

For those who don't need 20 megabytes of storage capacity, there's the Irwin 110, a 5/4-inch half-high and the Irwin 210, a 3 1/2-inch form factor. We put a big byte in every backup we build.

If we've whetted your appetite, perhaps it's time you ordered a 125 tape drive for evaluation.

Irwin Magnetics. We back you up with integrity.

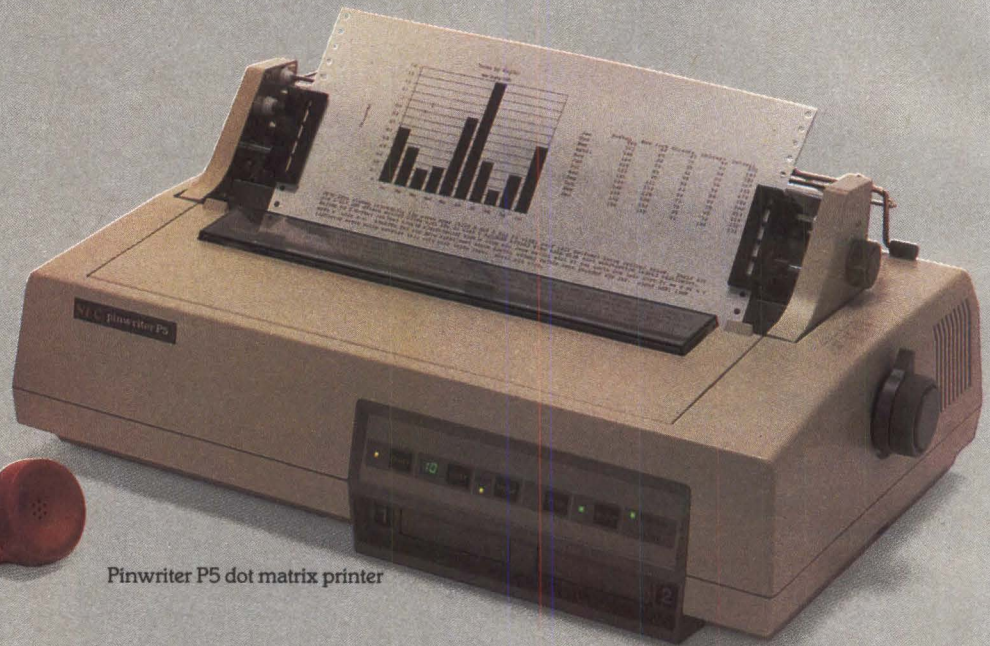
The DC-1000, 185 feet of .150" width tape, is a trademark of the 3M Company.

Irwin Magnetics
2311 Green Road
Ann Arbor, Michigan 48105
313/996-3300
TWX 810-223-6050

IRWIN™
IRWIN
MAGNETICS

CIRCLE NO. 26 ON INQUIRY CARD

TO HEAR HOW QUIET OUR NEWEST PINWRITER DOT MATRIX PRINTER IS, JUST CALL 1-800-543-8000.



Pinwriter P5 dot matrix printer

We won't waste words trying to describe how quiet our new Pinwriter™ P5 printer is. Besides we've come up with an easy way to for you to actually hear it. Without even getting up. Just call the toll-free number above and you can listen to a recorded demonstration.

You'll hear the actual sound of the Pinwriter. And how it compares to other leading dot matrix printers. You'll also see, that unlike most other dot matrix printers, you can talk on the phone or carry on a conversation, while the P5 is running.

The Pinwriter P5 not only sounds great, it looks great. It has superior graphics resolution. And more built-in true fonts than any other dot maxtrix printer. Plus it can use a variety of font cartridges.

It's also the fastest 24-pin dot matrix printer going. It clocks at 290 CPS in draft mode and 100 CPS in letter-quality. And you can select either speed at the touch of a button.

NEC printers are also incredibly reliable. With normal use they can run an average of 5 years without a repair.

The new Pinwriter P5 dot matrix printer. The first printer that offers less bang for the buck.

To hear one in action, call the above toll-free number. Or see your nearest NEC dealer. For more information, call 1-800-343-4418 (in MA 617-264-8635).

Or write: NEC Information Systems, Dept. 1610, 1414 Massachusetts Ave., Boxborough, MA 01719.

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

NEC

NEC Information Systems, Inc.

C&C Computers and Communications

Pinwriter is a trademark of NEC Corporation.

CIRCLE NO. 27 ON INQUIRY CARD

vendors, however, report that they are experiencing no delays in shipments.)

Compaq, manufacturer of the DeskPro 286 and other Intel Corp. 80286-based products, is expected to do well in the PC-AT-compatible market. With Compaq No. 3 in sales behind IBM and Apple Computer Inc. in dealer distribution channels, industry analysts believe the company is in a good competitive position.

IDC's Goldberg estimates that Compaq will report sales of approximately 75,000 units in 1985. This figure includes the DeskPro and the Portable 286, both 80286-based.

Michael S. Swavely, vice president of product marketing for Compaq, contends that the IBM shipping delay was more of a negative than a positive for AT-compatible manufacturers. "Delayed shipments resulted in a slowdown in the overall market. Also, if the AT had been readily available, software developers would have made it a priority to get software to market early, which would have, in turn, boosted the overall market sooner," Swavely says.

TI, Austin, Texas, expects to be successful with its AT-compatible computer—the Business Pro—because of positioning through the value-added reseller channel. "The VAR channel has been the strength of our minicomputer business over the last couple of years, and we expect to expand that well-developed channel with the Business Pro," says Roger Roberts, manager of personal systems marketing for TI.

The company will also sell direct, but sees most of its PC-AT-compatible competitors targeting their products for the retail desktop-PC, high-performance-workstation and PC-replacement markets. "We're going to emphasize the VAR channel. The other vendors don't seem to be taking that track," Roberts adds.

Rumors prevail that IBM will expand its 80286-based line (currently just the PC-AT) and integrate the new products into the company's overall office-automation strategy. The PC-AT will represent the top-of-the-line unit, while the much-talked-about

PC II, expected to make its official appearance within the next six months, will replace the PC as the company's low-end machine.

"The AT will increasingly become part of integrated, information-processing office-automation systems," says Arthur D. Little's Weizer. "It will become an IBM standard." According to the analyst, IBM has already stated that its primary intelligent workstation is the PC—"and therefore the AT" he suggests. In addition, he says, "It makes sense that IBM will standardize its office-automation architecture to more fully integrate with the rest of the company's product line."

Weizer believes that if IBM does standardize the architecture, the PC-AT-compatible manufacturers could face some difficulties. "Now, this is where large users get nervous about clones," he says. "Increasingly, we're finding that large business users are doing long-range planning—and PCs are a part of the office-automation systems. So, users have to get that warm feeling about vendors that what-

ever changes IBM makes in hardware or software, they, the end user, will be able to follow."

According to Weizer, the nature of the market changes as one deals more with the PC as part of a larger system or as a workstation. "It's much different than dealing with the PC as a standalone device—and this concept will give the AT-compatible manufacturers some trouble," he contends.

Goldberg doesn't believe that a redirected strategy on the part of IBM will hurt the PC-AT-compatible manufacturers. "I don't think it will be a disaster for the AT-compatible vendors—at least not the good ones," he says. "And I don't think customers should be scared away from these products, because some of them are better and less expensive than IBM's machines."

TI's Roberts believes that an IBM endorsement of the 80286-product would be good sales incentive for other manufacturers' offerings. "I think it reinforces the 80286 standard in the marketplace and will contribute to a longer life for such products," he says. □

Jazz and Excel: Can the Mac now get down to business?

Lynn Haber, Associate Editor

The threatened battle between Lotus Development Corp.'s Jazz and Microsoft Corp.'s Excel software will never develop. The real question facing these powerful new application packages is whether they can make the computer for which they were designed—Apple Computer Corp.'s Macintosh—a serious player in the business computer market.

Neither Lotus nor Microsoft are solely vying for market share within the approximately 275,000 Macs now installed. Rather, they hope to create a new market for the Mac and, therefore, for themselves.

"I don't see direct competition between Jazz and Excel," asserts Robert M. Lefkowitz, director of the software

industry research program at Info-Corp, a market research concern in Cupertino, Calif. "I believe that success for these products depends on whether the companies can create new markets for their products instead of simply tapping into existing needs."

But can Jazz, an integrated software package for first-time microcomputer users, and Excel, a robust microcomputer spreadsheet, bring the Macintosh to the large business users Apple would like to address?

The Apple Macintosh microcomputer, introduced in January 1984, has a clientele comprised primarily of small-business and home users. Last January, Apple introduced the Macintosh office concept to attract a stronger business-office clientele. With the introduction of LaserWriter, a high-reso-

lution printer, and AppleTalk, a local area network that allows the Mac to communicate with other personal computers, Apple promotes an integrated range of business products. Both Lotus and Microsoft see their software products as an expansion of this business concept.

Lotus promises innovations

According to Eric Bedell, product marketing manager for Jazz, the target user for the \$595 integrated package is the work group and the departmental-level user in both small and large organizations. "In all companies, there are certain workers who perform similar tasks—decision-makers who move from one task to another throughout the course of the day," he explains. "Jazz is personal-productivity software designed to facilitate the job of the first-time [managerial or professional] microcomputer user."

Jazz integrates five functions—worksheet, word-processing, graphics, database and communications—in a single package. According to Lotus, the communications function can retrieve information from other personal computers or minicomputers and mainframes. Additionally, users can convert files from Lotus' 1-2-3 and Symphony software packages and from Microsoft's Multiplan into Jazz files. Currently, 1-2-3 and Symphony cannot convert Jazz files, but according to Bedell, Lotus will offer a new version of these products that will convert the files.

The company will also make available this fall the Jazz internal file format so that third-party developers can write macros for the software. A macro is a feature that enables a user to tailor the software for a specific, often-used task. Bucking criticism from some industry analysts who chided Lotus for not including a macro in Jazz, Bedell defends the company's decision, saying that, by and large, the targeted Jazz user doesn't require such a sophisticated tool.

Lotus is also making available the internal file formats of 1-2-3 Version 2 and Symphony Version 1.1. According to the company, the availability of this

HOW JAZZ AND EXCEL MATCH UP				
Package	Functions	Memory required	Features	Price (\$)
Jazz Lotus Development Corp. 55 Cambridge Parkway Cambridge, Mass. 02141 (617) 577-8500	spreadsheet, word processing, database, graphics, communications	Apple Macintosh 512K (plus external disk drive)	employs Macintosh conventions; pull-down menus; visual icons; multiple documents open at once; supports Apple's ImageWriter, LaserWriter and AppleTalk	595
Excel Microsoft Corp. 10700 Northup Way Bellevue, Wash. 98004 (206) 828-8080	spreadsheet	Apple Macintosh 512K (plus external disk drive)	graphics interface; automatic programming of macros; array-handling; two-way file compatibility with Lotus 1-2-3	395

information will assist third-party developers and application designers to work with and interchange data between all Lotus products.

InfoCorp's Lefkowitz views Jazz as a general-purpose business tool. "It's good for users who aren't sure what they'll use the Mac for," he says. "They'll use Jazz to dabble in a bit of everything." But the industry analyst questions whether enough people have delayed purchasing personal-productivity tools because they were waiting for something like Jazz, or that Jazz will spur the sale of Macs to this untapped market.

Excel designed for power

Microsoft's Excel is a spreadsheet package designed to run on the 512K-byte Macintosh. The software combines automatic macros, user-defined functions, array-handling and two-way file compatibility with Lotus' 1-2-3. Not only is the spreadsheet large—256 rows by 16,384 columns—but also extremely fast by virtue of recalculating only those cells affected by a change. Excel is priced at \$395 and will reportedly begin shipping in September.

According to Michael Slate, product marketing manager for Excel, the target customer is the power user as well as the first-time user. "No other spreadsheet product is as powerful as Excel," claims Slate. "This software is

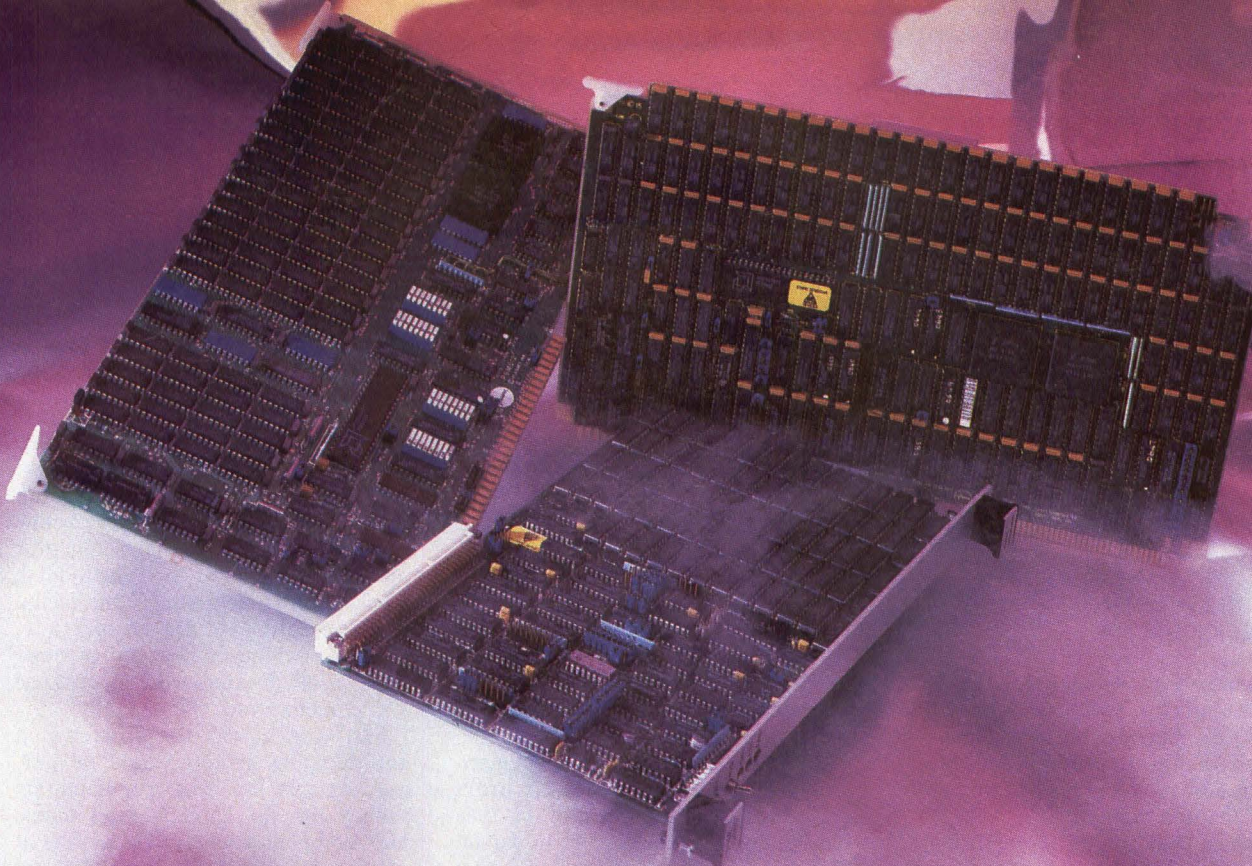
specifically for people who have to do some serious work with numbers."

While Lotus' Bedell claims that the spreadsheet in Jazz can do all the things Microsoft's Excel can do, Eric Arnum, research analyst at International Research Development Corp. (IRD) in Norwalk, Conn., says, "These two software packages are different in philosophy as well as product." Neither, he claims, will be all things to all users.

Despite the fact that Excel has been lauded by industry analysts as a "meaty" spreadsheet package, these same analysts again question whether users needing serious number-crunching have been sitting around waiting for a package such as Excel, rather than having already purchased IBM Corp. PCs and the business-oriented software packages written for them.

"Is there a need for a super-sized spreadsheet for Mac users?" asks InfoCorp's Lefkowitz. "I think most users who need a good spreadsheet went the IBM/Lotus 1-2-3 route." Analysts also wonder if the Mac, with only 512K bytes of memory, will be adequate for such powerful packages.

How much of an influence these two products will exert on the undecided customer has still to be seen. "One thing I don't believe is that Jazz and Lotus alone will make the Mac an office product," says IRD's Arnum. □



Memory Magic.

No illusions. Just vastly superior memory boards from Plessey Microsystems.

There are no tricks involved in building memory boards that work like magic. All it takes is advanced technology, painstaking attention to quality and a knack for knowing just what the marketplace needs. At Plessey Microsystems, we've got it all . . . for your systems.

Every Plessey memory is built in a facility that meets U.S. (AQAP 1&2) and U.K. (DEF. STAN. 05-21) military standards. So you get mil spec quality at the best commercial pricing.

Plus a full year guarantee, double sourcing by Plessey in America and England and a range of memories to meet your every need.

Work Wonders for Your Micro.

You don't need tricks to bring the wizardry of superior memory technology to your system. All you really need is Plessey Microsystems. Memory Magic without the tricks. Call us today or use the coupon below.

Plessey Microsystems Memories

	Capacity/Slot	Parity	EDC	Data Bits	Write Access	Read Access	Volatile	Non-Volatile
Multibus*	2 Mbyte DRAM	•	•	8/16	200nS	200nS	•	•
VMEbus	4 Mbyte DRAM	•	•	8/16/32	150nS	270nS	•	•
VERSAbus†	4 Mbyte DRAM	•	•	8/16/32	300nS	300nS	•	•
iLBX	2 Mbyte DRAM		•	8/16	200nS	200nS	•	
Bubble	2 Mbyte		•	—	36mS	36mS		•

*TM Intel. †TM Motorola

Plessey and the Plessey symbol are registered trademarks of The Plessey Company plc.



PLESSEY
MICROSYSTEMS

One Blue Hill Plaza
Pearl River, New York 10965
(914) 735-4661, **(800) 368-2738**

22931 Triton Way, Suite 231
Laguna Hills, California 92653
(714) 855-4947

CIRCLE NO. 28 ON INQUIRY CARD

For additional information, clip and mail to Plessey Microsystems, One Blue Hill Plaza, Pearl River, NY 10965

Name _____
Company _____
Address _____
City _____ State _____ Zip _____
Title _____
Phone _____

HEARD ON THE HILL

Semiconductor group asks help in selling to Japan

Stephen J. Shaw
Washington Editor

Joining a crowded field, the U.S. Semiconductor Industry Association (SIA) has become the latest industry organization to voice complaints about how its members are treated in the Japanese market.

SIA, a trade group representing 57 U.S. semiconductor manufacturers, has petitioned the Office of the U.S. Trade Representative (USTR) for a determination that Japanese companies and government agencies have actively conspired to keep U.S.-made semiconductors out of the Japanese market.

In July, the U.S. Trade Representative Clayton Yeutter agreed to launch a formal investigation of SIA's complaints. Two weeks later the International Trade Commission issued a preliminary ruling that Micron Technologies Inc., a Boise, Idaho, semiconductor manufacturer, had suffered economic harm because of Japanese dumping of chips on the U.S. market at prices below their usual cost.

The Department of Justice in August agreed to SIA's request to launch an investigation into possible predatory pricing of semiconductors by Hitachi Ltd.

Some industry observers feel that the petition is an attempt to pressure Japanese manufacturers to sit down with U.S. companies and arrange a set of mutually agreeable market shares. SIA contends, however, that specific quotas are not the goal. Rather, they want to force the Japanese to work domestically under the same set of market risks that U.S. manufacturers operate under at home.

"The Japanese in the early 1970s had virtually no presence in the U.S. market for semiconductors. They targeted the U.S. market and significant-

ly increased their presence here," comments Pat Cox, a computer industry analyst with Dataquest Inc., a Cupertino, Calif., research organization that worked with SIA in developing market estimates.

According to SIA figures, American semiconductor manufacturers controlled only 11 percent of the 1984 market for semiconductors in Japan. The Japanese share of the U.S. market, however, is estimated at 17 percent. "If U.S. companies had the same market share in Japan as Japanese manufacturers have here, U.S. sales would have been \$3.3 billion higher in 1984, and we would have had an additional 27,000 jobs," claims an SIA spokeswoman.

Negotiations on the issue are already under way as part of the ongoing bilateral trade talks between the United States and Japan. However, acting U.S. trade representative Michael B. Smith told a congressional committee that progress on most agenda items was moving at a "glacier pace."

SIA filed its petition partly out of frustration over the slow pace. "We would not have filed our petition if the U.S.-Japanese talks...had not appeared to have failed," says the SIA representative.

The petition cited SIA fears that Japanese manufacturers are repeating the techniques they used in 1981 to 1982 to dominate a major portion of the world market for 16K and 64K RAMs: establish a restricted domestic market that allowed Japanese companies to expand production capacities, then flood the world market with relatively inexpensive semiconductors.

SIA cited a memo from Hitachi Corp. to its dealers that SIA claimed provided proof of Japanese intentions to gain market share regardless of cost. The memo illustrated Hitachi's "10 percent rule:" dealers were in-

structed to quote to prospective customers prices that were 10 percent below the competition. Dealers were told to keep bidding 10 percent below competitors' prices if the competitor matched Hitachi's price. "The bidding stops when Hitachi wins," the memo stated, according to SIA. Apparently, Hitachi is willing to bear any revenue losses itself. Dealers were guaranteed a 25 percent profit.

SIA also raised the specter that anti-dumping actions would be pursued against Japanese manufacturers selling into the United States unless U.S. companies achieved some sort of market-share parity in Japan. The association urged the President to prevent potential dumping of semiconductors in the American market. SIA maintains, however, that it will not file for an investigation into alleged dumping. That will be left up to individual member companies, according to the association. SIA has requested that the U.S. Department of Justice investigate whether "the collusive and anti-competitive activities of Japanese semiconductor producers have violated U.S. antitrust laws."

The Japanese government dropped formal protection of the Japanese semiconductor market by 1975. But by encouraging a "Buy Japanese" attitude, as well as close cooperation between semiconductor researchers and suppliers, and development of a large captive market for semiconductors within Japanese companies, the Japanese government has effectively blocked penetration of the market by non-Japanese companies.

The SIA's petition was filed under Section 301 of the 1974 Trade Act. The USTR was expected to rule by the end of July whether to launch an investigation of SIA's complaints. If USTR's initial ruling is positive, as expected, comments will be solicited from other executive agencies, industry and the public. And if the USTR finds in SIA's favor, the President is empowered to enter into negotiations with the Japanese government to ease import restrictions. The whole process is expected to last into late 1986.

Fast Access
20 MB/Sec.

The only reason you're not using Pioneer's disk drive tester already.

If you still haven't seen the Pioneer hard disk drive tester in action, it's time to take a look. And judge for yourself.

Beginning with the price tag, every aspect of the Pioneer Qualifier™ is designed to meet your requirements for pocketbook *and* performance.

It's the only tester to interface with any and all SMD drives.

It's the only one with a hefty 20-megabit per second capability. Even at triple the price.

It's the only one that can read and transfer Fujitsu's error map right into your computer. In seconds.

It's the only one that will format to your custom specs. And it does it at one megabyte per second. Over five times faster than by computer.

It pinpoints your errors to a specific media sector. And separates the correctable from the uncorrectable. So you can detect and log either set.

Have you ever seen a tester that does all that?

And also checks the address mark capability of your drive? And isolates

intermittents in the output? And works with embedded servos? And can be multiplexed to test four drives at once?

The Pioneer Qualifier does all those things. And easily, at that.

It's almost turnkey. It's totally programmable through the simplified keyboard. And you can input a custom set of drive characteristics with no EPROMS to modify or boards to change.

Plus, there's even a standard RS232 port for remote operation, data print-out, uploading and downloading.

Call Pioneer for a demonstration today. It's an eye opener.

Pioneer Research, 1745
Berkeley St., Santa
Monica, CA 90404.
(800) 233-1745
(outside California).
(800) 848-1745 (in
California). Rep opportunities available.

 **Pioneer
Research**

Qualifier is a registered trademark.

CIRCLE NO. 31 ON INQUIRY CARD



"With this high-performance GCR Streamer, the benefits begin with reliability and end with cache."

That's the advantage you get with a leader."

Norman B. Petersen, President, Storage and Peripheral Products, Fujitsu America, Inc.

At Fujitsu America we want our back-up devices to be second-to-none in price, performance and reliability.

That's why we developed the M244X series 1/2" GCR tape drive with an intelligent 256KB cache buffer. The buffer means you get all the versatility of our start/stop drive, plus the speed and reliability of our streamer technology. Parameters such as transfer rate, block size and ramp times are all switch selectable so you can easily optimize the drive for your system.

But the cache buffer is just the finishing touch on a tape drive that already outperforms the competition.

By incorporating Fujitsu's advanced LSI electronics, we have eliminated the high-cost, high-failure mechanics found in other low-cost GCR tape drives. As a result, you get a high-performance GCR Streamer with the best reliability rating—and the best price—in its class.

Throughout this drive's design, we have found ways to keep your cost of ownership to a minimum. The drive performs its own internal monitoring and self-adjustment, eliminating costly preventative maintenance. And the sophisticated diagnostics make it possible to isolate system faults without special test equipment.

For information on this or any other Fujitsu tape drive, call (408) 946-8777. Or write Fujitsu America, Inc., Storage Products Division, 3055 Orchard Drive, San Jose, CA 95134-2017.

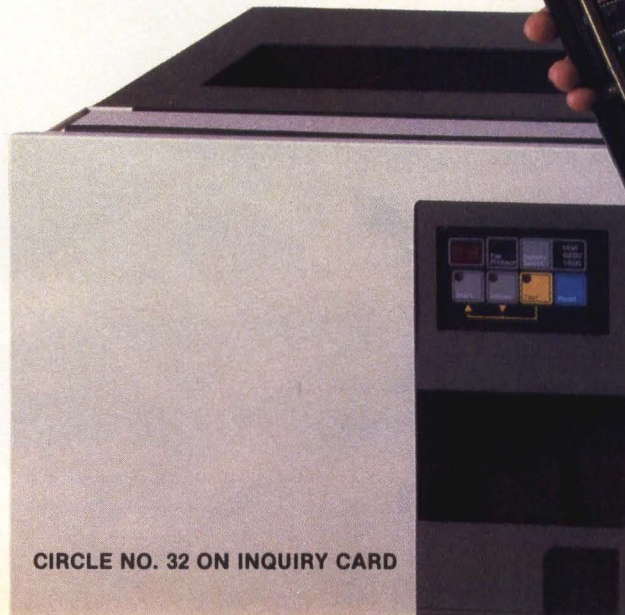
The Fujitsu M244XAC GCR Streamer, with cache buffer. From price, to performance, to reliability—it's the best tape drive in its class.

We're developing technology for you.

MODEL	M2442AC	M2444AC
Tape Speed (ips)		
Streaming	100	75
Start/Stop	12.5	25
Recording Density (bpi)	6250/1600	
MTBF	8,000 hours	
Cache Buffer	256 KB	
Transfer Rate	Selectable from 60 KB/sec to 1 MB/sec	
Compatibility	IBM*, ECMA and ANSI	
Interface	Cipher*, Pertec compatible	

FUJITSU

FUJITSU AMERICA, INC.



CIRCLE NO. 32 ON INQUIRY CARD

VERTICAL MARKET INTEGRATOR

*Applying integrated systems
in industry, engineering and commerce*

PHARMACISTS NATIONWIDE ORDER DRUGS BY COMPUTER

Network speeds drug orders and price updates through countertop terminals

Joan Tharp

Approximately 200 pharmacies nationwide daily place drug orders for as many as 400 prescriptions over a pharmaceutical network system from RxNet Systems, a division of Northwestern Drug Co. Each pharmacy's system has a microcomputer, one to eight terminals, one to eight printers and a modem that connects to a minicomputer at Northwestern Drug headquarters in Auburn, Wash.

Because many of its customers are first-time users, RxNet strives to keep the system simple and to make any changes transparent to users. But in 1980 the company's terminal supplier, Ampex Corp., Cupertino, Calif., discontinued the line that RxNet was using, and RxNet was faced with having to replace the terminals, re-write its application programs and retrain its customers.

Customizing the terminals

As a result, RxNet set out to find new terminals while keeping its application program intact. The company looked for terminals similar in features and functions to those of Ampex but with smaller footprints because counter space in pharmacies is limited. After looking at many standard terminals, RxNet officials found none of the right size that would interface smoothly with the RxNet software. What's more, says RxNet general manager Rip Corter, "The manufacturers insisted that we'd have to change our application to fit their hardware."

The only viable solution seemed to be custom-

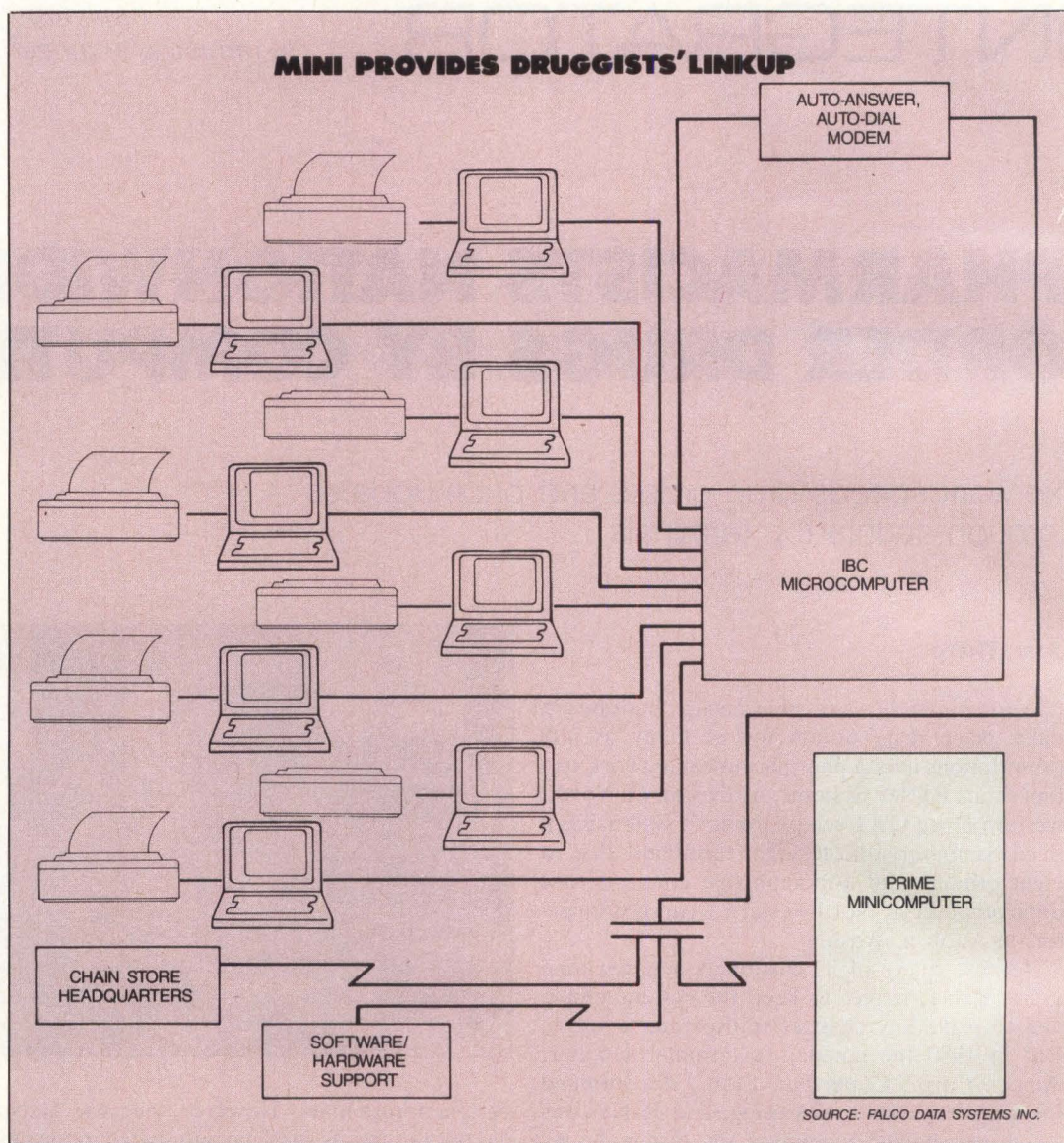


Pharmacies connected to the RxNet network use Falco Fame II terminals to place drug orders.

designed terminals. However, because RxNet did not require its customers to switch to the new systems, the company's initial order was for only 100 terminals. RxNet then found that many vendors couldn't accommodate such a small order and that those that could would have attached a prohibitive price tag. However, one company that RxNet evaluated, Falco Data Products Inc., Sunnyvale, Calif., could provide RxNet with a small quantity of a reasonably priced terminal—the TS-1—and customize it to work with RxNet's application software.

After choosing the TS-1, RxNet's Corter and the Falco engineering department fine-tuned the terminal to the RxNet system. Corter described the desired keyboard layout for the RxNet system and outlined the functions the TS-1 had to perform. Using Corter's suggestions, Falco developed specifications and shipped a prototype

Each pharmacy in the RxNet network includes a micro-computer, one to eight terminals, one to eight printers and a modem that connects the pharmacies to a Prime minicomputer at Northwestern Drug headquarters.



to RxNet for evaluation.

To use the RxNet system, a pharmacist enters the product stock number and requested quantity. This information is stored until the pharmacist is ready to send a batch of orders, which he does via the auto-dial, auto-answer Signalman modem from Anchor Automation, Van Nuys, Calif., and Magic Wand electronic mail from Peachtree Software Inc., Atlanta.

When the pharmacist wants to receive his electronic mail, he selects "EMS" from the software menu and then chooses an option, such as price updates, express mail or regular mail. He then enters the time that he wants to begin receiving his mail. If the pharmacist has a prob-

lem with the system, he can enter it into the communications mode of the system. Then, hardware/software communications support can correct the problem. The system can send program updates to the pharmacist via modem.

At Northwestern Drug headquarters, a minicomputer from Prime Computer Inc. receives the data and processes the drug order. It provides pharmacists with drug price updates and allows them to leave messages for other pharmacists on the network. It also sends information to an NCR Corp. mainframe, which then produces order documentation and "pick tickets" to identify the products ordered.

One change in the TS-1 Corter had suggested



Our Smart-Frame™ will put you in touch.

Carroll Touch

a subsidiary of AMP Incorporated

In Touch with Technology

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

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

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

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

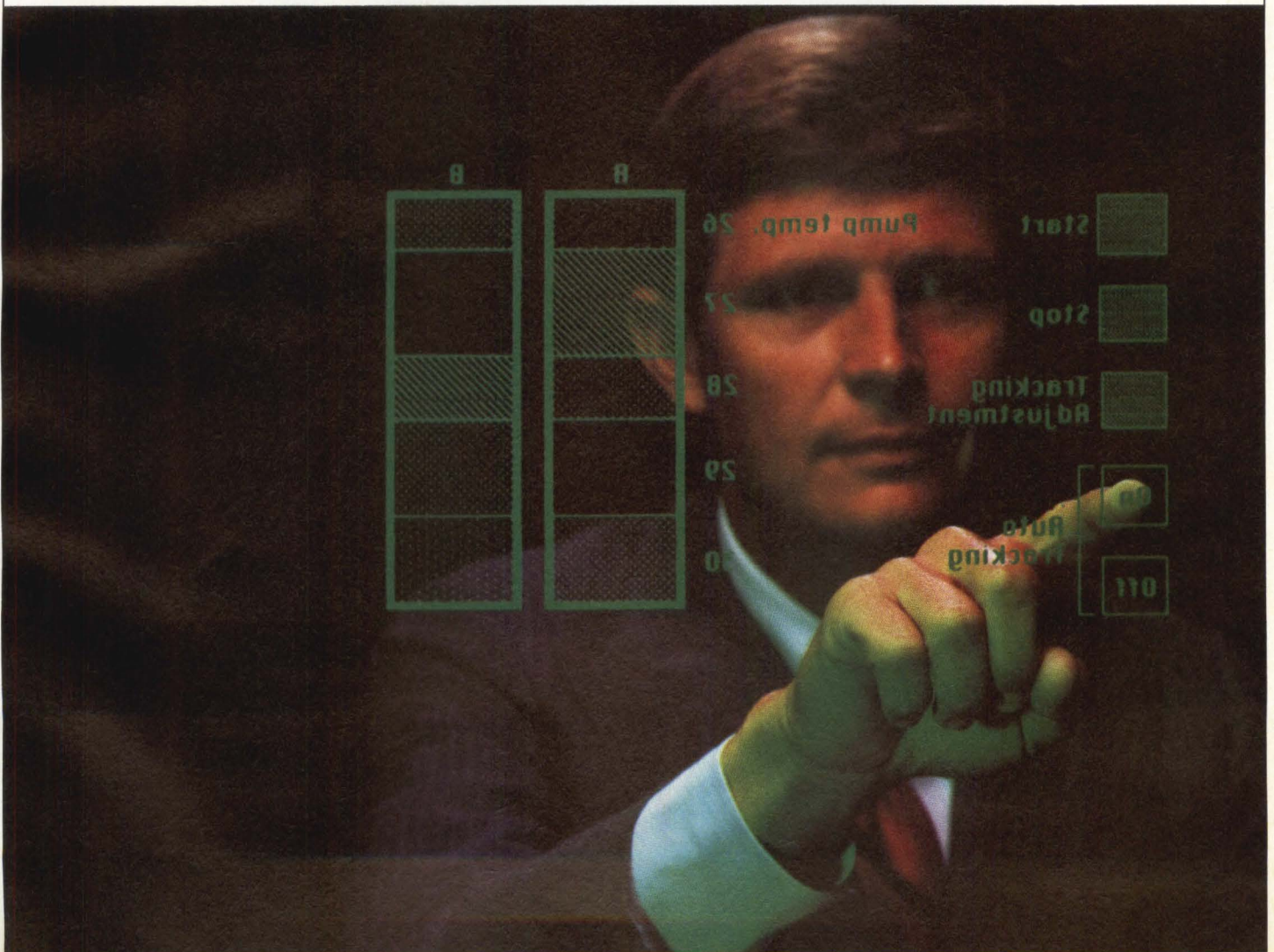
We call it Smart-Frame™. Because it contains a powerful microprocessor built into the frame. And because it uses scanning infrared technology—a touch technology which is incredibly reliable, rugged, accurate, and fast. A technology Carroll Touch pioneered and refined.

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

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

CIRCLE NO. 33 ON INQUIRY CARD

P.O. Box 1309
Round Rock, Texas 78680
512/244-3500, Telex 881906



Equinox didn't invent the Data PBX...



we just perfected it!

All the Data PBX features you need

Port selection: User-controlled terminal switching between computers.

Access control to keep your database secure from unauthorized personnel and to protect dial-in lines from "hackers".

Port contention or sharing for maximum port utilization and economy.

Network control from a central point; alter system configuration, collect statistics and perform diagnostics.

Non-blocking architecture permits 660 full-duplex connections at 9600 bps.

Plus these Equinox only features

Expandable from 24 to 1320 lines without taking your system down.

User-friendly menu-driven battery-backed configuration plus on-line help.

Compact dimensions: 360 lines in the unit shown above. Less than one sixth the size of Micom or Gandalf PBXs!

Simple do-it-yourself installation using low-cost modular telephone wiring.

Complete system backup with auto-switchover power and logic, plus comprehensive on-line diagnostics.

And the price: under \$100 per line. No other LAN compares!

Call 1-800-DATA-PBX* for a free color brochure and on-site demonstration.

EQUINOX

Systems

12041 SW 144th Street, Miami, Florida 33186 * In Florida call (305) 255-3500 · Telex 289307

to Falco was reprogramming of the 10-key function keypad so that it would match the procedures of RxNet's electronic-mail system, which incorporates Peachtree's Magic Wand word-processing software. For example, Falco changed some of the TS-1's numerical keys to arrows that executed such Magic Wand tasks as inserting characters and lines. In addition, Falco moved the TS-1's function keys to the top of the keyboard to match the Ampex terminal's keyboard layout.

Faster CPU requires new terminal

Last summer, RxNet changed the system's CPU to a microcomputer from Integrated Business Computers (IBC), Chatsworth, Calif. The IBC unit runs the Oasis 6.0 operating system from Phase One Systems Inc., Oakland, Calif. Because the IBC unit operates twice as fast as the previous CPU that RxNet was using, RxNet had to switch to a faster Falco terminal—the Fame II, an ergonomic TS-1 replacement.

The \$795 Fame II provides higher microprocessor speed through the use of an extra crystal oscillator and several new circuits on the logic board. In addition, the Fame II meets ANSI X3.64 standards and supports the 2674 and 2675 CRT controller chips, which improve the display and the screen attributes and provide smoother scrolling.

Besides improved processing ability, the Fame II provides better ergonomics, including the ability to tilt and swivel. With a smaller footprint than the TS-1, the Fame II also fits more easily onto pharmacy countertops. The reduced-glare Fame II displays 24 lines by 80 or 132 columns and features a 77-character-per-key character memory, which, Corter says, helps pharmacists store detailed commands.

Falco and RxNet updated the keyboard firmware so that the terminal could accept data from the more powerful CPU. The two companies also changed the "freeze" key from single to multiple stroke to prevent its being accidentally struck by pharmacists when they reach for a nearby key. Falco and RxNet also reprogrammed the Fame II firmware to respond to RxNet's 20 non-standard escape sequences.

Falco attributes its ability to offer lower cost terminals than its competitors do to using electrically programmable ROM, incorporating modular software and employing flexible manufacturing techniques. Through the use of EPROM circuits, Falco simplified the customizing of the RxNet order, according to Kachun Lee, Falco's vice president of development. "Most terminal

manufacturers have their software burned into thousands of ROMs, which can't be altered for special orders," says Lee. "By using EPROMs, we can program any kind of software to meet customer specifications. And, if we discover a bug, we can erase all of the ones we had programmed and burn them back again."

Lee says that the modular structure of the terminal's software gives Falco added flexibility in customizing. "Changing the software isn't a major job for us. We just have to change one chip," and the changes to the chip do not affect the rest of the circuitry in the terminal, he adds.

In addition, Falco uses "work centers" rather than rigid assembly lines in manufacturing. The company claims these flexible work centers also aid in the production of small orders of customized terminals, such as the one for RxNet. □

Joan Tharp is a business writer from Palo Alto, Calif.

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

**1MHz
FAST
A TO D
DATA
FOR IBM
PCs**

Don't duck the use of your IBM PC for engineering/scientific applications. Preston's family of 1MHz 15 Bit and 13 Bit A/D Conversion Systems featuring the MPC interface provide high performance data acquisition for your IBM PC, XT, AT and other IBM compatible computers.

PRESTON

Representatives in major cities throughout the world.
Preston Scientific
805 E. Cerritos Avenue, Anaheim, CA 92805
Tel. (714) 776-6400, Telex 65-5321

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

Available as boards, boxes,
systems or microsystems.

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

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

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

Virtual code and data for large
program support.

Performance range: 1-3 MIPS.

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

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

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

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

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

Support beyond the year 2000. Guaranteed.

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

1-800-556-1234
ext. 160.

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

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



CIRCLE NO. 36 ON INQUIRY CARD

OEMs... Is Your Input Strategy As Sound As Your CPU Strategy?



Computer users are demanding additional input devices from you. Key Tronic can help you meet the demand for these input devices, and minimize your development costs.

Key Tronic is integrating the most popular input devices into OEM keyboards. All processing is done in the keyboard and no additional system ports are required . . . using existing electronics saves money. Also, all input can be presented as a series

of key presses to assure compatibility with existing and future software.

Speech Recognition, Touch Pad, Mouse, Bar Code and Joy Disk are available to enhance your product with unique, value added benefits. Distinguish your product from the ordinary! Talk to your Key Tronic representative today.

A. Joy Disk — Four keys in one; rapid cursor control.

B. Touch Pad — Multi-purpose input device; programmable key pad, cursor control, drawing tablet.

C. Speech Recognition — Natural, language independent command entry. Hands free operation.

D. Mouse — Popular pointing and selecting tool.

E. Bar Code — Fast, accurate data capture.

“Feel the Key Tronic Touch”

key tronic
The Responsive Input Company

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

CIRCLE NO. 37 ON INQUIRY CARD

VERTICAL MARKET INTEGRATOR

OEM INCORPORATES SOFTWARE DUPLICATION

A word-processing manufacturer cuts labor costs 90 percent and reduces order turnaround to less than a day with a software-duplication system

Mike Knight, CPT Corp.,
and **Sandra Clifford**, IXI Laboratories Inc.

Until recently, CPT Corp., a Minneapolis OEM of word-processing and other office-automation systems, handled software releases and field upgrades to its customers manually. Customers would order software from any combination of 15 options. Field salesmen then installed the software on the customers' equipment, which normally took about 30 minutes per item.

But this method became burdensome when CPT's installed base grew to 60,000 systems, each of which received three or more updates per year. Because there were more than 500 salesmen worldwide installing and updating software, the chances for error were great.

Initially, CPT tried to solve the problem by bringing the work in-house. Efficiency increased, but software sales were rising. CPT projected it would soon be selling 30,000 floppy disks per month. Even a software-duplication expert could configure no more than seven disks per hour. So, at the projected volume, CPT would require more than 4,000 additional man-hours or 27 additional staff members.

CPT turns to 'project circle'

To solve the problem, CPT formed a "project circle" comprised of members of the affected departments—manufacturing, software engineering, order entry, marketing and accounting—along with a corporate facilitator. The project circle's goal was to develop a flexible software-distribution system that would cut manufacturing costs, cut turnaround time to less than 24 hours and develop software-protection schemes that would eliminate software piracy.

The project circle was required to address the



The IXI model FDFS format/copy system includes a base station (left), a CRT terminal and as many as 30 autoloaders (right rear).

needs of the company's various departments. For example, the manufacturing department wanted to computerize order processing. For its part, the order-entry department wanted a menu-driven entry system so orders could be taken easily by phone. Previously, operators had to enter 15-digit numbers for each order. Marketing department personnel wanted a system that would facilitate price changes and allow them to offer specially priced option packages. They also wanted the system to record purchases so that personnel could analyze orders demographically and set sales quotas. In addition, the billing and accounting department wanted the system to eliminate the necessity for customers to return software for credit.

Circle selects software duplication

After testing various automatic duplication systems for data integrity and other specifications, CPT chose the FDFS format/copy system from IXI Laboratories Inc., Minneapolis. The FDFS duplicates CPT's master disk, which con-

Even a software-duplication expert could configure no more than seven disks per hour.

tains all software options. It consists of a CRT terminal and a base station that controls as many as 30 autoloading duplicators simultaneously.

The base station includes a manual module for loading CPT's original software programs into the system. It stores these master programs on a hard disk and sends them to the autoloading devices as needed. With the base station, users can analyze and copy formats and devise, implement and duplicate copy-protection schemes.

The FDFS also provides menu-adjustable quality parameters. In addition, the duplicated floppy disks can operate in almost any end-user drive. The autoloading devices can handle 3½-, 5¼- or 8-inch disks with track densities of 48 or 96 tracks per inch. Each autoloading device can handle 85 to 135 floppy disks per hour, and at full capacity of 30 autoloading devices the system can duplicate 4,050 floppy disks per hour. Input hoppers for the autoloading devices are available in 100- and 250-disk capacities.

System links departments

In addition to performing copy protection, the IXI duplicator also had to link to the corporate computer, a Sperry Corp. 1100/80 mainframe system, which contains all order information.

The first step in this procedure is order entry. Using a Sperry terminal system, an operator

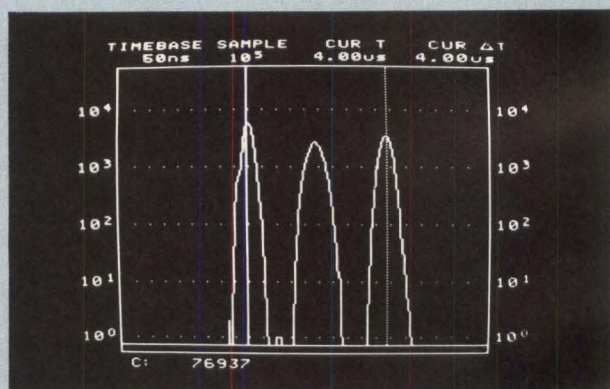
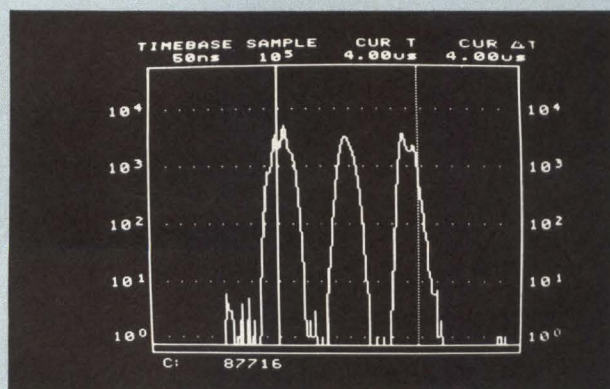
first determines whether a customer is new and, if so, creates a file for that customer. Then, the operator enters the customer's order into the 1100/80. The 1100/80 also sends this information to a remote printer, which prints shipping schedules. After the order is entered, the 1100/80 places the order in a queue and lists all options, both installed and on order.

Meanwhile, other personnel load blank floppy disks into the IXI autoloading devices. From these, the IXI FDFS mass-produces formatted floppy disks that contain all options. The system can duplicate up to 30 disks simultaneously. Once the blank disks are loaded into the hopper, this process can occur without operator intervention.

The next step in the process is customizing, which begins when the 1100/80 computer transmits the orders entered via phone line to a bank of networked Phoenix JR word-processing systems, using a CPT SRS45 mass-storage system. Upon receipt of the orders, the SRS45 network dials back to the mainframe for the next block of orders. As the mainframe sends this data, it also sends the shipping and production schedule to the shipping department, and a printer produces an order report.

After receiving a block of orders, a controller for the SRS45 network looks for the first open word-processing console in the network and

IXI equipment passes data-integrity test



In selecting software-duplication equipment, CPT Corp., Minneapolis, ranked data integrity as an important criterion. The company used a time-interval analyzer to test this criterion on IXI Laboratories Inc.'s FDFS format/copy system (results shown, left) and another manufacturer's equipment (right). The analyzer measures the two parameters that most affect data integrity: bit shift and bit jitter. It also tests motor-speed variations and read/write circuitry.

CPT took measurements at the innermost (worst-

case) track of a 3½-inch floppy disk onto which a worst-case pattern was recorded. The numbers after the letter "C" in the lower left corner of both charts indicate the number of bits sampled. The curves represent the number of times within three data windows that data occurred. Variance from the center measures bit jitter, and left or right displacement of the curves represents bit shift. Optimum recording results in a curve that is narrow, symmetrical and centered as on the IXI equipment.



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

RUGGED VME PACKAGING

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

THE 32-BIT PATH TO 68020

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

THE FIRST INDUSTRIAL STRENGTH SUPERMICRO

ISO/OSI/MAP STANDARD NETWORKING

Our 7-layer ISO-standard UniverseNet™ ties Universe systems into multi-vendor networks including Ethernet (802.3) and the General Motors MAP network (802.4),

making the 2400 an ideal Computer-Integrated Manufacturing (CIM) platform.

UNIX SYSTEM V AND REAL TIME

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

UNDER \$6,000, QUANTITY 100

That includes 12-slot VME chassis, 512KB 32-bit RAM, 4 serial ports, 68000-based SCSI/SASI channel controller, 20MB Winchester, and 320KB floppy, in tower, rack, wall, or table mount models. For details, contact Charles River Data Systems, 983 Concord St., Framingham, MA 01701, (617) 626-1000, Telex 681-7373 CRDS (W).

CHARLES RIVER DATA SYSTEMS

UniverseNet is a trademark of Charles River Data Systems. Ethernet is a trademark of Xerox. UNIX is a trademark of AT&T.

CIRCLE NO. 38 ON INQUIRY CARD

Introducing a start-up systems company that wasn't born yesterday.

We're Hamilton Standard Digital Systems, Inc. And although we may be a new name to you, we're not new to the systems business. In fact, Hamilton Standard has been a major supplier of systems products for nearly thirty years.

And now, we've taken over the Mostek Systems Technology you've come to trust from our sister UTC company. And in the process, created a start-up systems company with a head start in the business.

For example, we're the world's largest supplier of 8-bit, Z80®-based, CP/M®-compatible STD BUS boards. Like our newest intelligent STD BUS family including the 68010-based processor card, and our user-configurable intelligent I/O VMEbus products, we offer a range of more than 30 other STD and VMEbus boards that help you build flexible, high-performance systems.

We're also a major supplier of add-in products for DEC®, Data General, Perkin-Elmer and MultiBus systems. And a pioneer of surface mount technologies, which allow a reduction of 40-60% in board sizes. We offer full-service CAD and automated manufacturing facilities. And a custom-build-to-print service to produce your own design, or vary one of ours.

So whatever your systems needs, start up a conversation with your nearest Hamilton Standard Digital Systems representative. In the Northeast, call 203/531-1146 or 609/586-9200. In Central areas, 214/466-7921 or 312/577-9870. In the West, 714/205-0455 or 408/287-5080. Or write 1419 Dunn Drive, Carrollton, Texas 75011, 214/446-2664.



sends it the next work order. Then, operators load the duplicated floppy disks into word-processing consoles for customizing. The consoles delete from the floppy disks any unselected options, add loading instructions and record disk-label information.

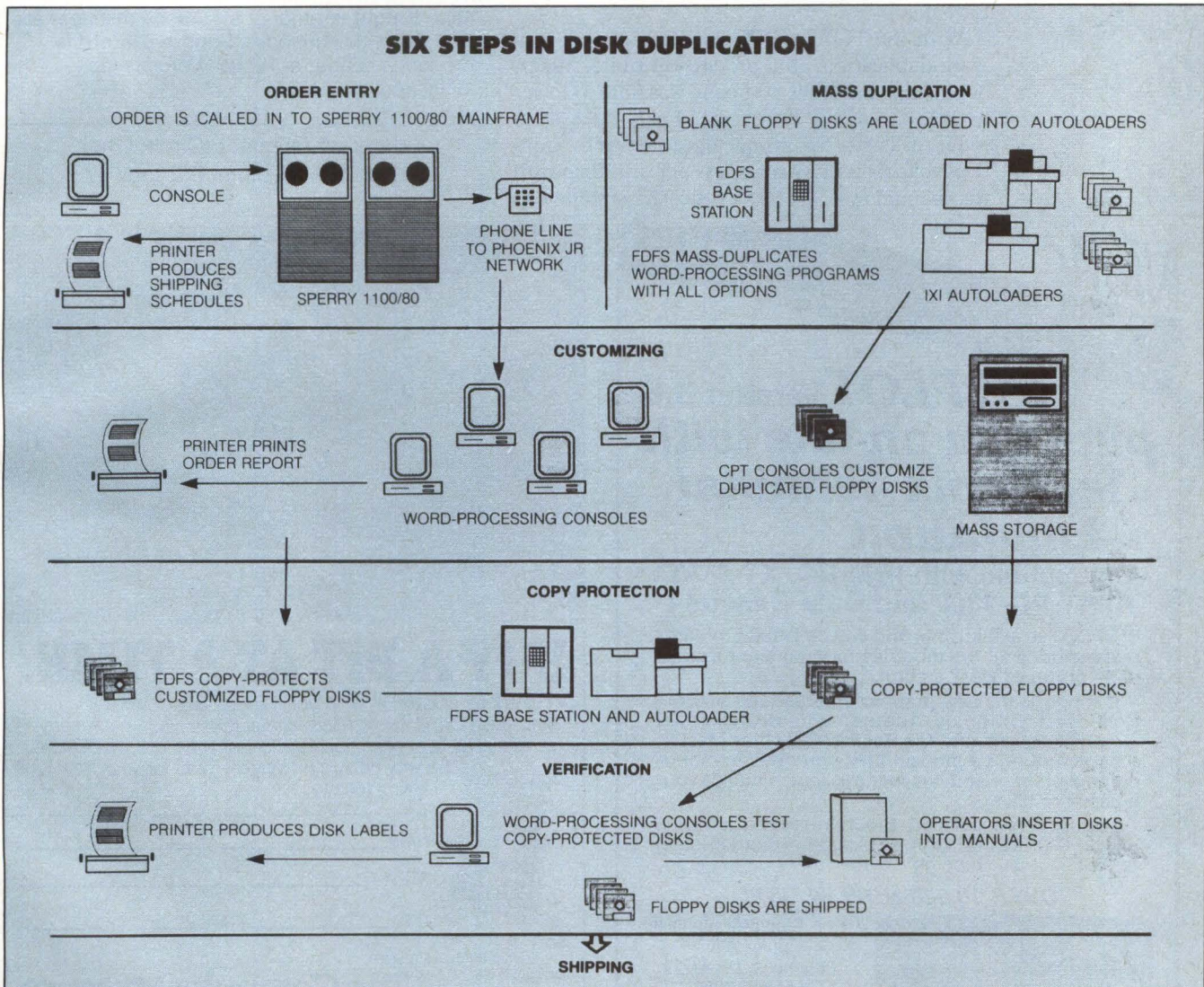
Operators then load the customized disks back into the IXI FDFS base station, which installs copy protection. CPT personnel then verify the disks by running them on a word-processing console, ensuring that the disk can be loaded into the system, that it will operate and that it is copy-protected. A printer then produces labels for the floppy disks.

If the floppy disks pass the test, the label shows part, shipper, license and serial numbers. If the disk fails the disk test, the label indicates

the identifying numbers plus instructions to reorder. Currently, the CPT system rejects only 1 percent of the disks compared with 5 percent on the manual system. The last step in the process is for workers to insert the disk into a manual and send it to the distribution department for shipment.

CPT plans eventually to port all the SRS45's software to the IXI duplicators. This would eliminate some steps in the process because the IXI duplicators have network capabilities and can directly communicate with the mainframe computer. However, the CPT word-processing system would still handle labeling, although IXI's in-line labeler is now an available option.

The FDFS software-protection scheme is unique to CPT's application. To protect a disk,



CPT's software-duplication process has six basic steps: order entry, mass duplication, customization, copy protection, verification and shipping.

With the FDFS, users can place blocks of information, which serve as locks, almost anywhere on a floppy disk.

operators use the edit function of the IXI format/copy system with a proprietary disk drive controller. With the FDFS, users can place blocks of information, which serve as locks, almost anywhere on a floppy disk. These locks prevent users from duplicating files from the floppy disk.

For example, users could lock their software by altering an identification mark. To run the software, the system would have to locate the lock (the altered ID mark). A non-IXI controller would generate an accurate ID mark but would not be able to locate the inaccurate one. As a result, a second user could not open the first user's file, and the software would be useless.

In devising a protection scheme, IXI combines locks and disk locations to provide a virtually infinite number of protection schemes, which users can change weekly or monthly using the format/copy system.

With the FDFS, CPT met its goals for software duplication. In a production run of 10,000 duplicated disks, the company was able to lower its labor costs by 90 percent. First, the system reduced costs by producing formatted, non-copyable disks at 49 cents less per disk than with the manual system. Use of the IXI system also

reduced costs by decreasing labor from 80,000 to 8,000 man-minutes.

In addition, CPT reduced errors by 75 percent and shortened turnaround time to less than 24 hours for most orders. Formerly, the company could turn around only 5 percent of its orders within 24 hours.

What's more, the new order-entry system provides a bill-of-materials program, which allows marketing department personnel to establish prices, promotional packaging and specials. When specials are available, the system automatically changes the order-entry screen. This system also eliminates the need for customers to return disks to CPT to order options and provides for end-user licensing without the need for customers to mail in cards. □

Mike Knight is product assurance manager at CPT Corp., Minneapolis. **Sandra Clifford** is product manager at IXI Laboratories Inc., Minneapolis.

Interest Quotient (Circle One)
High 471 Medium 472 Low 473

NEW EXPANDED
PC-PLOT Version 3.6
puts you on-line with
Tektronix Terminal
Emulation

Compatible with IBM-PC, XT & AT
AT&T PC-6300 and Data General I

PC-PLOT is a Tektronix and DEC VT-100 Emulator that includes all the modules to implement a complete graphics work station.

It supports the new graphics boards such as IBM's Enhanced Graphics Adapter and Professional Graphics Board, and the Tecmar Graphics Master. Plus it supports a mouse! Lets you draw in monochrome or color and has features that minimize your time-share billings.

Request free detailed brochure today, or send check, MO, MC or VISA # (include expiration date) for \$95 plus \$3 shipping.

OVER 10,000 NOW IN USE!




2151 E. Dublin-Granville Rd.
Suite 205
Columbus, OH 43229
614/882-4786

Call 1-800-338-0333 In Ohio: 1-800-242-0333
(Give operator ID number: 766-8501)



BUY A BIT AT A TIME.

You'll be amazed at what you'll find in the Computer Museum Store Catalog: micro-circuit jewelry, tote bags, core memory scarfs, books, chocolate "chips" and much, much more. So why delay a bit longer? Send for your free catalog today.

E  NAME _____
STREET _____
CITY _____ STATE _____ ZIP _____

MAIL TO:
The Computer Museum Store
Museum Wharf
300 Congress Street
Boston, MA 02210
(617) 426-2800

The Computer Museum
B O S T O N

CIRCLE NO. 41 ON INQUIRY CARD

FIRST, A QUICK MESSAGE FROM NEC.



19,200 bps.

AND NOW FOR THE REST OF THE STORY.



NEC proudly introduces the most sophisticated communications products available. Starting with the revolutionary new DSP 19200 with O-QAM—Orthogonally multiplexed Quadrature Amplitude Modulation. This NEC innovation provides data transmission at an actual speed of 19,200 bps, over 4-wire, type 3002, D-1 conditioned lines. Because data compression is not used, the DSP 19200 is insensitive to protocol. In conjunction with advanced Trellis-encoding forward error correction

and carrier jitter cancellation, it offers users the highest data rates and throughput available today.

The DSP 19200 features an 8-channel TDM multiplexer. For flexibility, it provides a variety of data rate combinations, with individual speeds of from 2400 to 19,200 bps per channel. Additionally, a pair of data rate fallback systems selectively compensate for both line noise and bandwidth limitations.

With its integral soft-touch keypad, alphanumeric display and sixteen

LED indicators, the DSP 19200 lets the user

- set the strapping options for local and remote unattended modems,
- perform diagnostics and bit error rate testing with a built-in pattern generator, local/remote analog and digital loopbacks,
- monitor transmit/receive and carrier detect levels
- monitor EIA interface control signals on all eight channels.

With its superior capabilities, the DSP 19200 is a compact unit that measures just 12.6" w x 3.5" h x 15.6" d.

The new NEC DSP 19200, with revolutionary O-QAM technology and highly comprehensive features, offers unmatched performance over existing telephone circuits. It is the unequalled choice for saving both time and money on high-speed data transmission.

NETWORK CONTROL AND MANAGEMENT SYSTEM (NCMS).

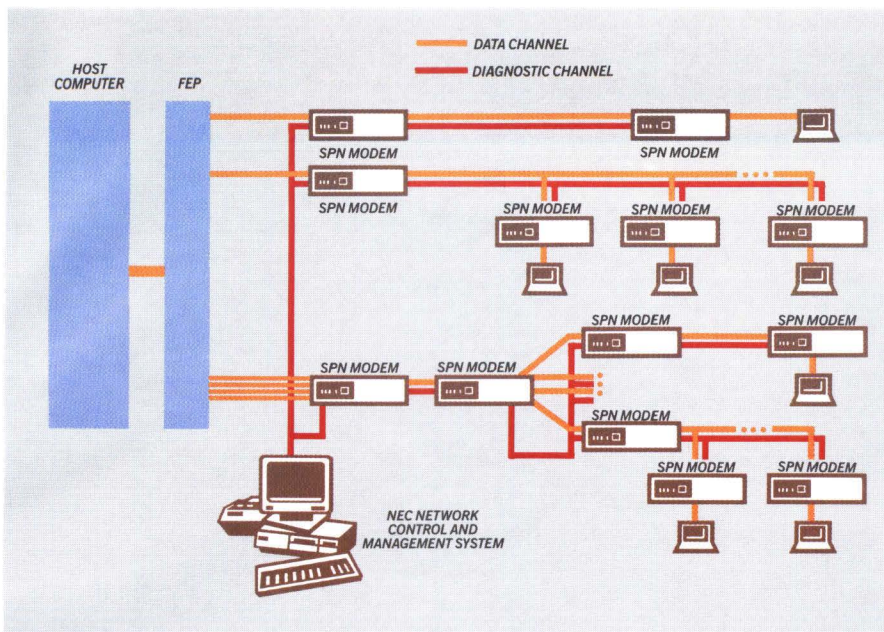


The NEC Network Control and Management System is a powerful, user-friendly troubleshooting tool for small to medium scale networks.

The menu-driven NCMS uses high-resolution color graphics, presenting easily interpreted information on all aspects of network activity. It allows quick response to network problems, simplifies day-to-day operation, and facilitates better system management.

Based on the versatile NEC APC III Computer, NCMS operates under UNIX(R), and includes mass storage, printer, and high-resolution color display.

NCMS uses NEC SPN Series intelligent modems with operating speeds of 2400 to 14,400 bps, in a variety of configurations: point-to-point, multi-point, or tandem. And it manages from one to sixteen central site lines, providing enough control for almost any small- to medium-sized business.



NCMS offers a range of diagnostic functions, starting with continuous monitoring of eight key analog parameters, and including EIA lead status.

For measurement of error rates, NCMS provides analog and digital loopback, with multipoint, end-to-

end, and self-testing. Plus automatic polling tests. NCMS even allows downline loading of modem options for easy installation and control.

Continuously monitoring the communications network, NCMS automatically alerts the system operator to problems, so they can be quickly

identified, isolated and resolved. It also provides multilevel password protection for system security. And to simplify administration, NCMS generates trouble tickets and network management reports.

The NEC Network Control and Management System. The simple solution to complex networking problems.

N500A DSU/CSU.



The NEC N500A is a highly efficient Digital Service Unit that operates at rates of 2400, 4800, 9600 and 56,000 bps. By using easily changed interface cards, it supports RS-232C and v.35. It offers both full- and half-duplex operation, and is completely DDS network compatible.

For rapid fault diagnosis, the N500A offers local and remote testing capabilities. In a multi-drop environment, the N500A allows the user to address an individual DSU/CSU for testing from the central site—an industry first.

Also built in is an LCD display for front panel monitoring of equipment status, data rate, and error performance when in the test mode. Seven LEDs indicate EIA status.

The N500A is available in both stand alone and card versions for Rack Mounting.

The New N500A DSU/CSU offers advanced technology and rapid, reliable data transmission, for the most efficient, most cost-effective system operation.

N2420/30 DIAL MODEM.



The NEC N2420/30 Modem offers full duplex operation at 300 bps, 1200 bps, or 2400 bps over two wire DDD networks. For the first time, the user can specify performance options.

Including:

- Full Hayes auto-dial compatibility.
- 12 number NEC dialing with auto log-on sequences.
- Call-back security with capability for storing 96 users' codes and passwords.
- Built-in Error Control for error free data transmission.
- Synchronous dialer.

The N2420/30 modem is available in both stand alone and rack mount versions.

The NEC N2420/30 modem offers the user the ability to pick and choose performance options to meet specific telecommunications needs now and in the future.

DSP9620 DATA MODEM.



The new NEC DSP9620 employs the latest in high-density LSI technology, and offer stable, reliable operation at speeds up to 9600 bps.

The auto-answer DSP9620 is compatible with CCITT v.32, v.28, v.24 and EIA RS-232C standards, and operates in full-duplex mode over the 2-wire public switched dial network or on unconditioned 2-wire leased lines. It maintains both high transmission speeds and data integrity by employing an array of innovations, including a powerful echo canceller, automatic adaptive equalization and Trellis encoding/Viterbi decoding.

The DSP9620 makes operation simple. It provides automatic fallback, easy setup, comprehensive monitoring, and a full range of diagnostics. It features eye pattern output. Plus an optional adapter for asynchronous operation.

The new NEC DSP9620. A combination of high speed, reliability and ease of operation never before possible.

ADVANCED TECHNOLOGY, SIMPLY APPLIED.

PRODUCT LINEUP

		Data Rate								
		300 b/s	1200 b/s	1800 b/s	2400 b/s	4800 b/s	9600 b/s	14400 b/s	19200 b/s	56K b/s
Dial-Up	Half Duplex		N202SR		N201CR	N4810	DSP9610R			
	Full Duplex	N103J N113C/R	N212AR N1220		DSP2420		DSP9620			
	Full Duplex w/Dialer		N212BR		DSP2430 N2420/30					
	• w/Hayes Dialer		N1230		N2420/30-H					
	• w/Security				N2420/30-S					
	• w/NEC+ Hayes Dialer				N2420/30-HN					
	• w/Sync Auto Dialer				N2420/30-Y					
• w/Security & Error Control				N2420/30-SE						
• w/NEC+ Hayes Dialer & Error Control				N2420/30-HNE						
Leased Line	Standard Product		N202T	N202T	N201C	DSP4800	DSP9600 DSP9600M	DSP14400M	DSP19200M	
	Rapid Polling					DSP4800R	DPS9600R			
	NCMS Network Control				SPN2400	SPN4800	SPN9600 SPN9600M	SPN14400M		
Digital Service	2400/4800/9600 bps				N500A	N500A	N500A			
	56K bps									N500A-H

Data specifications subject to change without notice.

From the simplest point-to-point connection to the fully automated, multi-drop network, NEC can satisfy all your critical needs with a full line of advanced communications equipment. From 300 bps through the revolutionary DSP 19200 bps modems, from high-speed DDS DSU/CSU units to complete NCMS Network Management Systems, each NEC product delivers solid reliability, consistently high price/performance, and uncompromising customer support.



SR0801 Multiple Mounting Rack.

Most NEC modems are conveniently rack mountable in one of three rack enclosures.

CALL 1-800-538-8166.

Call now (in California, call 1-800-672-3309). And get the whole story on our lineup of remarkably quick, extremely reliable communications products.

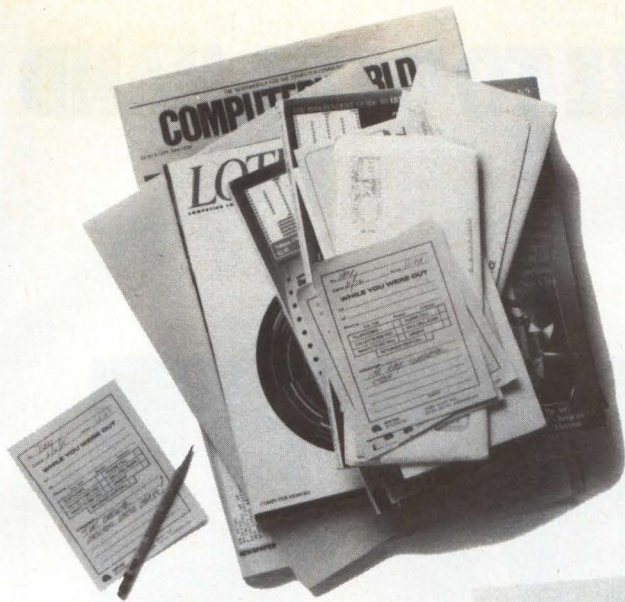
Be sure to visit the exciting NEC exhibit in booth room #207 in the Annex at TCA, September 17, 18 & 19.

NEC America, Inc., 110 Rio Robles, San Jose, CA 95134.

C&C Computers and Communications

DATA COMMUNICATIONS PRODUCTS

NEC

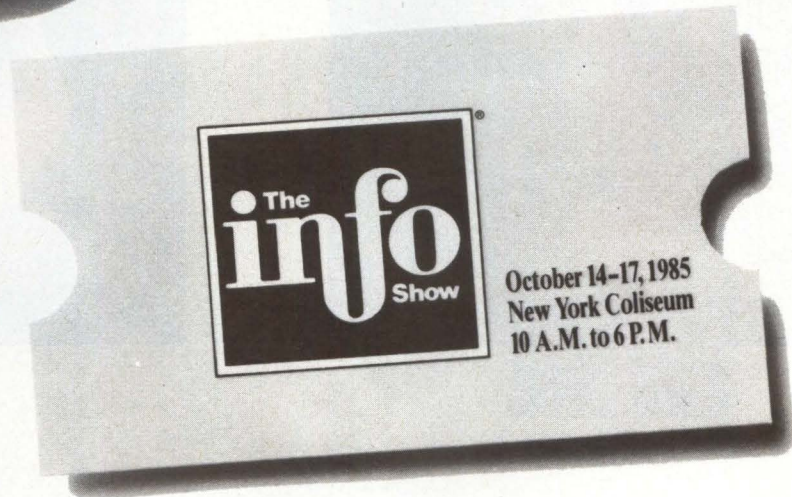


Either

Read 67 computer magazines.
Talk to 115 computer salespeople.
Study 1000 pieces of computer mail.
Take a night course in computers.

Or

Come to
The INFO[®] Show.

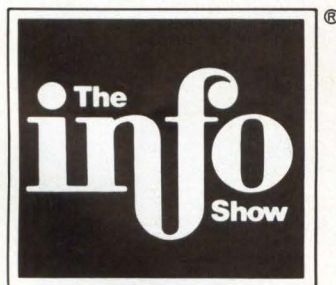


For 12 years, the industry's most successful business computer show... featuring IBM, AT&T, DEC, HP, Cullinet, Ashton-Tate, Lotus, and many other major exhibitors of computer products and services... from mainframes to pc's, hardware, software, peripherals, and data communication equipment. The renowned INFO Conference presents industry experts speaking out on timely issues. And the INFO/Software Locator

Service provided by ICP Inc., will direct you to the answers to your software needs.

If You're in a Business That Uses Computers, Don't Miss The INFO Show.

For a Free Ticket to the show and to receive a complete Conference Program, send this coupon to the address below. Or call, 1-203-964-8287. After September 27th 1985, bring the coupon to the Information Booth for on-site registration.



**The Information Management
Exposition & Conference**

**October 14-17, 1985
New York Coliseum
10 A.M. to 6 P.M.**

The INFO Show

GAG PQRSTUW

Media Services
Cahners Exposition Group
P.O. Box 3833
999 Summer Street
Stamford, CT 06905

I would like to attend. Send me a free ticket to the show and full Conference Program.

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

I would like to exhibit. Send me more information.

RS

CIRCLE NO. 42 ON INQUIRY CARD

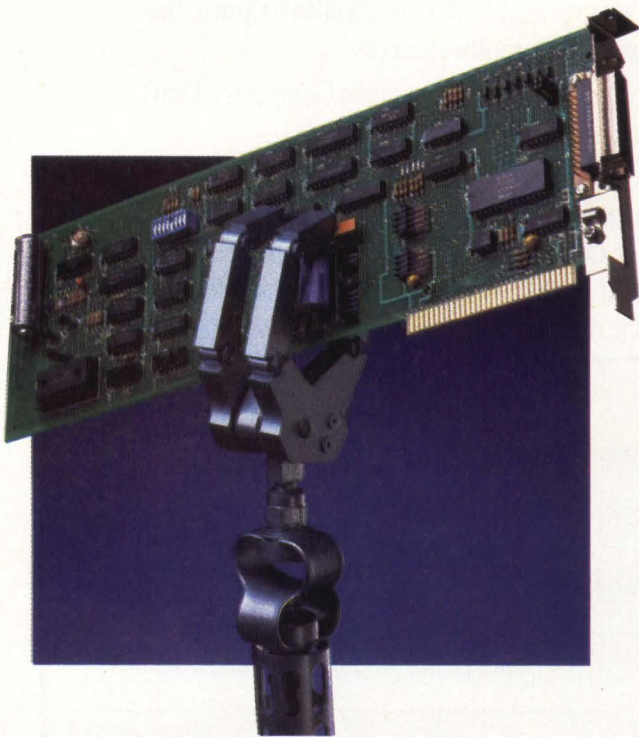
HERE'S WHAT IT'S LIKE TO GET A HAND



Major Accounts Sales Program.



Service.



High-volume manufacturing and distribution.



Lead Referral Program.

FROM A \$4 BILLION COMPANY.



System and software support.



Co-op advertising support.

Most computer companies are eager to tell you about their product line. Especially when you ask about their VAR support programs.

NCR's approach is a little different. Sure we have an outstanding product line. The IBM PC-compatible NCR PC4.[™] The IBM PC/XT-compatible NCR PC6.[™] The IBM PC/AT-compatible NCR PC8.[™] and NCR PC2PC,[™] a simple local area network.

But we're also very proud of the programs we've put together for VARs.

Take our Major Account Sales Program. You use NCR Direct Sales prices and discounts for 2000 NCR-targeted accounts. Big-name companies. Including most of the largest in your potential markets.

You get 10% of product list prices. Plus 100% of all add-on revenues. We maintain the inventory, schedule shipments, invoice the customer, and accept responsibility for receivables.

If you want NCR service for your customers, they can get it from any of our 7,000 qualified service reps in over 400 locations nationwide. We'll also pay you a commission for selling NCR service agreements to your customers. Covering both our products and those of other vendors.

If you want to provide your own service, we can help you there, too. We'll even train your service technicians tuition-free.

We have a toll-free number for any and all questions about any industry-standard hardware or software.

Our automated assembly lines are designed to turn out highly reliable products in high volume. So you're always assured of getting products configured to your specifications when you need them.

Our Electronic P.O. Service lets you use a local phone and an assigned access number to order directly from our strategically-located regional distribution centers.

We'll even drop-ship directly to your customers, if you prefer.

Our Lead Referral and Cooperative Marketing Programs reward NCR's Direct Sales Reps for referring prospects to you.

And our co-op ad program is one of the most generous in the business. With the money paid up front, when you need it.

Our products and our programs are the reasons why you should become an NCR VAR today. It's easy to do. Just call (513) 445-7478.



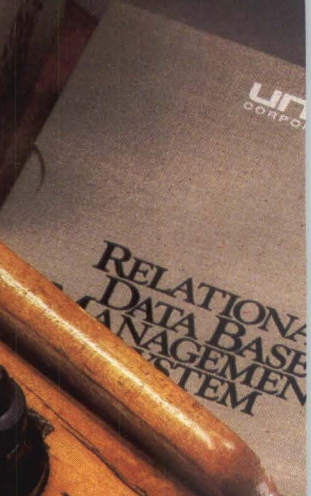
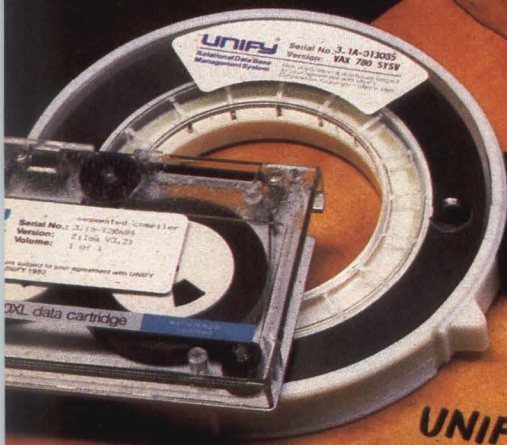
WE'RE GIVING VARs A HAND. AND VICE VERSA.

NCR
Personal Computer Division

NCR Corporation, Personal Computer Division, World Headquarters, Dayton, OH 45479. (513) 445-7478.

NCR PC4, NCR PC6, NCR PC8 and NCR PC2PC are trademarks of NCR Corporation.

CIRCLE NO. 43 ON INQUIRY CARD



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

UNIFY CORPORATION
 Relational Data Base Management System
 Serial No.: 3. 1A-013055 Tar
 Version: Intel 310 Mod Mod
 Volume: 1 of 1

UNIFY
 RELATIONAL
 DATA BASE
 MANAGEMENT
 SYSTEM
 DEMO DISKETTE

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

DEMO UNIFY: THE MOST POPULAR DBMS IN ITS CLASS.

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

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

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

formatted, reports designed and menus customized to each user.

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

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

UNIFY
THE PREFERRED DBMS.

CIRCLE NO. 44 ON INQUIRY CARD



Is this the year of the Modem?

- If you aren't already including modems in your systems, maybe you should be. Because whether you do or not, there is an increasing user demand for on-line capability. This trend will make communications a selling advantage for you now, and an absolute necessity in the not-too-distant future. Communications can now expand the potential of your systems, without creating more headaches for you.
- When looking for a communications supplier, experience and support can be as important as price. Multi-Tech Systems has been providing modems and other datacomm equipment to systems integrators since 1970. Our Technical Support people are second to none. Our products include 300, 1200 and 2400 bps intelligent modems (Hayes-compatible autodial and auto-answer, in desktop, in-board and rack-mount versions), multiplexers, breakout boxes and communications software. And our prices (and margins) are right where they should be.
- So whether your systems are for your own use, or you sell systems to others, Multi-Tech modems can make them better. On-line software updates and maintenance make life easier for you, and on-line capability provides better system versatility for your users.
- Why not let Multi-Tech help make this year of the modem your best year yet?

For more information, call us toll-free at
1-800-328-9717 (in Minnesota, call **1-612-631-3550**).

CIRCLE NO. 45 ON INQUIRY CARD

MultiTech
Systems

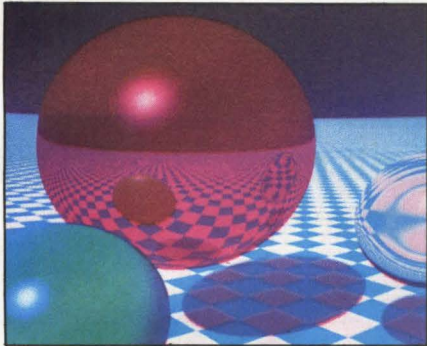
The right answer every time.

82 Second Ave. S.E., New Brighton, MN 55112 (612) 631-3550. TWX: 910-563-3610

MultiTech
Systems

MultiModem
1200/300 BPS Intelligent Modem

FEATURE HIGHLIGHTS



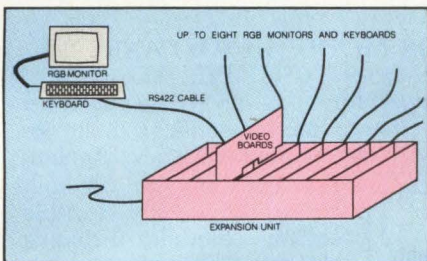
p. 95 . . Fighting for the LAN market

NETWORK SOFTWARE REJUVENATES LAN MARKET . . 81

Popular opinion to the contrary, value-added resellers in search of networking software compatible with Microsoft's MS-DOS 3.1 can still shop around for something other than IBM's PC Network. Although IBM and Microsoft seem to control the game, other players—such as Novell and 3Com—have strong cards. But the joker in the deck is UNIX.

PROTOCOLS COMPETE FOR LAN MARKET 95

A variety of acronyms are crowding the workstation LAN market. To make informed decisions on how to link diverse workstations on heterogeneous networks, you'll have to understand the significance of OSI, ISO, XNS, DARPA, ARPANET, TCP/IP, NFS and MAP.



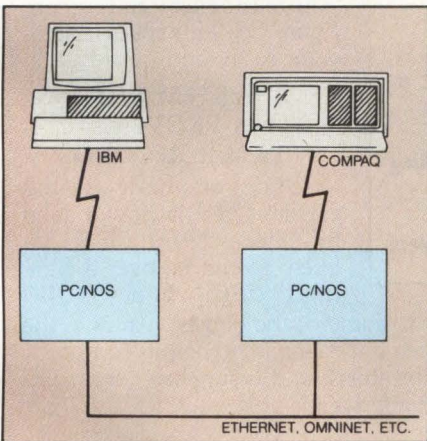
p. 117 . . Different integrating options

MICRO-TO-MAINFRAME LINKS: SOFTWARE SPEEDS ACCESS TO MAINFRAME (Cover story) 106

Many of the micro-to-mainframe links being touted today fall short of DP/MIS managers' expectations. One company claims to overcome some of the conventional limitations with a software solution that permits direct program-to-program communications between microcomputers and mainframes in SNA environments.

OPTIONS MULTIPLY FOR PC, PC-AT INTEGRATORS . . 117

There are a number of approaches to integrating a workstation based on the IBM PC and PC-AT buses. These include starting with a motherboard and building on it, working through one of the new "PC OEMs" and configuring a system based on an expansion unit.



p. 141 . . Standardizing connections

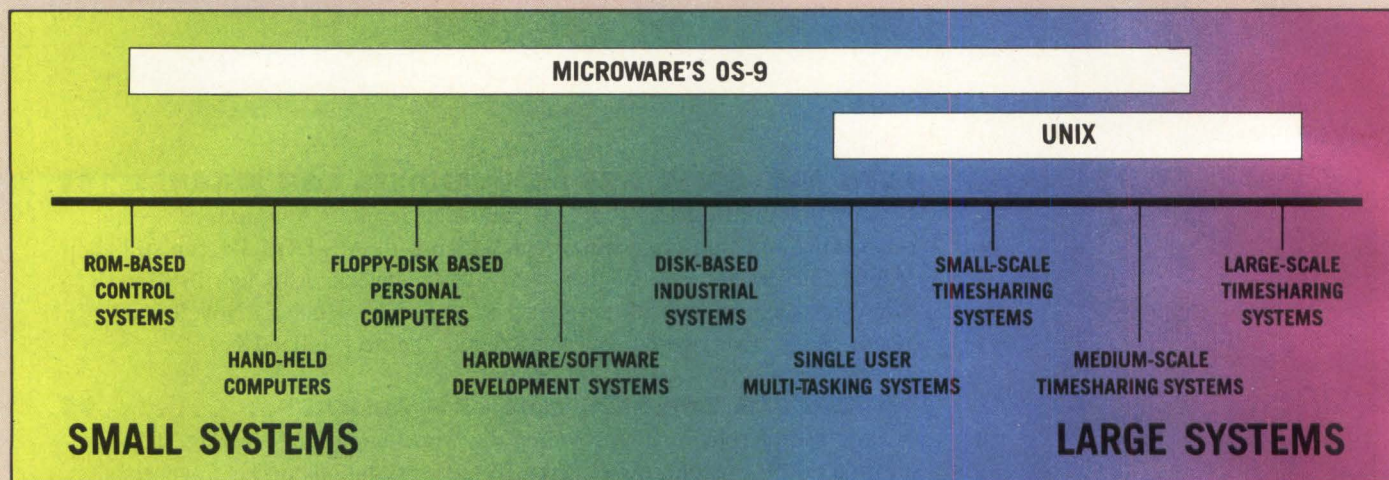
TOP 32-BIT BUSES CLAIM MULTIPROCESSING EDGE 129

The battle between backers of Multibus II and VMEbus borders on a war of claims and counterclaims. This second part of a two-part series focuses on operation modes (synchronous vs. asynchronous) and arbitration methods.

LAN SOFTWARE LINKS DIVERSE MACHINES, OS's . . . 141

PC/NOS, a network operating system, provides a standardized connection language and message-passing protocol among the diverse machines and OS's in a network.

Only Microware's OS-9 Operating System Covers the Entire 68000 Spectrum



Is complicated software and expensive hardware keeping you back from Unix? Look into OS-9, the operating system from Microware that gives 68000 systems a Unix-style environment with much less overhead and complexity.

OS-9 is versatile, inexpensive, and delivers outstanding performance on any size system. The OS-9 executive is much smaller and far more efficient than Unix because it's written in fast, compact assembly language, making it ideal for critical real-time applications. OS-9 can run on a broad range of 8 to 32 bit systems based on the 68000 or 6809 family MPUs from ROM-based industrial controllers up to large multiuser systems.

OS-9'S OUTSTANDING C COMPILER IS YOUR BRIDGE TO UNIX

Microware's C compiler technology is another OS-9 advantage. The compiler produces extremely fast, compact, and ROMable code. You can easily develop and port system or application software back and forth to standard Unix systems. Cross-compiler versions for

VAX and PDP-11 make coordinated Unix/OS-9 software development a pleasure.

SUPPORT FOR MODULAR SOFTWARE — AN OS-9 EXCLUSIVE

Comprehensive support for modular software puts OS-9 a generation ahead of other operating systems. It multiplies programmer productivity and memory efficiency. Application software can be built from individually testable software modules including standard "library" modules. The modular structure lets you customize and reconfigure OS-9 for specific hardware easily and quickly.

A SYSTEM WITH A PROVEN TRACK RECORD

Once an underground classic, OS-9 is now a solid hit. Since 1980 OS-9 has been ported to over a hundred 6809 and 68000

systems under license to some of the biggest names in the business. OS-9 has been imbedded in numerous consumer, industrial, and OEM products, and is supported by many independent software suppliers.

Key OS-9 Features At A Glance

- Compact (16K) ROMable executive written in assembly language
- User "shell" and complete utility set written in C
- C-source code level compatibility with Unix
- Full Multitasking/multiuser capabilities
- Modular design - extremely easy to adapt, modify, or expand
- Unix-type tree structured file system
- Rugged "crash-proof" file structure with record locking
- Works well with floppy disk or ROM-based systems
- Uses hardware or software memory management
- High performance C, Pascal, Basic and Cobol compilers

microware[®]
OS-9[™]

MICROWARE SYSTEMS CORPORATION
1866 NW 114th Street
Des Moines, Iowa 50322
Phone 515-224-1929
Telex 910-520-2535

Microware Japan, Ltd
41-19 Honcho 4 Chome Funabashi City
Chiba 273, Japan
Phone 0474-22-1747
Telex 298-3472

OS-9 is a trademark of Microware and Motorola. Unix is a trademark of Bell Labs.

CIRCLE NO. 46 ON INQUIRY CARD

NETWORK SOFTWARE REJUVENATES LAN MARKET

Increased competition in LANs and new networking alternatives create diverse choices for VARs

Michael Tucker, Associate Editor

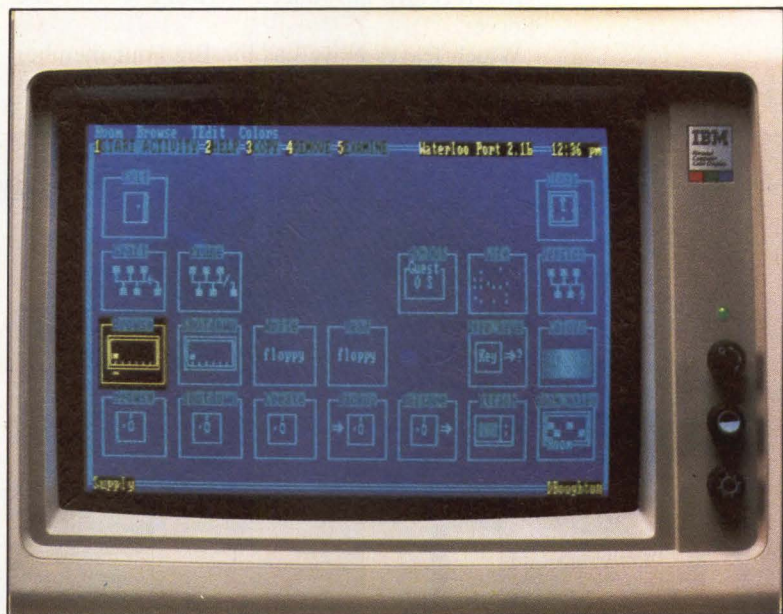
Reports of the death of the personal computer local area network market have proved greatly exaggerated. Popular opinion to the contrary, value-added resellers in search of networking software compatible with Microsoft Corp.'s MS-DOS 3.1 can still shop around for something other than IBM Corp.'s PC Network. A host of communications products—ranging from full-scale networks like Novell Inc.'s Netware to smaller, "limited area networks (LmANs)"—remains very much alive and kicking.

PC Network may even be in for competition from other products from IBM. Some buyers in the office-automation market seem to be delaying LAN investment until IBM's token-ring network comes to market.

And finally, the effects of the UNIX operating system on the personal computer LAN market remain unclear.

When IBM first announced that it would support PC Network, a variant of Microsoft's MS-NET, many observers felt that the LAN market was pretty much wrapped up. The conventional wisdom was that, given IBM's mass, and the sheer number of IBM PCs and compatibles already on the market, all LANs would eventually be PC Network variants of some kind—even, according to some analysts, those in industrial applications.

To a certain extent, that may yet happen. Market analysts already predict that the network operating system that can't link with PC Network is doomed. "The key to success for networking software is to make it compatible with PC Network," says David L. Terrie, director of



Waterloo Port from Waterloo Microsystems is a kind of LAN-equivalent of the Apple Macintosh. As a network "for the rest of us," it is friendly to the non-programmer. Waterloo Port has a visual interface in which system resources are represented as "rooms" that the user can enter or exit.

office systems research for the market research concern, the Yankee Group, Boston. With the exception of proprietary systems such as AppleTalk from Apple Computer Inc., he says, this boils the major players in full-service personal computer LAN software down to a tiny few. "PC Network, MS-Net, Novell's Netware and

PC Network has a few problems of its own—not the least of them springing from IBM.

3Com Corp.'s EtherSeries; those are the four that are going to survive," Terrie says.

Of these four, some market analysts say that if MS-NET and PC Network aren't already the same product with two names they soon will be. "The thing we're really interested in watching is how quickly MS-NET and PC Network get compatible," says Kim Myhre, director of communications industry research at International Data Corp., Framingham, Mass.

PC Networks set the pace

For 3Com and Novell, the challenge now is to gain and maintain PC Network compatibility. Terrie notes that 3Com is already making a significant effort to do exactly that. 3Com has an advantage in being in the hardware business as well. Even assuming that their EtherSeries network operating system had to be completely rewritten to match PC Network, the company might be able to profit nicely with such products as its recently introduced network server, the 3Server.

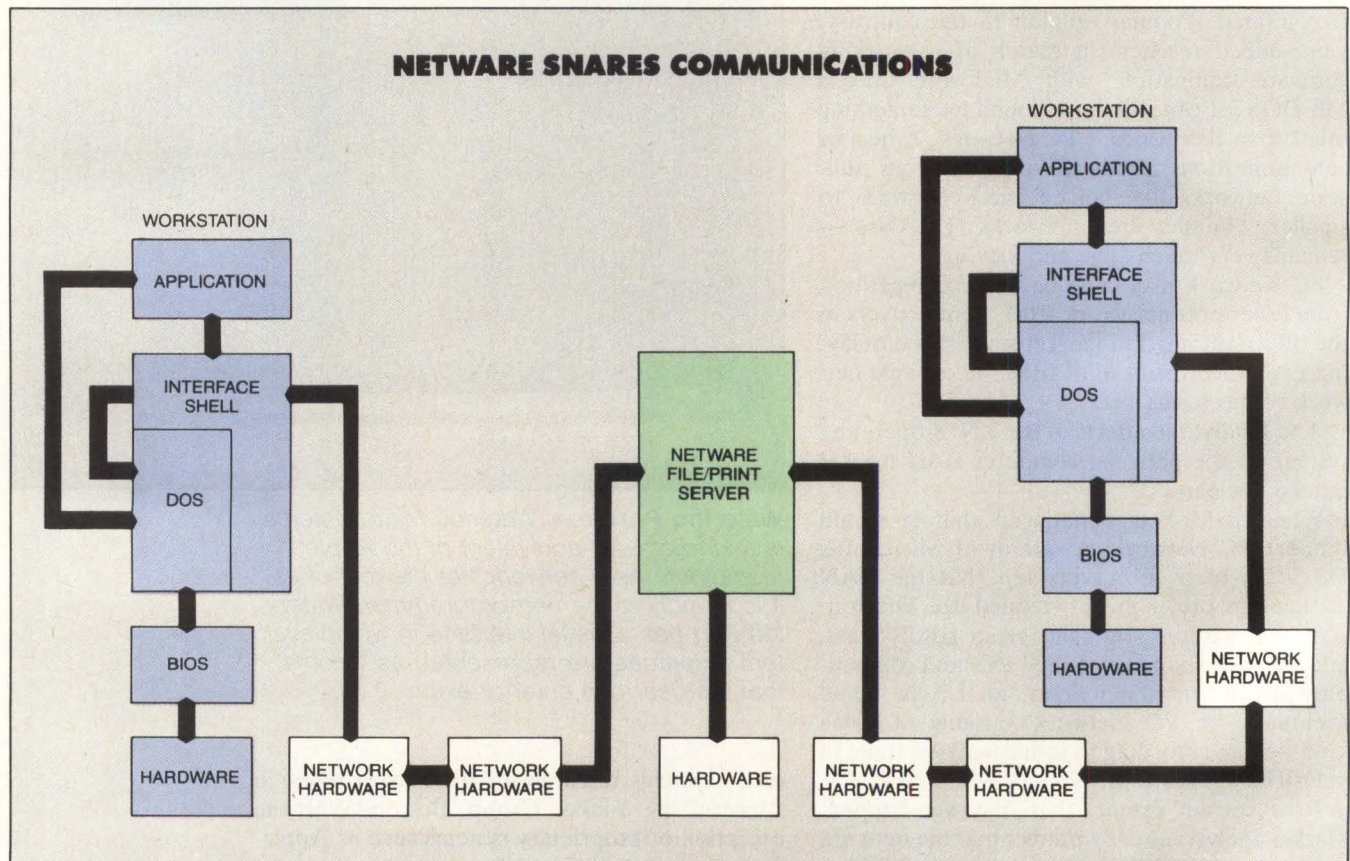
Which leaves Novell as the Big Four member most exposed. "Novell's NetWare, at least from

everything I've heard, is a far more complete operating system than PC Network," says Myhre. "But Novell's got the problem it's always had. People aren't writing for NetWare. Software developers know that IBM is going to be around forever. They can't say the same about Novell."

"It's not so much a technical question as a marketing one," says Eric Arnum, editor of the *EMS Newsletter* of the market research company International Resource Development Inc. (IRD), Stamford, Conn. "If everybody writes applications for Microsoft's network, and nobody writes Novell's, then it doesn't matter if Novell's product is better...It's a question for the marketplace. Where the software developers go, the customers will follow."

Token ring awaited

But PC Network has a few problems of its own—not the least of them springing from IBM itself. Big Blue is also bringing a token-ring LAN to market. "IBM itself actually endorses three networks," says J. Edward Snyder, general manager of the Information Networks Division of



NetWare from Novell is one of the leading contenders in the current round of network operating system wars. NetWare is a server-based system, meaning it

runs in a central location to interconnect individual workstations via their common operating system—usually MS-DOS.

Candy is dandy but it won't do diddly for your throughput

**There are Life Savers®
and there are life savers.**

When your PDP-11 or VAX system is slow as molasses because of the data transfer bottleneck between your main memory and disk, you need more than a sugar-coated answer from your computer salesman.

What you need is the BS-207, the High-Speed Storage Subsystem from Dataram which breaks that bottleneck by storing your most frequently used data and providing CPU access in microseconds, instead of milliseconds.

It means your computer's CPU can function at its full design speed and the overall performance of your computer can be greatly increased — providing as much as five times more throughput than a conventional disk-based system. Performance that can't be gained simply by acquiring a more powerful (and expensive) computer.

That performance adds up to new life for your PDP-11 or VAX system...eliminating the need to consider a new, more powerful CPU (which won't solve the I/O bottleneck anyway!).

The Need for High-Speed Storage

Whether for transaction processing, commercial data processing, data base management, CAD/CAM, artificial intelligence, simulation or process control applications, many programs spend relatively little time performing calculations on data. A system will spend most of its time transferring data back and forth between main memory and disk (often referred to as "thrashing"). As a result, the full power of the CPU is hardly used.

These throughput problems cannot be solved by acquiring a more expensive CPU which operates at higher speeds. For even if the CPU could perform calculations in zero time, your system would still bog down because most of its time is spent moving data between high-speed main memory and the much slower disk memory.

The Dataram BS-207 High-Speed Storage Subsystem changes all that by bringing to the computing world a peripheral storage device that can respond at microsecond CPU speeds.



BS-207 is a trademark of Dataram Corporation. PDP-11, Q-Bus, UNIBUS, and VAX are trademarks of Digital Equipment Corporation. Life Savers is a registered trademark of Nabisco Brands, Inc.

CIRCLE NO. 47 ON INQUIRY CARD

**A hole in your candy is one thing;
a hole in your system is something else.**

There's no longer a need to ignore the gap in your throughput that's created because disk access times are magnitudes longer than main memory cycle times. The BS-207 bridges that gap, saving you time and money in the process.

The BS-207 High-Speed Storage Subsystem can be acquired with as little as 2.0 MB and increased in similar increments to a maximum of 256 MB.

The BS-207 High-Speed Storage Subsystem from Dataram. Learn how sweet it is.

DATARAM

**Dataram Corporation, Princeton Road, Cranbury,
New Jersey 08512 (609) 799-0071, TWX: 510-685-2542**

A LIFESAVING IDEA FOR YOUR PDP-11 OR VAX

- Call me at once to tell me more about your high-speed storage subsystem.
- Send me more information.

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____

- Tell me about your family of VAX, Q-Bus, and UNIBUS plug-compatible memory products.

Both letter-quality and draft hard copy

Fastest document throughput in its class

Both friction and tractor paper feed

Industry standard serial and parallel interfaces.

Better, more versatile operator controls

TI reliability

Compatibility with third-party and proprietary software

Better, more durable easy-access font modules

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

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

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

A Great Family Name. Texas Instruments is known for providing the world with the industry standard for printers — the TI 810. TI builds the same reliability into every 800 series microprinter. Both the 855 and the data processing Model 850 are part of the expanding TI line of high-performance, low-cost microprinters.

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

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

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

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

Get the printer that makes for better information systems. For more information visit your nearest TI authorized dealer or write Texas Instruments Incorporated, P.O. Box 809063, DEPT. NO. 083MY Dallas, TX 75380-9063. Or call toll-free: 1-800-527-3500.



TEXAS INSTRUMENTS

Creating useful products and services for you.

TRW Inc., Torrance, Calif., "one meant for industrial situations, one—PC Network—for office automation, and the token-ring, which is neither for the office nor for the factory floor."

And, says IRD's Arnum, "The token ring is expected to have a lot of the capabilities of PC Network. Many buyers seem to be waiting for the token ring, which would give them both [office and factory] sets of functions in one package...IBM is by no means assured of success with its office LAN."

In addition, PC Network has come head-on against the one single problem faced by all personal computer networks—they are not via-

ble products unless they can connect with something larger than personal computers. "Personal computer networks can't survive on their own," says Myhre. "The big question for IBM is how fast they can phase PC Network environments into their mainframe and minicomputer environments—particularly, IBM System/36 environments."

Blending personal computer networks with IBM mainframe and minicomputer environments is something several companies are becoming clever at. Last January, for example, Novell announced a comarketing arrangement with Pathway Design Inc., Wellesley, Mass.

For 3Com and Novell, the challenge now is to gain and maintain PC Network compatibility.

How Novell views standards

Michael Durr, Novell Inc.

The local area network industry is still struggling over standardization. But, fortunately, a standard is being established, and the struggle today is toward the standard, not against it.

That emerging standard is Microsoft Corp.'s MS-DOS 3.1, which is, of course, MS-DOS upgraded to include primitives for network access and synchronization. Most LAN companies have said they will upgrade their LANs to remain compatible with MS-DOS 3.1.

DOS commands this following for the same reason that it dominates the personal computer industry—its attractiveness to software developers. Any LAN that did not remain DOS-compatible could not share in the benefits of software written for DOS.

The application-to-network interface, defined by MS-DOS 3.1, is the key component to LAN standardization—as well as the reason standardization is beneficial.

A standard application-to-network interface lets developers reach a larger market with less effort and gives LAN users a large variety of application software from which to choose. It also allows LAN users to migrate to new technology.

As new applications appear, most will be compatible with the standard interface, and applications can be exchanged without modifying the network. Similarly, when new network technology appears, it can be moved in under existing applications without having to change the application, recreate the data or retrain users.

Another reason for standardization is internetworking. LANs should be able to communicate—globally, nationwide and intra-company. It's not unusual for a business to have two or more types of LANs and want to connect them in a single system.

Bridges and gateways—the devices that let sepa-

rate and dissimilar LANs communicate—will therefore be key elements in the future of local area networking. Standards will not lessen their importance. Instead, by providing developers with a common software base, standards will make it easier to design and install such bridges. Different networks can connect above their hardware at some point where they share software commonality.

Novell Inc., Orem, Utah, for example, achieves interconnectivity via bridge software. All of the 18 LANs supported by the company's Netware can be internetworked. With the Netware operating system running on top, the internetwork is totally transparent. To both user and application, it looks like a single LAN.

A common misconception is that standards would make all LANs identical in physical characteristics, functionality and performance. In fact, the negative aspects of such a uniformity would far outweigh its value. Different installations have different requirements and LANs have tended to meet these requirements by specialization—usually specialization of hardware.

However, no one hardware choice can suit every environment. In cost/performance measurements, for example, broadband hardware is ideal for workstations where multichannel capability is required. In a three-workstation LAN, however, broadband performance would be overkill.

The only way to meet these different needs is for the LAN industry to offer a variety of hardware and standardize hardware-software interfacing. This would provide interlinking without sacrificing flexibility or practicality.

Michael Durr is manager of public relations for Novell Inc., Orem, Utah. He is the author of *A Practical Guide to Networking IBM PCs*.

All the players in the PC LANs game remain acutely aware of a joker in the deck—UNIX.

Under the terms of the agreement, Pathway produced "Netpath," an IBM Systems Network Architecture gateway that allows Netware-linked IBM PCs and compatibles to communicate with IBM hosts.

Available from either Novell or Pathway for \$1,995, Netpath is a communication circuit card and associated software that runs on a single IBM PC or compatible in a Netware network. With it, up to 32 users can access an IBM host (or hosts) over dial-up, leased, point-to-point or multidropped lines. They can upload or download files, use host applications and switch between the personal computer and host environments with single keystrokes.

Meanwhile, the dominance of the Big Four is

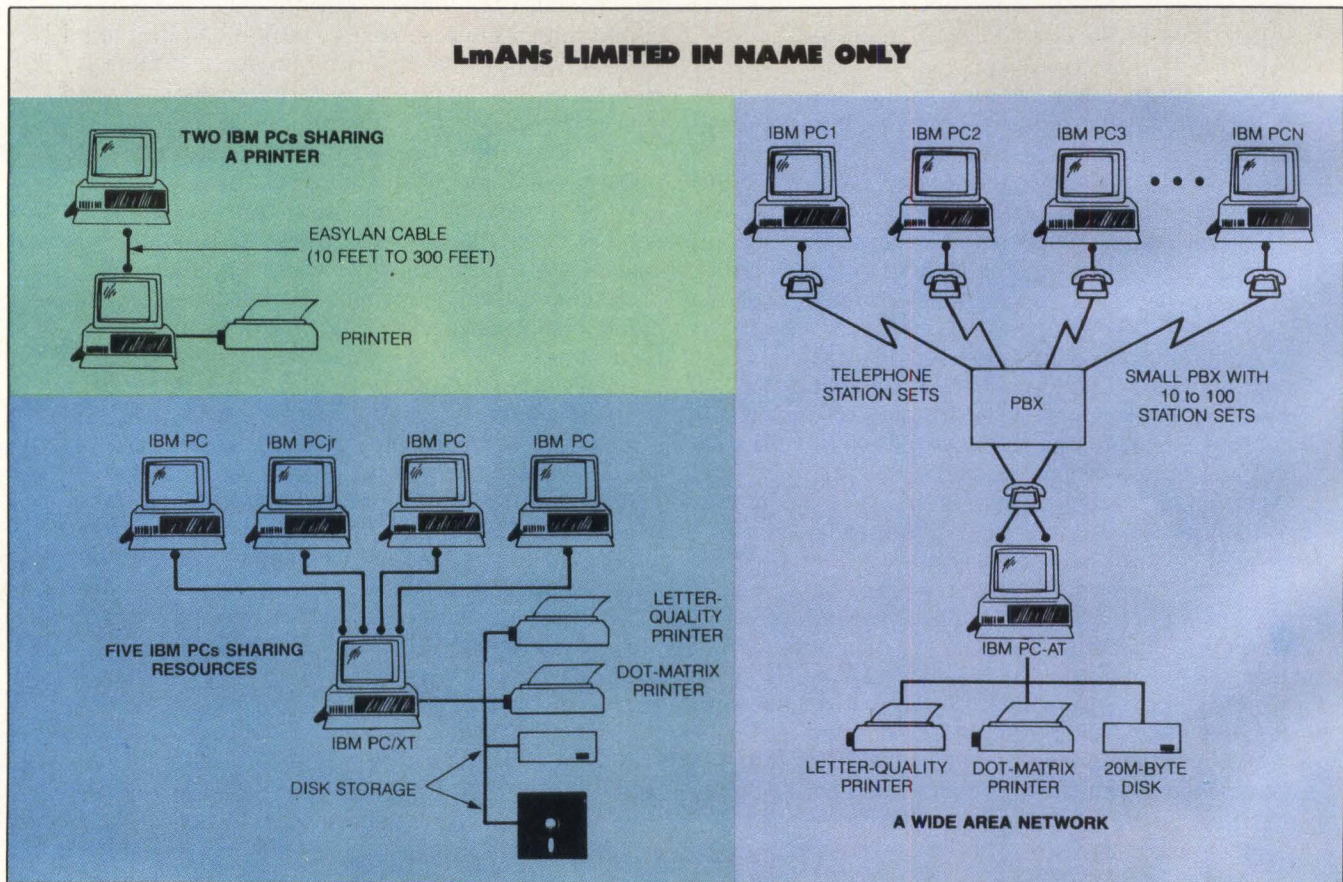
A LmAN like EasyLAN from Server Technologies can link computers via their RS232C ports. Some possible configurations of Easylink include a simple two-workstation design (left top), a cluster of personal computers sharing data storage (left bottom) and a complex wide area network of personal computers and remote workstations (right).

under attack. Office integrators are beginning to explore other communications options that lie outside the LAN technologies that have been traditional in office automation. For example, some system integrators are making use of "message-passing" network operating systems that behave like tiny packet-switching networks whose terminals happen to be IBM PCs.

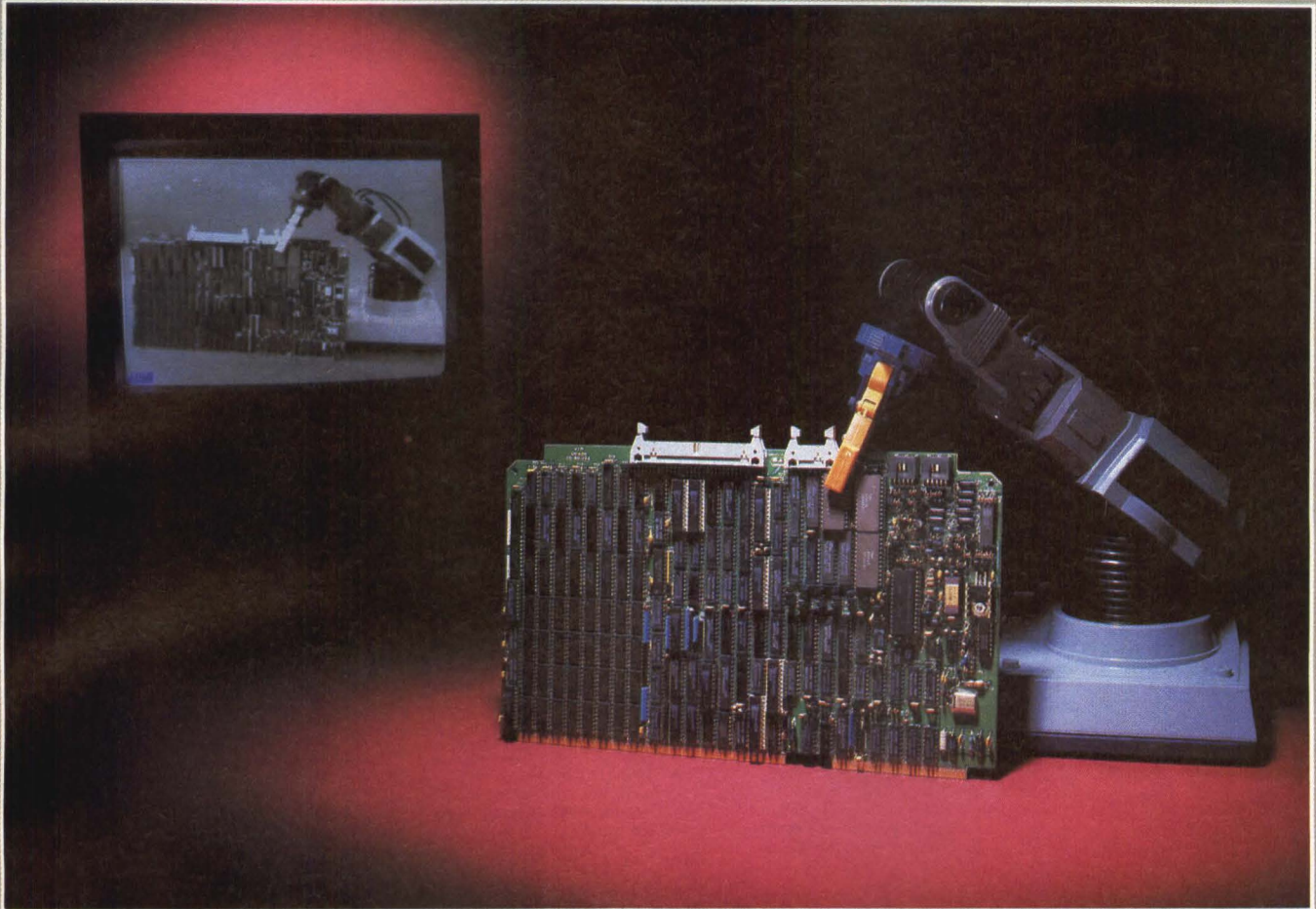
Such networks haven't shown up in personal computer LANs as a rule because they were viewed as massive overkill. Frequently, in these networks, every node functions as a server, something the average office system just doesn't need—and doesn't want—because it involves complex problems of network control. On the other hand, multiple servers do mean it's very hard to crash the network.

Examples of this particular approach include the PC/NOS network operating system from Applied Intelligence Inc., Mountain View, Calif., and Waterloo Port from Waterloo Microsystems Inc., Waterloo, Ontario.

Waterloo Port runs on Arcnet and links IBM PCs and compatibles. Waterloo Port's user interface reflects a commitment to marketing—it's designed with the non-programmer in mind. For example, a visual interface in which network



REAL-TIME IMAGE PROCESSOR — \$2,995



MIP-512 - The Single Board Multibus Machine Vision System

- 512 x 512 or 1024 x 1024 resolution
- 8 bits/pixel up to 24 bits/pixel
- 4:3 or 1:1 aspect ratio
- 16.7 million color LUT
- Hardware pan, scroll and zoom
- Dual ported video RAM for true DMA
- IEEE-796 (Multibus) compatible

Image processing technology need not cost an arm and a leg. With the Matrox MIP-512 you can get full 8 bit data acquisition, 8 bit image storage and 90nsec/pixel image processing **all on one Multibus board and for only \$2,995 in singles.**

REAL-TIME IMAGE ACQUISITION

An 8 bit flash A/D converter is used for digitizing an external video signal. External sync genlock or internal sync generation are software selectable. On-board programmable offset and gain controls and input look-up tables are provided for real-time pre-processing of raw video data.

IMAGE STORAGE AND DISPLAY

The MIP-512 contains 256K Bytes of dual ported video RAM for storing a 512 x 512 x 8 image. The new MIP-1024 contains 1M Byte of dual ported video RAM for storing four 512 x 512 x 8 images or one 1024 x 1024 image. Images can be loaded or unloaded from Multibus to video memory under DMA control in just a fraction of a second.

- 8 bit frame grabber
- 90nsec/pixel video ALU
- MIP-LIB image processing software library
- Image processing functions:
 - addition & subtraction
 - averaging
 - convolution (N x M)

The MIP-512 supports instantaneous pixel by pixel panning and scrolling of images, and zooming by a factor of x2 or x4. Up to 256 colors or shades of gray can be displayed from the 16.7 million color LUT.

REAL-TIME IMAGE PROCESSING

A 90nsec/pixel video ALU is provided for performing real-time arithmetic and logical operations on image data. The MIP-512 supports several standard image processing functions including frame addition and subtraction, exponentially weighted frame averaging, low and high pass filtering and convolution with an N x M kernel. All computations are performed at high speed by the MIP-512 without burdening the host CPU.

The new **MIP-LIB** image processing software library is available for **free** to all MIP-512 customers. MIP-LIB lets you get your application up and running quickly.

In addition to state-of-the-art graphics and imaging boards, Matrox also supplies monitors, cardcages, CPU cards, memory boards and communication controllers for complete OEM display system requirements.

MULTIBUS - TM INTEL

Call now for a complete documentation package.



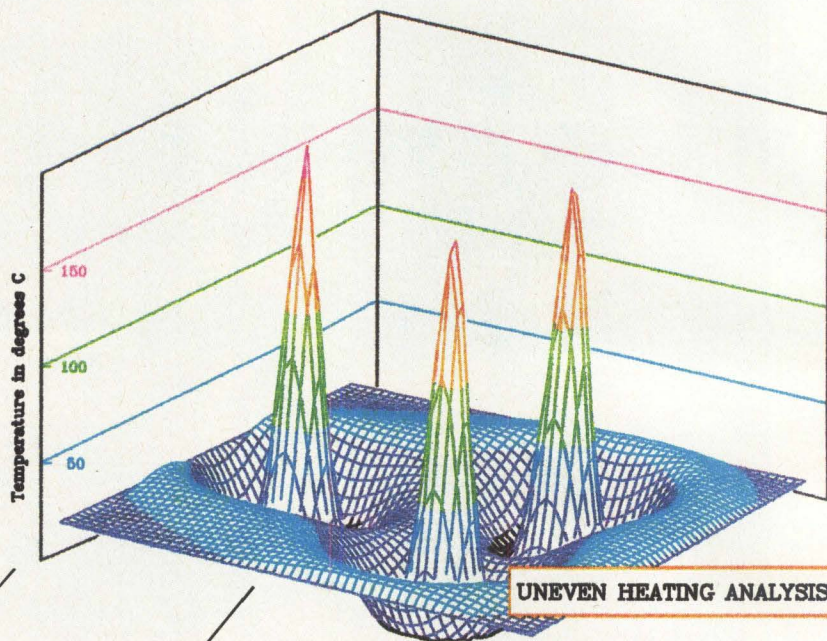
matrox
electronic systems ltd.

1055 St-Régis Blvd
Dorval, Québec
H9P 2T4
Tel.: (514) 685-2630
Telex: 05-822798

CIRCLE NO. 49 ON INQUIRY CARD

"DOTS INCREDIBLE."

You're looking at letter-quality text created by an AMT printer. The same printer that produced the CAD/CAE diagram you see on the right. **Dots incredible!** But that's not all. With the AMT, you can print letters or documentation at 45, 100 and 250 cps. Print in *italics* and different **type styles** and **sizes**. Print scientific and special symbols--even other languages 中文字. You can print on transparencies and multipart forms. And you can do it all in a **RAINBOW** of **COLOR**.



Actual size—you can't get quality like this on a plotter, but you can with AMT.

AMT is the highest resolution dot matrix color printer available—with dot addressable graphics to 480x240 dpi.

Naturally, AMT prints bar graphs and pie charts. But it also does incredible, 3-dimensional diagrams so precise you can use them for measurements.

You're looking at AMT, the first dot matrix color printer so advanced it's better than a desk top plotter.

Why?

Because our new AMT color printer is the first dot matrix to combine letter-quality text with plotter-quality graphics. You get the speed, flexibility and industrial strength reliability of a top-notch dot matrix. Without the toner, pens and nuisance of a plotter.

And as you can see, AMT actually out-performs many plotters, large or small, on high precision applications.

For more product and distribution information, write to Don Lawrence, V.P. Sales and Marketing, Advanced Matrix Technology Inc., 1157 Tourmaline Drive, Newbury Park, CA 91320. Or call (805) 499-8744.



Advanced Matrix Technology Inc.

CIRCLE NO. 50 ON INQUIRY CARD

© 1985 Advanced Matrix Technology Inc.
Graphic software by Cerritos Computer Services, Inc., Long Beach, CA.

resources are represented as "rooms" that the user can enter or exit.

Another option system integrators can exploit is the LmAN (MMS, June, Page 179). A LmAN differs from a LAN in that it links machines via RS232C ports. They're called "limited" because they're subject to the inherent limitations of the RS232C—they're relatively slow, for instance, with transmission rates of about 9,600 baud.

However, 9,600 baud is more than fast enough for many network applications. LmANs also have a wide area networking capacity, because the addition of a modem gives them the power to link up with other machines via standard phone lines. And, LmANs are inexpensive—less than \$100 a connection.

Server Technology, Sunnyvale, Calif., for example, markets a LmAN named "EasyLAN." EasyLAN is a convenient method of linking small numbers of IBM PCs—less than 10—into a serviceable network at low cost. A kit to network two IBM PCs, with up to 30 feet of cable between them, is priced at \$179.

Another RS232C-based LmAN is Ideashare from Ideashare Inc., Billerica, Mass. Ideashare can link up to four IBM PCs, PC-ATs, PC/XTs, PCjr's, compatibles or assorted combinations thereof into a star LAN in which one node acts as a server. Ideashare sells retail at \$325.

LmANs aren't for every application—putting one in a computer-aided design/computer-aided engineering network, for instance, would beg for disaster. But, they seem tailor-made for small to medium businesses. "The other day we installed



The UNIX-based, multiuser Tandy 6000 links to Tandy personal computers through ViaNet, from ViaNetix. Products like ViaNet and the Tandy 6000, which combine UNIX and MS-DOS into a single network, could be the shape of LANs to come.

one at a large insurance company," says Server Technology president, Carrell Ewing, "and the fellow there said an interesting thing, 'It does 95 percent of everything the big boys do. And that 95 percent is 100 percent of everything I need.'"

UNIX plays the joker

Meanwhile, all the players in the PC LANs game remain acutely aware of a joker in the deck—UNIX. Nobody even pretends to know the long-term impact of AT&T Information Systems' favorite operating system on the LAN market. If ATTIS is successful in making UNIX System V a desktop product—and the company's recent releases of UNIX-based personal computers amply demonstrate its intention to do exactly that—then existing personal computer networks could be endangered.

Given the vast installed base of IBM PCs,

Under the Banyan tree

System integrators have been hamstrung by the lack of standards in local area networks for years, but now they can also exploit that lack. When confronted with an office that contains a number of incompatible machines, LANs and peripherals, an office-system integrator could tie in all those dissimilar parts with intelligent gateways/servers just now coming to market.

Among the first of these is the Banyan Server from Banyan Systems Inc., Westboro, Mass. A 32-bit UNIX-based system with proprietary software, Banyan Server can link diverse microcomputers, minicomputers, mainframes and LANs into what is effectively a distributed multiuser system.

In the process, says Banyan president David Mahoney, the Banyan Server "provides what we call 'network services.' Specifically, electronic mail, file-

and record-locking, file- and disk-sharing, resource management and centralized system administration."

Depending on the configuration, the Banyan costs between \$9,000 and \$40,000. So far, it's been sold primarily into offices where 10 to 20 individuals are using IBM Corp. PCs as executive workstations. Mahoney notes though that the product is in no way limited to that particular machine. In fact, he says, the company is now looking into the possibility of including the Apple Computer Corp. Macintosh into the Banyan network.

"It's a nice little box for people who have to deal with a mess of different LANs and operating systems," says Kim Myrhe, director of communications industry research for International Data Corp., Framingham, Mass. "We expect it to be the first of a series of very intelligent server/gateways on the market."

If mixed UNIX-DOS networks become commonplace, LmANs could have significant advantages over orthodox personal computer LANs.

that's probably not going to happen soon. But, even so, UNIX is bound to play an increasingly important role in the personal computer LAN industry—particularly if it becomes the operating system of choice for file- and network-serving machines.

One sign of things to come may be ViaNet from ViaNetix Inc., Boulder, Colo. A distributed, message-passing network operating system running on such media as Ethernet, ViaNet can link PC-DOS or MS-DOS systems with UNIX machines. By constantly translating MS-DOS system calls to UNIX system calls, ViaNet makes it easy to link IBM PC workstations in a network centered on a UNIX-based minicomputer or multiuser microcomputer. Radio Shack, for example, is remarketing ViaNet to link personal computers to its new XENIX-based multiuser microcomputer, the Tandy 6000.

Meanwhile, even LmANs are getting into the UNIX-to-MS-DOS networking business. TouchStone Software Corp., Seal Beach, Calif., for example, markets a collection of terminal-emulation, file-transfer and communications software under the general name "The Connectables Net-

work." The package allows a system developer to build up what is effectively a LmAN—but one which freely mixes IBM PCs, UNIX-based machines and even Apple Macintoshes.

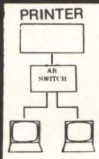
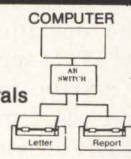
Products like TouchStone's can manage cross-vendor linking partly because they can make use of the standardized RS232C interface. Indeed, if mixed UNIX-DOS networks become commonplace, LmANs could have significant advantages over orthodox personal computer LANs.

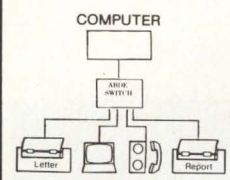
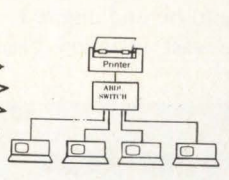
But, no matter what the effect of UNIX, the trend in the personal computer market seems to be increased competition among vendors—something that can't help but provide system integrators with a host of new options and lower prices. Notes IDC's Myhre, "The feeling at IDC is that personal computer LANs will have to be sold with some value-added technology...because they are gong to be so cheap that nobody's going to be able to survive selling them by themselves." □


Interest Quotient (Circle One)
High 474 Medium 475 Low 476

DATA SWITCHES

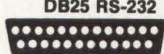
Efficiently shares costly computer peripherals
Eliminate:
Redundant Hardware
Wasted time plugging/unplugging cables

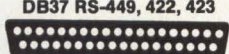






DB25 RS-232



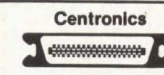
DB37 RS-449, 422, 423




DB50




Centronics




BNC



TNC & BNC (Wang)



Twinaxial




	ABC	ABCDE
DB25 (RS232)	\$ 79.00	\$109.00
CENTRONICS	\$125.00	\$175.00
BNC	\$ 49.00	\$ 99.00
TWINAXIAL	\$119.00	\$209.00
WANG	\$111.00	\$149.00
DB37 (RS449)	\$139.00	\$189.00
DB50	\$149.00	\$219.00

Compare Our Super Low Prices

CALL

800-243-5760
2 0 3 - 3 5 6 - 9 3 1 5



DATA CABLE
652 GLENBROOK ROAD
STAMFORD, CT 06906
TWX 510 10 10 669

PACKETAPE

1/4"
CARTRIDGE



~~1/2"~~
~~MAG TAPE~~

VERSUS

50% MORE STORAGE FOR 50% LESS COST!

FULLY EMULATES 1/2" TAPE

UTILIZES EXISTING 1/2" HARDWARE & SOFTWARE

SUPERIOR DATA RELIABILITY

Unique "On-the-fly" error detection and correction

1-800-835-3298

TELEBYTE
TECHNOLOGY INC.
270 E. Pulaski Road
Greenlawn, NY 11740
A Public Company

(516)423-3232

TWX 510-226-0449

Introducing seven different
ASCII displays...



The new IBM 3161 ASCII Display Station is really seven different ASCII displays in one.

In addition to its own function-rich native mode, the new IBM 3161 can emulate the IBM 3101 Model 88L, ADDS Viewpoint, Hazeltine 1500, Lear Siegler ADM-3A and ADM-5 and TeleVideo 910.*

Besides fitting nicely into existing systems, the IBM 3161 also offers impressive improvements in ergonomics.

Improved Ergonomics For Improved Productivity

Take the 102-key ASCII-style keyboard, for example. Its low profile, gentle contour and typewriter touch make for faster keying with fewer errors. The keyboard has programmable function and editing keys so it can be custom-tailored to meet your application needs.

Then, for comfortable viewing, there's the tilt and swivel of the 12" display. And the sharp, clear 8 x 16 character matrix for easy reading. Plus cursor, character and field attributes (blink, reverse video, underscore, dual intensity, etc.). And scrolling. And partitioning. And lots more.

The IBM 3163 with Plug-in Cartridge

And, as if that weren't enough, we're also announcing



The sharp 8 x 16 character matrix helps make for easier reading and fewer operator errors.

a second new ASCII display station with even higher function—the IBM 3163.

Outwardly, these two new displays look alike. But the 3163, in addition to its built-in emulation of the IBM 3101 Model 88L, also offers the ability to emulate the DEC VT 52 and VT 100* by means of a unique plug-in cartridge.

And while you'll like the power and flexibility of the 3161, for your high-function applications the 3163 goes even further. For example, a 7,680-character buffer and up to three windows enable you to view and modify portions of different host data bases. The 3163 lets you redefine and even recap the keys.

On both displays the setup is menu-guided and written in plain English, so it can be done easily and quickly. The point is, both are designed to improve your user productivity.

Very Attractive Prices

The price per terminal is \$695 for the 3161 and \$1,095 for the 3163. Quantity discounts are available. What's more,

IBM maintenance offerings start as low as \$35 per year per terminal for customer carry-in repair.

Now there's a new family of ASCII displays with the quality, service and support IBM is famous for. Both displays are available through IBM Authorized Distributors and IBM marketing representatives.

FEATURES	3161	3163
Lines x Characters	25 x 80	25 x 80
Double-sized chars	No	Yes
Line drawing chars	24	24
Vertical scroll	Jump	Jump/Smooth
Definable function keys	24	24
Windowing	No	Yes
Partitioning	Horiz	Vert/Horiz

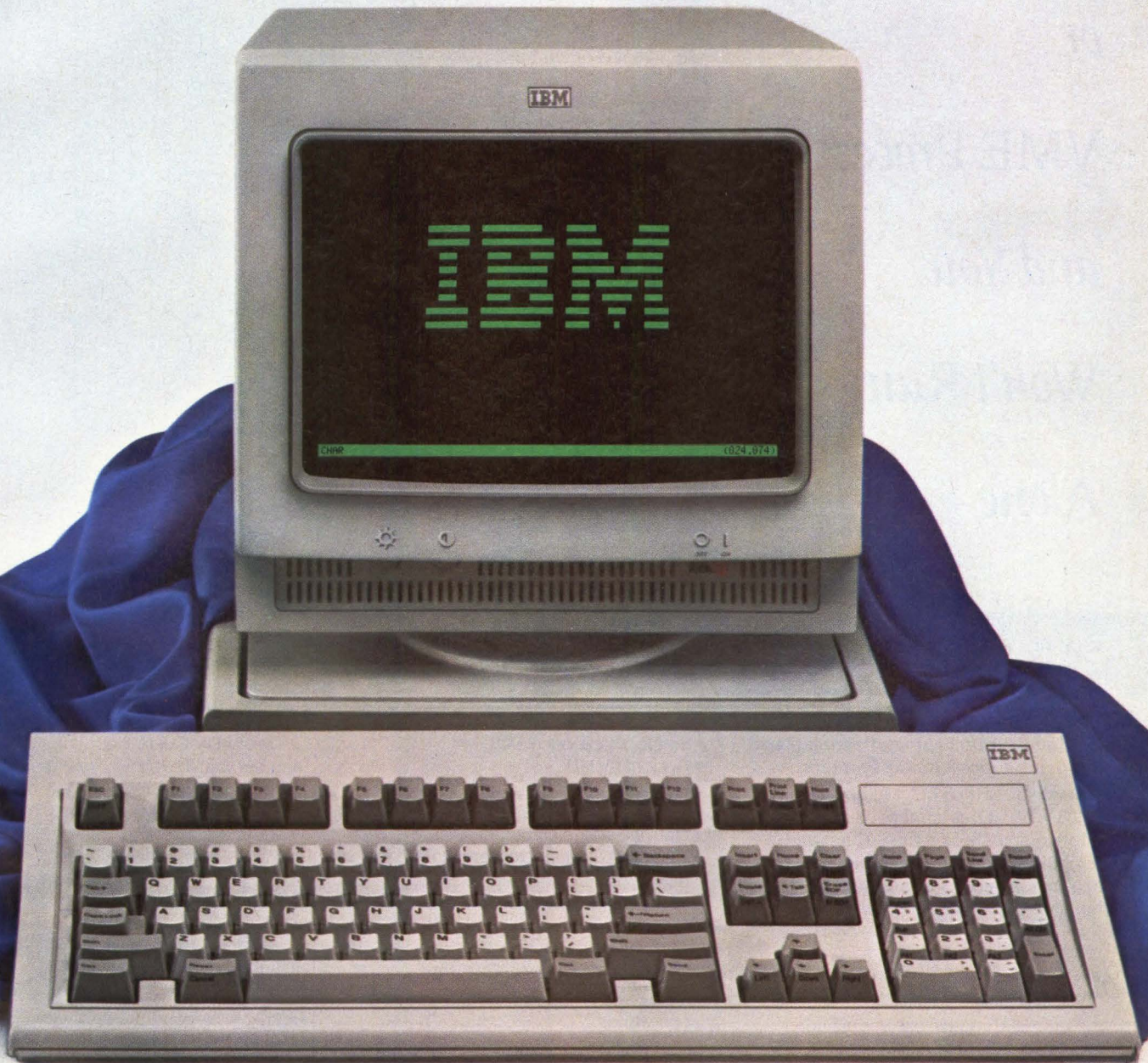
Call 1 800 IBM-2468, Ext. LE/96 for the name of an Authorized Distributor near you.



*ADDS Viewpoint is a trademark of Applied Digital Data Systems, Inc.; Hazeltine 1500 is a trademark of Hazeltine Corp.; Lear Siegler ADM-3A/ADM-5 are trademarks of Lear Siegler, Inc.; TeleVideo 910 is a trademark of TeleVideo Systems, Inc.; DEC VT 52/VT 100 are trademarks of Digital Equipment Corporation.



in one.



The IBM 3161 ASCII Display Station

CIRCLE NO. 53 ON INQUIRY CARD

*Run With
Heurikon
Multibus
or
VME Processors
and You
Won't Run
Alone*



Let Heurikon Technology, Reliability and Support Be Your Running Partners.

Heurikon's HK68/M™, Multibus™ and HK68/V™ VMEbus families of single board microcomputers offer the features and flexibility necessary to meet your application needs. Regardless of the bus architecture required, Heurikon provides you with technology and reliability developed through 13 years of experience in microcomputer design and manufacturing.

Some key product features include:

- No wait state 10 or 12.5 MHz 68010 CPU
- Up to 1 MByte of on-card dual ported DRAM
- 128K of EPROM

- Single cycle mode DMAC
- Optional MMU
- Full SCSI high speed parallel bus
- Multiple serial ports
- Optional floating point processor
- Twin iSBX™ connectors and iLBX™ for high speed memory expansion on Multibus models

There are no more powerful or versatile processor boards than the HK68/M10 and HK68/V10 for UNIX™, image processing, graphics, communications and scientific applications.

For real time systems such as industrial vision, data acquisition and control applications, the HK68/ME and HK68/VE are unsurpassed price performers.

Last but not least, Heurikon offers another valuable tool as your running partner: *Technical Support* to help solve your complex application problems. To learn more, just call:

1-800-356-9602

HEURIKON CORP.

Heurikon Corporation, 3201 Latham Drive, Madison, WI 53713. 608-271-8700.

UNIX is a trademark of Bell Laboratories, Inc.
Multibus, iLBX and iSBX are trademarks of Intel Corp.

CIRCLE NO. 54 ON INQUIRY CARD

PROTOCOLS COMPETE FOR LAN MARKET

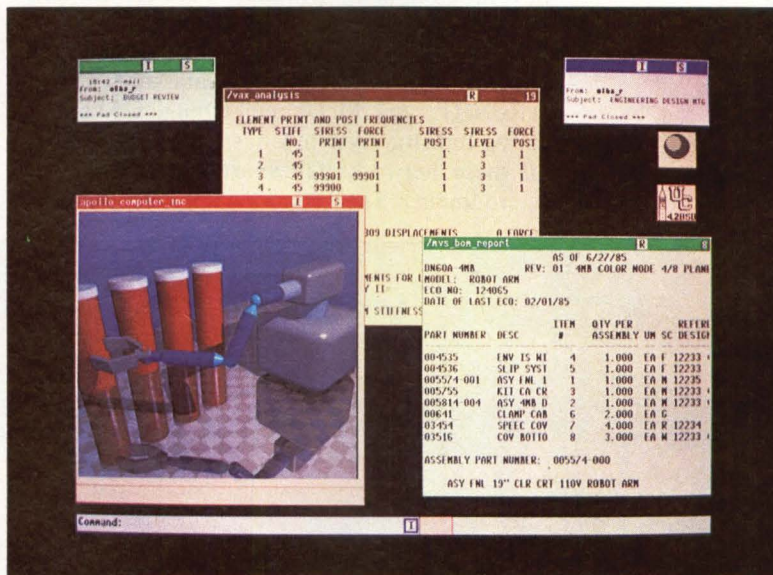
UNIX and Ethernet technologies dominate the present local area network market, but ISO standards will govern future workstation communications

Jerry Borrell, Senior Western Editor

The race by workstation vendors for the sophisticated user market has obscured a less obvious competition in communications networks to support the workstations. As products proliferate among scientists, technicians, engineers and programmers, their need to share information has brought networking to the forefront. Standards and products now under development will shape the workstation industry over the next decade.

To date, three features have characterized the workstations: a move toward 32-bit microprocessor technology, use of some version of UNIX as an operating system, and communications via Ethernet. Now, a fourth characteristic arises: a demand that workstations from different manufacturers communicate with each other. This goes beyond mere communication from one workstation to another, to communication among workstations on different, or heterogeneous, networks.

UNIX has become the operating system of choice for sophisticated end-user workstations. The two main versions of UNIX contending for the role are Berkeley UNIX Version 4.2, which was originally developed at the University of California at Berkeley, and AT&T Information Systems' System V. Traditionally, UNIX 4.2 has been the version that's shown up on engineering workstations, partly because of its origins in the research community. Recently, however, System V has begun to take on 4.2-like characteristics and the two UNIXes may ultimately merge.



The Apollo Domain workstation runs concurrent local and remote processes in overlapping windows. A solid modeling application appears at bottom left, a DEC VAX stress-analysis of that model runs at bottom right; and an IBM materials requirements planning application runs in the middle. Electronic mail from other Domain workstations appears at top left and right; menu icons for Berkeley UNIX Version 4.2 and System V appear in the smallest boxes.

The Ethernet standard for physical and data-link protocol connections is a de facto market

Users demand that workstations have the mutual ability to transfer files and to invoke remote procedures across diverse machines.

standard. With the notable exception of Apollo Computer Inc., the majority of workstation vendors supply either the Xerox Corp. or IEEE-standard 802.3 Ethernet. Even proprietary networks such as Digital Equipment Corp.'s DECnet use Ethernet as their physical connection.

Call for cross-networking

To meet the demand that workstations have the mutual ability to transfer files and to invoke remote procedures across diverse networks, vendors must select higher level communications protocols—particularly open systems interconnection (OSI) layers four and five. These two layers, the network- and transport-level protocols, describe the connection and exchange of data between devices across networks. They are critical because higher layers, such as the application level, are based upon them.

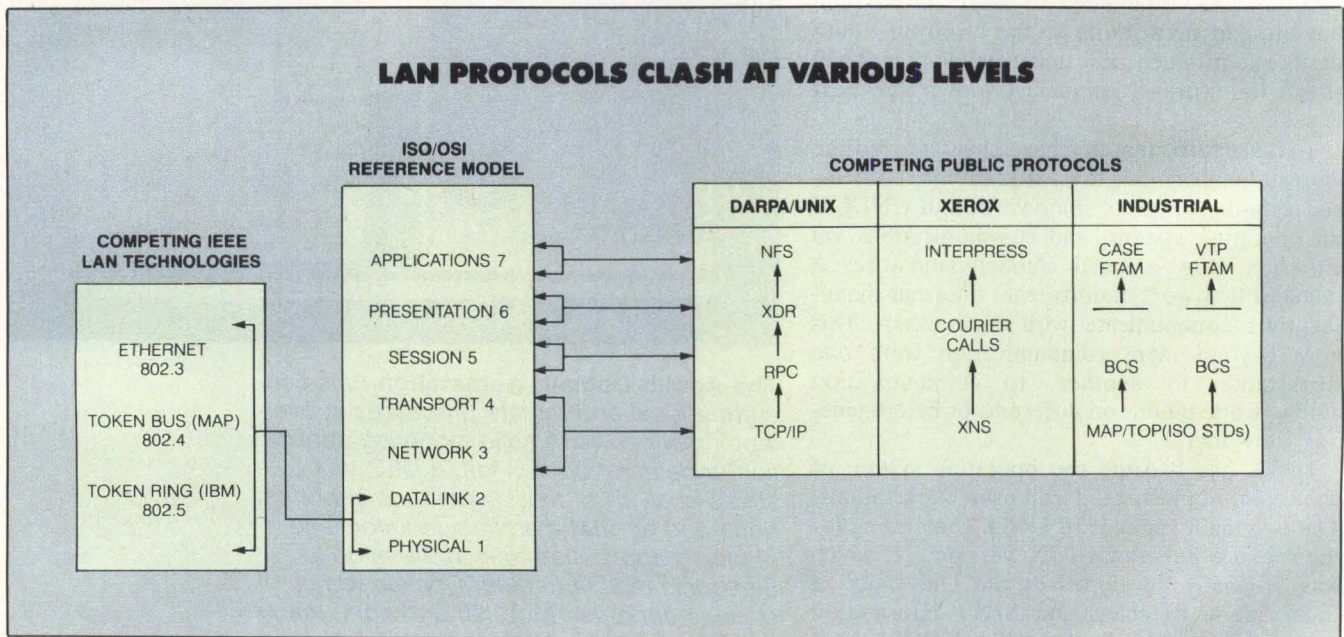
Such communications capabilities already exist on homogeneous or proprietary networks. Several companies' products offer robust functionality across all the OSI layers, including Apollo's Domain, DEC's DECnet, the Xerox Network Services (XNS), Datapoint Corp.'s ARCNET, and McDonnell Douglas Manufacturing Industry System Co.'s UG-net. However, all these networks fall short in heterogeneous environments. Their common approach to inter-

network communications has been the provision of gateways, which often are criticized for inefficient protocol conversion. Also, they may be proprietary, tying buyers to one company's products. Michael Katz, product manager for Domain heterogeneous networking at Apollo, Chelmsford, Mass., defends the proprietary approach as offering higher performance and functionality.

Despite the advantages of a proprietary, homogeneous network, heterogeneity is often required in large-user environments. Bob Judd, group leader of the computer department at Lawrence Livermore Laboratories, Livermore, Calif., works with supercomputers, personal computers and technical workstations distributed among 1,800 offices. Judd points out that "no single supplier can support such an environment, requiring the user to select computing tools as needed."

Military spurs heterogeneity

Until recently only Datapoint and Xerox had published their proprietary protocols, and both are criticized as having done so too late to provide public standards suitable for heterogeneous networks. The one such set of protocols publicly available for almost a decade and having the widest implementation came out of the Department of Defense.



The ISO/OSI model is the center point of LAN competition. In hardware (levels one and two), rivalry is fiercest between Ethernet IEEE 802.3, the token bus IEEE 802.4 supported by proponents of the manufacturing automation protocol (MAP) and token ring

IEEE 802.5 supported by IBM. In software (levels three through seven), supporters of DARPA's UNIX-related TCP/IP, Xerox's XNS and the various industrial protocols square off.

These days, computer printer technology appears to advance at a rate faster than the speed of most computer printers. And just trying to keep pace could easily keep a battalion of engineers occupied on a full-time basis.

But over 90% of the world's major computer companies have discovered a very simple way to stay abreast of printer innovations without requiring any such reallocation of their resources:

By letting Dataproducts® do it for them.

Because computer companies who have taken on Dataproducts as their OEM supplier have found that no one makes a printer line

as large or comprehensive, and no one serves the needs of all segments of the market as completely.

It isn't any secret, for example, that Dataproducts high-output band printers are designed to dramatically reduce downtime—which helps explain why they're used by virtually every mainframe and minicomputer manufacturer.


One of the largest U.S. airlines found our serial matrix printers so reliable, they've hooked up over 150,000 of them to their reservations system.

Our letter-quality printers are considered letter-perfect by one of the world's largest manufacturers of word processors. And we're

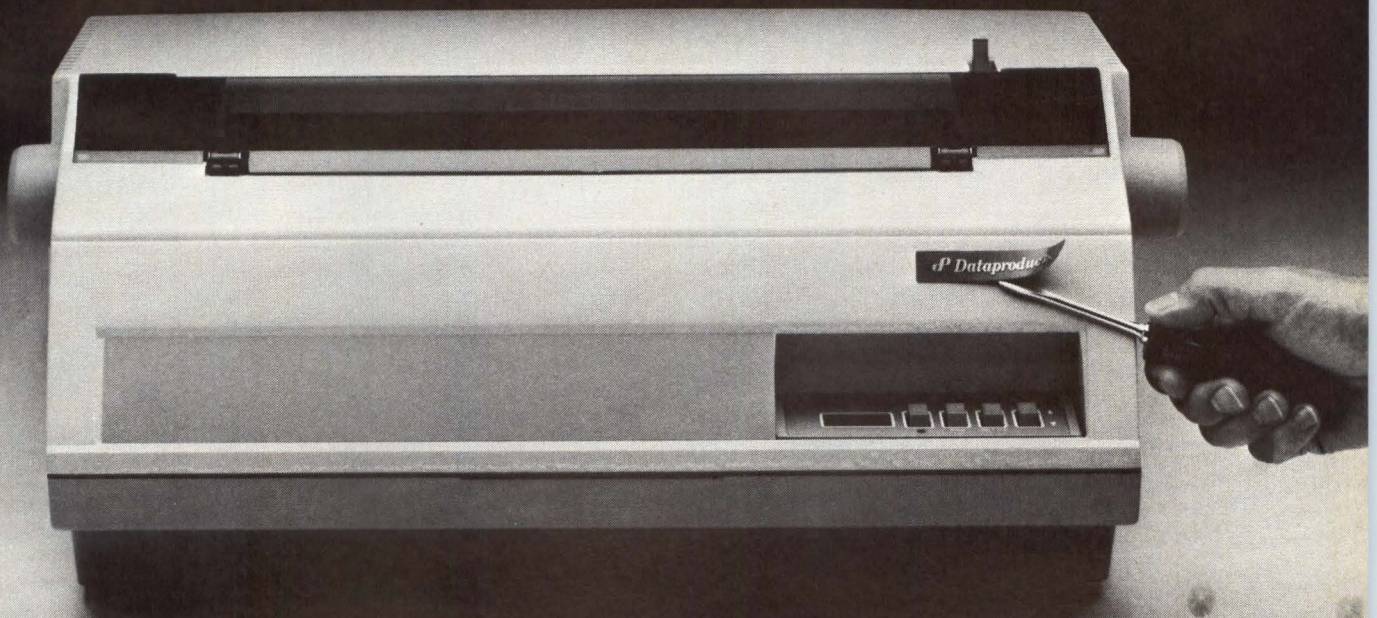
making a major impact upon the non-impact printer market with a laser printer that's faster, more compact and 15 to 40% less expensive than most others in its class.

To get in on the secret that's kept 370 computer companies from lagging behind the latest developments in printer technology, just call 1-800-258-1386, or write to Dataproducts Corporation, 6200 Canoga Avenue, Woodland Hills, CA 91365.

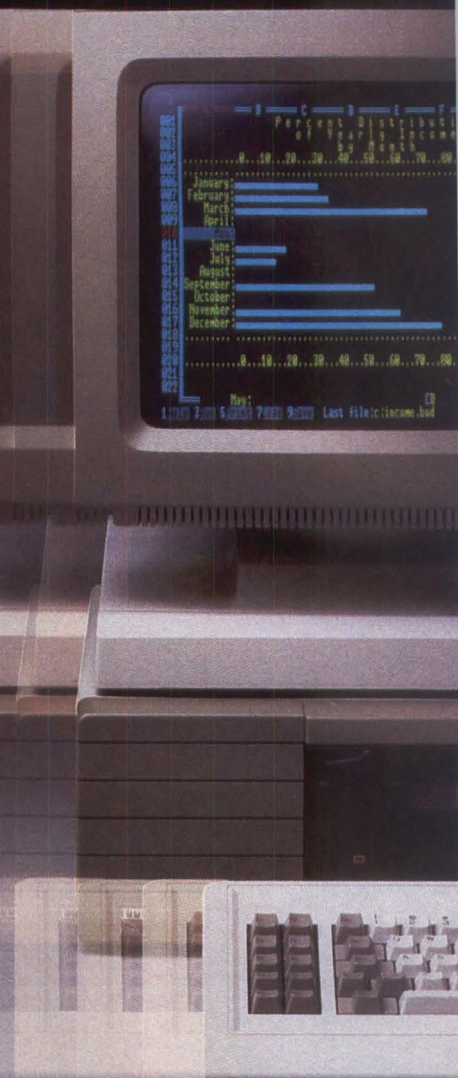
You will find that we'd much rather share our secrets than keep them all to ourselves.

 **Dataproducts**®
Where printers are an obsession.
Not an afterthought.

**370 computer companies have
discovered the secret to building some of
the world's most advanced printers.**



INTRODUCING THE FASTEST PC IN THE WORLD. WHAT YOU DO WITH IT IS YOUR BUSINESS.



Think what you could do with a personal computer whose sheer power and speed simply leave the competition in the dust.

ITT proudly announces the new ITT XTRA™ XP, carefully crafted around the powerful Intel 80286.

Imagine, up to 2 MB of memory to match all of that muscle.

Imagine over three and a half times faster and fully compatible with the IBM XT and twenty-five percent faster than the AT on a Lotus recomputation.

Imagine proven dependability, flexibility and serviceability.

And the partnership of a \$20 billion international corporation.

Now stop imagining. And start dialing.

Call (800) 321-7661, or in California, (800) 368-7300. Or clip the coupon for much more information on one of the most powerful weapons in the VAR's arsenal yet.

Whatever you do, do it soon. Before the rest of the business world passes you by.

Faster than you can imagine.

ITT Information Systems-Mail Stop 38
2350 Qume Drive
San Jose, California 95131
Please send me more information on the ITT VAR Program.

Name _____
Title _____
Company _____
Address _____
City _____
State _____ Zip _____
Phone _____

ITT
PERSONAL COMPUTERS MMS

HELPING AMERICA WORK SMART.

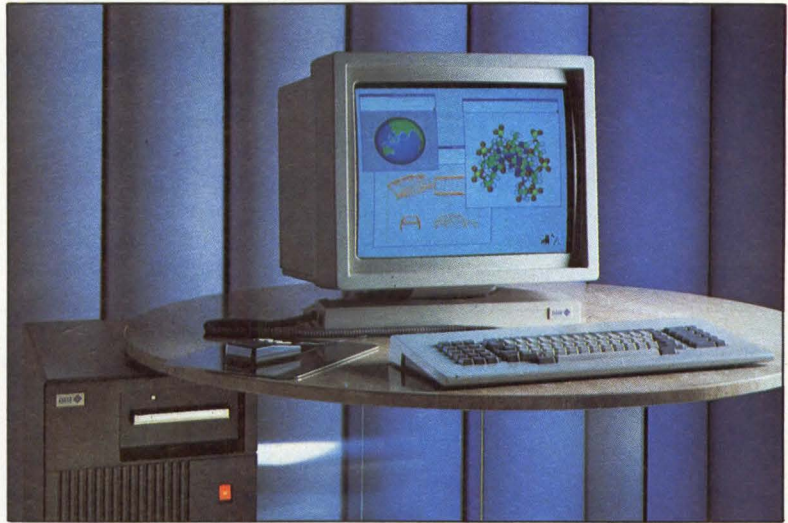
© 1985, ITT Systems, Inc.
IBM XT and AT are registered trademarks of International Business Machines. Intel 80286 is a registered trademark of Intel Corporation.
The new ITT XTRA™ XP is scheduled to be available summer of 1985.

CIRCLE NO. 56 ON INQUIRY CARD

The Defense Advanced Research Project Agency (DARPA) undertook the development of communications links between heterogeneous computers in the mid 1960s. The project, called ARPANET, had three goals—the provision of file transfer, access to remote terminals and electronic-mail service. By 1974, there were a large number of users on ARPANET at defense-related research facilities throughout the United States.

Military needs then dictated that the project be extended to provide ARPANET capability to mobile communications devices for use in the field. This project, the Packet Radio Network, provided the impetus for developing two protocols: the transport control protocol (TCP) and the internet protocol (IP). TCP ensured reliable delivery of data packets by sending end-to-end acknowledgements of shipment and receipt. IP provides the means for internetwork communications (e.g. ARPANET to nets of other types). TCP and IP were first demonstrated in 1975, marking the first heterogeneous network communications.

Barry Leiner, assistant director of information-processing technology at DARPA in Arlington, Va., comments that "TCP/IP was designed to work over many networks, not just 802.3. It's not the optimum protocol for specific products,



The Sun 2/160 workstation makes use of the Network File System (NFS), a set of protocols based on TCP/IP. NSF gives Sun workstations a complete ISO/OSI model implementation. Sun hopes to make NSF an industry standard.

but allows communications serving a wide group of networks." Use of the protocols ensures that any two machines or networks can share data,

NFS links disparate systems

As the number of engineers, scientists and programmers using workstation networks increase, their ability to share common files becomes crucial. A severe drawback of UNIX-associated networks to date has been the need to copy original files in order to allow their use by different workstations. For example, Apollo Computer Inc.'s Domain lets several users access the original copy of a file, while preventing more than one user at a time from editing.

Sun Microsystems Inc., responding to this criticism, has made available its Network File System as a public document. The NFS describes an approach to vendor, media and protocol-independent communication of files in heterogeneous networks. It addresses International Standards Organization open systems interconnection protocols on the seventh—or applications level—and requires the support of the fifth and sixth layer protocols, called remote procedure call and external device reference. Sun has implemented the NFS and two additional protocol layers, 5 (RPC), and 6 (XDR), as have Gould/SEL, Fort Lauderdale, Fla., and Pyramid Technology Inc., Mountain View, Calif. However, the protocol could be implemented over Xerox Corp.'s XNS or even on a different Ether-

net standard, such as a token ring (802.5), or a token bus (802.4).

The intent of NFS, says David Cardinal, manager of consulting services at Sun, "originates with the desires of those of us at Sun who have worked with several manufacturers' workstations—Xerox, Hewlett-Packard Co. and others. We know that people want to use different equipment on networks of differing capability." As a result, Sun spent two years developing the protocols. The protocols were published to help promulgate the concept of open networks. The protocols also provide Sun's workstations with the "virtual paging" capability that has been one of Apollo's best selling points.

Michael Katz, product manager of Domain Heterogeneous Networking at Apollo looks less charitably upon the effort. "The NFS has become good PR for Sun, but critical examination shows that their use of TCP/IP has the same constraints as those they refer to as proprietary networks such as Domain." Katz states that "the real competition for heterogeneity rests on who has the best performance on ISO standards implementation, and for off-the-shelf software."

provided that they are using a version of the protocol that meets the published DOD specifications.

Part of TCP/IP's wide implementation originates with the DOD's use of the protocols as part of the mandatory specifications in military procurement. The involvement of research institutions where ARPANET was installed has also proved important. Many universities, such as

Stanford University, Stanford, Calif., and the University of California at Berkeley, borrowed the TCP/IP protocols for use in developing UNIX-based systems. Thus, most of the UNIX-based workstations in the marketplace already use the TCP/IP protocols. Sudbash Bal, vice president of marketing at Excelan Inc., San Jose, Calif., says that efforts at his company "to provide TCP/IP protocols in firmware on front-

MAP charts automation's course

The manufacturing automation protocol (MAP) encompasses a family of International Standards Organization communications protocols evolved from work done at General Motors Corp. to reduce problems in the development and installation of automation systems. According to Gary Workman, staff development engineer on the MAP Program at GM's Technical Center in Warren, Mich., "Our problems at the beginning of the 1980s in maintenance, development and support of equipment from different vendors had become enormous." Workman cites studies showing that up to 50 percent of the cost of installing systems could come from communications-related expenses.

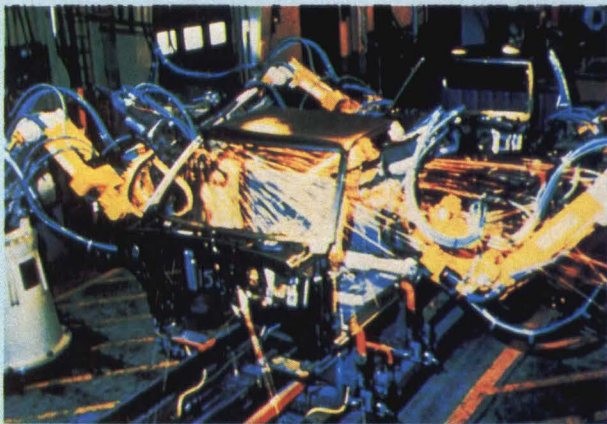
GM tackled the issue by forming study groups, and by making joint technology-study agreements with Digital Equipment Corp., Hewlett-Packard Co. and IBM Corp. One of the first results was the decision by GM to promote and adhere to standards for communications products, rather than continue developing systems unique to GM. The National Bureau of Standards (NBS), Gaithersburg, Md., also studying communications protocols, began to chair a series of workshops between GM and interested vendors. The result was a public demonstration by GM and several

vendors at the 1984 National Computer Conference exhibition of communications protocols for message service and file transfers across IEEE 802.4 standard communications links. IEEE 802.4 was chosen because it offered high performance, reliable data shipment and a straight-line topology suited to manufacturing. All the participants at NCC agreed to a two-year series of workshops, again to be chaired by the NBS.

Concurrent with the MAP demonstration, another group of vendors sponsored by Boeing Computer Services Co., Bellevue, Wash., participated in a demonstration of ISO standard protocols on an 802.3 Ethernet link. They included DEC, HP, Charles River Data Systems Inc., Eagle Computer Inc., Honeywell Inc., ICL Inc., Intel Corp. and NCR Corp. Their concerns were less with real-time, process-control communications than with the data processing in manufacturing and automation systems.

Laurie Bride, manager of advanced data-communications technology at Boeing, says that the Boeing-sponsored vendors will demonstrate an applications-specific subset of the ISO protocols analogous to the MAP protocol, called "TOP," for technical office protocols. Bride says TOP has been proposed to address requirements specific to the technical office such as the virtual device interface, file-transfer techniques and protocols closer to office needs.

This interim demonstration of TOP is scheduled for November at the Society of Manufacturing Engineers Autofact show in Detroit. Although, "The demonstrations will show minimal level product functionality," says GM's Workman, there also will be "products conforming to the MAP specification and ISO/OSI [open systems interconnection] standards for layers one, two, three and four; the kernel functionality of layer 5 and the FTAM (File Transfer and Management) of layer seven." For these reasons, John Heafner, chief of the Systems and Network Architecture Division at NBS sees "the work of the 30 or 40 participating vendors as advancing the ISO standards." At the same time, MAP represents an industry-proposed standard—a fortunate and unusual coincidence for communications protocols.



"Steel workers" like these welding robots at a GM plant are the real end-users of industrial LAN protocols. GM's solution to factory-floor networking problems is the manufacturing automation protocol (MAP).

Alloy takes your PC to the limit.

QICSTOR-PLUS. The ultimate in PC expansion with five IBM compatible slots, hard disk storage, and streaming tape backup in one neat package.

Alloy's QICSTOR-PLUS meets all your expansion needs. It's the ideal upgrade for a growing PC or AT system.

QICSTOR-PLUS has five full size expansion slots which are completely compatible with the IBM PC bus and they also support Alloy's PC-SLAVE/16 multi-processor, multi-user capability. Its high performance hard disk has a capac-

ity of 36 to 128 MBytes. And QICSTOR-PLUS has file-oriented streaming tape backup with a formatted capacity of over 50 MBytes. Alloy provides file-oriented QTIP software with a transfer rate of 2 MBytes/minute.

QICSTOR-PLUS is available right now. So call Alloy today at (617) 875-6100.

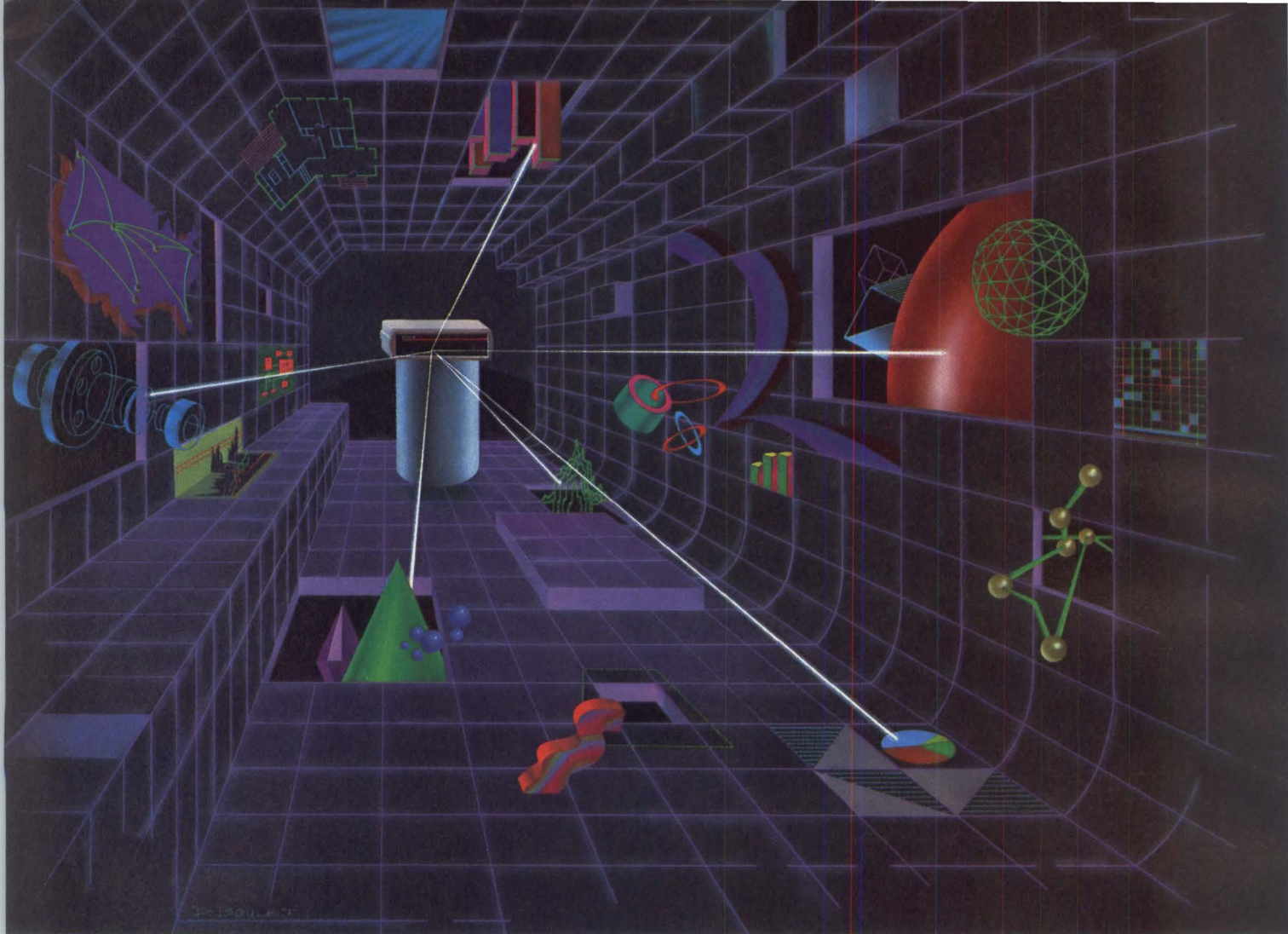


ALLOY QICSTOR-PLUS

ALLOY
Computer Products, Inc.

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

CIRCLE NO. 57 ON INQUIRY CARD



The graphic excellerator. Turbograph.™

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

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

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

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

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

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

AMF
LOGIC SCIENCES, INC.

10808 Fallstone Road
Houston, TX 77099
713/879-0536; telex 706691

CIRCLE NO. 58 ON INQUIRY CARD

end processors that also incorporate Ethernet chips will push workstations use even further."

Bill Joy, co-founder and vice president of Sun Microsystems Inc., Mountain View, Calif., developed the Berkeley extensions of UNIX which incorporate TCP/IP. More recently, he helped develop protocols based upon TCP/IP that extend the functionality to layer seven, making a complete International Standards Organization OSI model implementation that Joy sees as "an intermediate step toward the eventual use of ISO standard protocols."

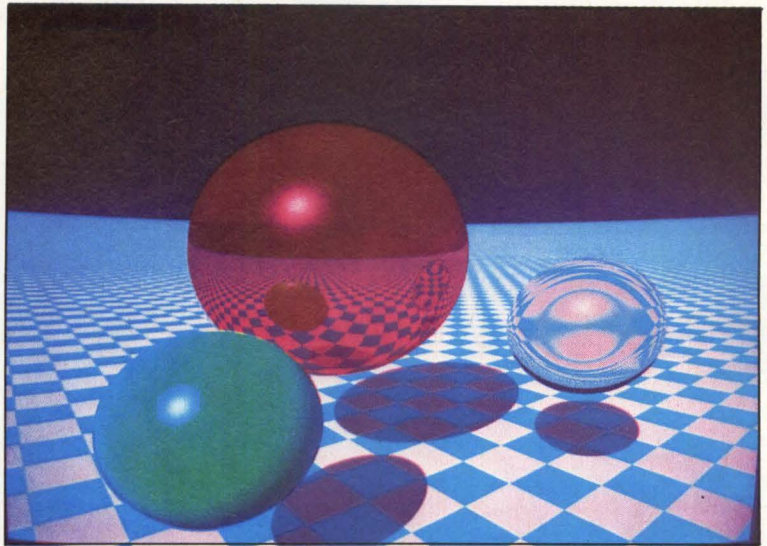
XNS renews its growth

XNS protocols have common roots with TCP/IP in that both were developed as a result of DARPA-funded research at Stanford University. Yogen Dalal, vice president for systems development at Metaphor Computer Systems Inc., Mountain View, explains that both share the layer three "datagram" concepts on which higher level protocols are based. "TCP/IP was developed for public data networks, so it has a somewhat more cumbersome architecture. When we designed XNS, we knew that public networks would be involved, but the architecture was made for local area networks to which file servers and workstations would be attached." He believes that XNS thus solved more problems across layers one through seven of the ISO protocols, but Xerox did not make public the transport and network levels until 1981.

Dennis Frahmman, manager of protocol development for the Xerox Office Systems division, Palo Alto, Calif., contends that the company now takes a more aggressive stance toward marketing the protocols. He points to the publication of layers five, six and seven during 1984 and a renewed effort to publish application layers. Xerox has recently released two more applications: the Raster Encoding Standard (bit graphics) and its Printer Integration Service (which describes how Xerox's page formatting software, Intrepress, works on the company's laser printers).

XNS finds growing support from other vendors. Greg Chesson, the senior scientist at Silicon Graphics Inc., Mountain View, co-chairs an XNS user group of 35 companies. Chesson states, "The XNS has all of the problems of the TCP/IP and then some....It nevertheless qualifies as the best high-level standard available." His opinion reflects the demands that SGI's IRIS workstations make in real-time multiple process applications such as flight simulation.

TCP/IP and XNS protocols are faced with developments in ISO standards. Judy Estrin, executive vice president of research and develop-



The transmission of true color images, like this one generated on PERQ Systems Corp.'s Perq 4 graphics workstation, is one of the chief goals of LAN developers. Sending such images across networks is difficult because of the large amount of data they contain—typically 640K bytes or more.

ment at Bridge Communications Inc., Mountain View, whose company builds products for both XNS and TCP/IP protocols, predicts that "both protocols will continue, but the ISO standards will grow in importance during 1986."

One large system integrator, McDonnell Douglas, Cypress, Calif., has recognized that "the ISO network standards will evolve as the leader," explains Tom Hamilton, product manager for MicroVAX and Unigraphics Network. "But we had to make a choice. TCP/IP was well-supported on DEC computers and was relatively portable to the Data General [Corp.] minicomputers, but not available on both DEC and IBM [Corp.] machines. XNS was available on both DEC and IBM machines, and was relatively portable, so we chose XNS." Hamilton points out that as the ISO standards evolve, they, too, will be implemented at McDonnell Douglas. It should be noted that the company primarily serves the mechanical computer-aided design marketplace with its workstation products, as distinct from the electrical CAD market where end users are more willing to accept UNIX and therefore TCP/IP operating environments. □

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



COMDEX/Fall '85...

The COMDEX Exposition... for your best prospects!

COMDEX delivers the largest national audience of your best prospects—at one time, in one place, in an environment designed for doing business.

SUPPLIERS—COMDEX will attract over 100,000 resellers (exclusively!) who depend on companies like yours for the products their customers demand. You'll do business with VARs, System Inte-

grators, Commercial OEMs, Retailers, Dealers, Distributors and other successful resellers who can move your products in the marketplace.

RESELLERS—You'll find hardware, software, related products and support programs from over 1,000 companies that will keep your customers coming back and new ones coming in. And, you can take advantage of special offers, discounts and incentives that many vendors feature at COMDEX!

The COMDEX Conference... for building profits now!

From value-added reselling, to vertical marketing, to effective promotion and all the other sales, marketing and management issues facing today's reseller, no industry forum can match The COMDEX Conference. Leading industry experts will show you the proven ideas and techniques that you can use *now* to keep products



**THE
INTERFACE
GROUP, Inc.**

World's leading producer of computer conferences and expositions including: COMDEX/Winter, COMDEX/Spring, COMDEX/Fall, COMDEX/Europe, COMDEX in JAPAN, INTERFACE, FEDERAL DP and COMMUNICATIONS Conference & Expo, The Nationwide COMPUTER SHOWCASE EXPOs and THE BYTE COMPUTER SHOWS.

©Copyright 1985 • 300 First Avenue, Needham, Massachusetts, USA 02194 • (617) 449-6600 • TELEX - 951176 • FAX (617) 449-6953

Offices In:

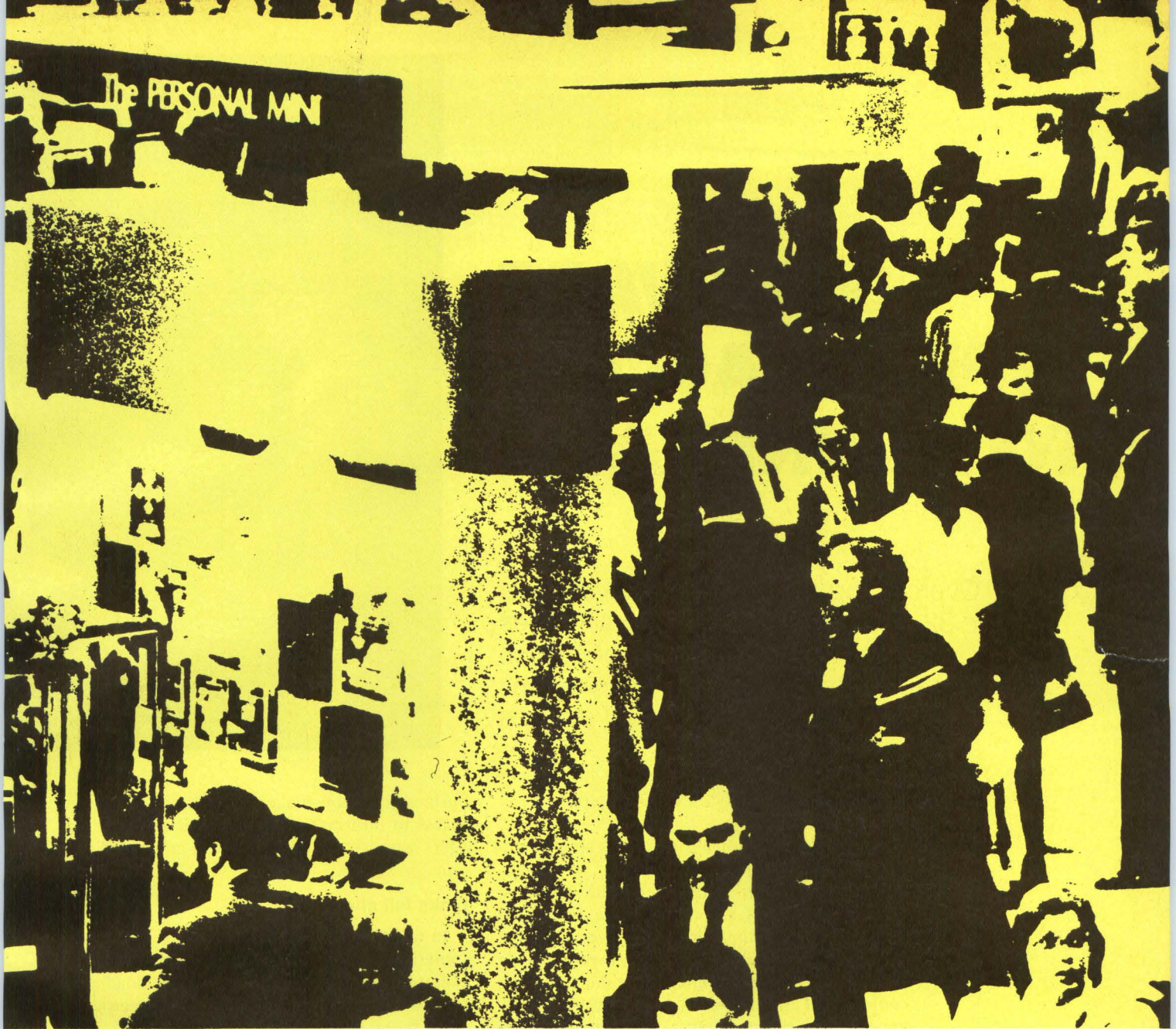
Los Angeles

San Francisco

Washington, DC

Amsterdam

Tokyo



for new business now!

moving from your shelves...and
add profits to your bottom line.

Now, more than ever before,
the best place to find new busi-
ness, new ideas, new contacts and
new profit opportunities is
COMDEX/Fall, November 20-24,
1985 in Las Vegas.

COMDEX/Fall '85

Nov. 20-24, 1985
Las Vegas, Nevada

YES, I want to find new business *now* at COMDEX/Fall '85!

- Let me know today what space is still available
- Please send me complete attendee information
- Please send me complete exhibitor information

Name _____

Title _____ Phone () _____

Company _____

Address _____

City _____ State _____ Zip _____

For exhibitor or attendee information, complete and return this coupon to:
COMDEX/Fall '85, 300 First Avenue, Needham, Massachusetts 02194;
or call (617) 449-6600.

CIRCLE NO. 59 ON INQUIRY CARD

SOFTWARE SPEEDS ACCESS TO MAINFRAME

Overcoming limitations of conventional 3270 emulators, 3270-Plus simplifies the micro-to-mainframe connection by permitting direct communications between networked devices

John Doherty, Rabbit Software Corp.

Today's office-automation systems aim at completely integrating microcomputers, terminals, printers and other peripherals with the host mainframe computer to achieve true distributed processing. However, integrating diverse devices and packages into a working network can be difficult, and accessing mainframe data can be a complicated and time-consuming process. A key approach to the problems—the micro-to-mainframe link—has not turned out to be the satisfactory solution expected by many management information system (MIS)/data-processing (DP) managers.

In contrast, Rabbit Software Corp.'s 3270-Plus software overcomes the limitations of conventional 3270 emulators and permits easily customized and flexible micro-to-mainframe links. Its program interface module (PIM) eases microcomputer-to-host integration by permitting direct program-to-program communications among connected devices in a computer network.

Micro-to-mainframe links do seem to promise significant benefits in distributed-processing environments. With them, users should be able to access and manipulate host data from a local or remote microcomputer. File-access and file-transfer capabilities should allow the generation of customized reports from several host files. In short, this "automated" process should give



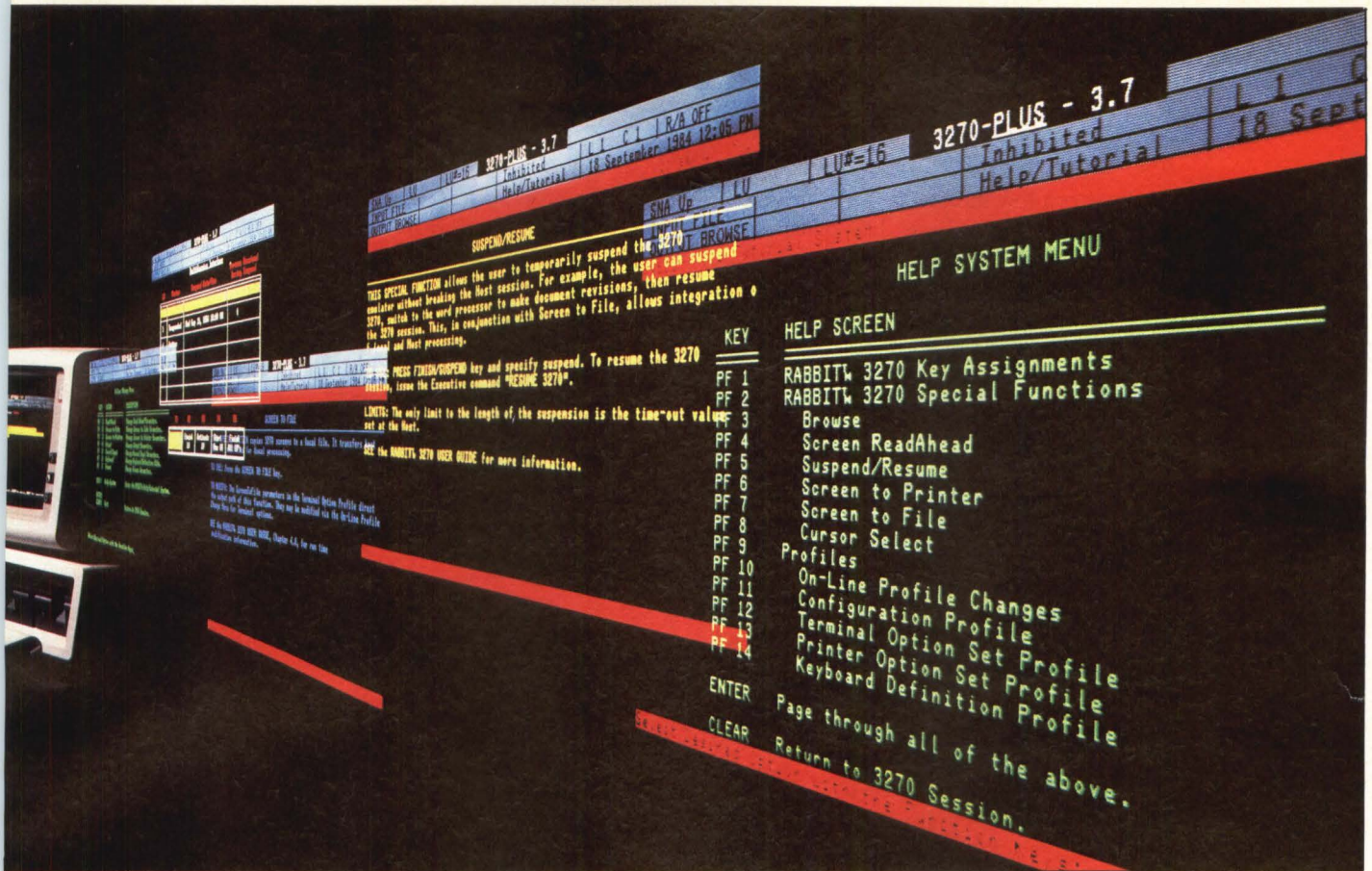
business decision makers faster, more efficient access to information and provide system managers with a cost-effective data-processing system.

Links fall short

In reality, however, micro-to-mainframe links sometimes fall short of achieving these goals. For example, many systems cannot download data from the host computer directly into microcomputer-based application programs.

In addition, most micro-to-mainframe links employ host-to-device communications based on resource-sharing mainframe protocols and IBM Corp. Systems Network Architecture—logical-unit (LU) types designed for emulation of specific 3270-system devices. As a consequence, standard emulation-based micro-to-mainframe products using boards, coaxial cable or software do not permit the integration of local or remote application programs with the host system. They also cannot coordinate application-processing tasks across an office network.

Standard emulation products require powerful microcomputers to serve as dumb 3270-type terminals in order to access host data, reducing the computers to the performance of the display-only functions of less-expensive ASCII-type terminals. Although terminal emulation can "trick" the mainframe into thinking it is talking to a 3270 terminal, it cannot implement interactive and simultaneous data manipulation among con-



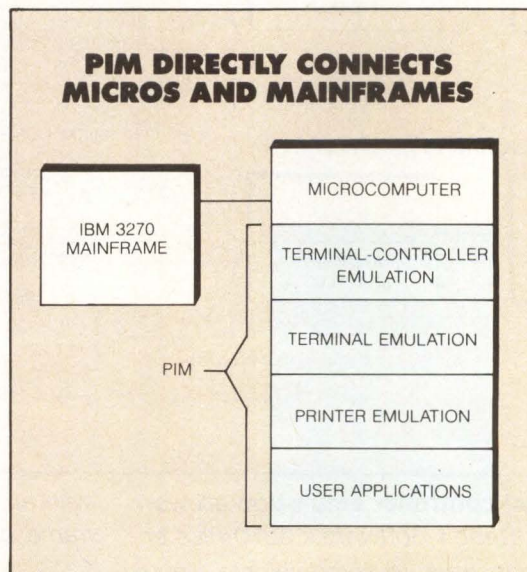
nected processors.

Both 3270-Plus for local micro-to-mainframe systems and Network 3270-Plus, a local area network version serving as a gateway to 3270 mainframe systems, promote host-application-to-microcomputer-application communications. They allow system integrators to implement sophisticated communications functions, including the integration of host and local processing and transferring data among host computer, microcomputers or minicomputers and peripheral devices.

The packages work with most 16-bit and 32-bit computers running under UNIX multitasking operating systems such as AT&T Co.'s UNIX System V, Microsoft Corp.'s XENIX and IBM's PC/IX. The 3270-Plus system presents microcomputers, workstations and printers as 3270-type devices to an IBM 3270 mainframe or plug-compatible host. By emulating an IBM 3274 cluster controller as well as device-specific LU types, 3270-Plus eliminates the need for the 3274. It increases the possible ports to the mainframe by supporting 128 logical devices.

Supporting SNA, Network 3270-Plus functions as a UNIX-based gateway between one or several LANs and a remote host computer. Its distributed architecture allows system integrators to implement multiple user and/or application links to mainframe data from any network information node through only one link to the mainframe.

Modular, four-part architecture allows the package's protocols to be distributed among gateway and information nodes. Thus the data-link and protocol-handler layers reside at the gateway to the mainframe—a microcomputer or other device. System integrators, however, can place the two upper-level, device-handler and terminal-emulation protocols anywhere throughout the LAN on any number of user nodes. Multidropping addresses to proprietary protocol



The program interface module (PIM) of the 3270-Plus software package permits direct application-program-to-application-program communication between a microcomputer and the mainframe. It also provides terminal-controller and printer emulation.

buffers allow the LAN-to-mainframe system also to support as many as 128 logical devices.

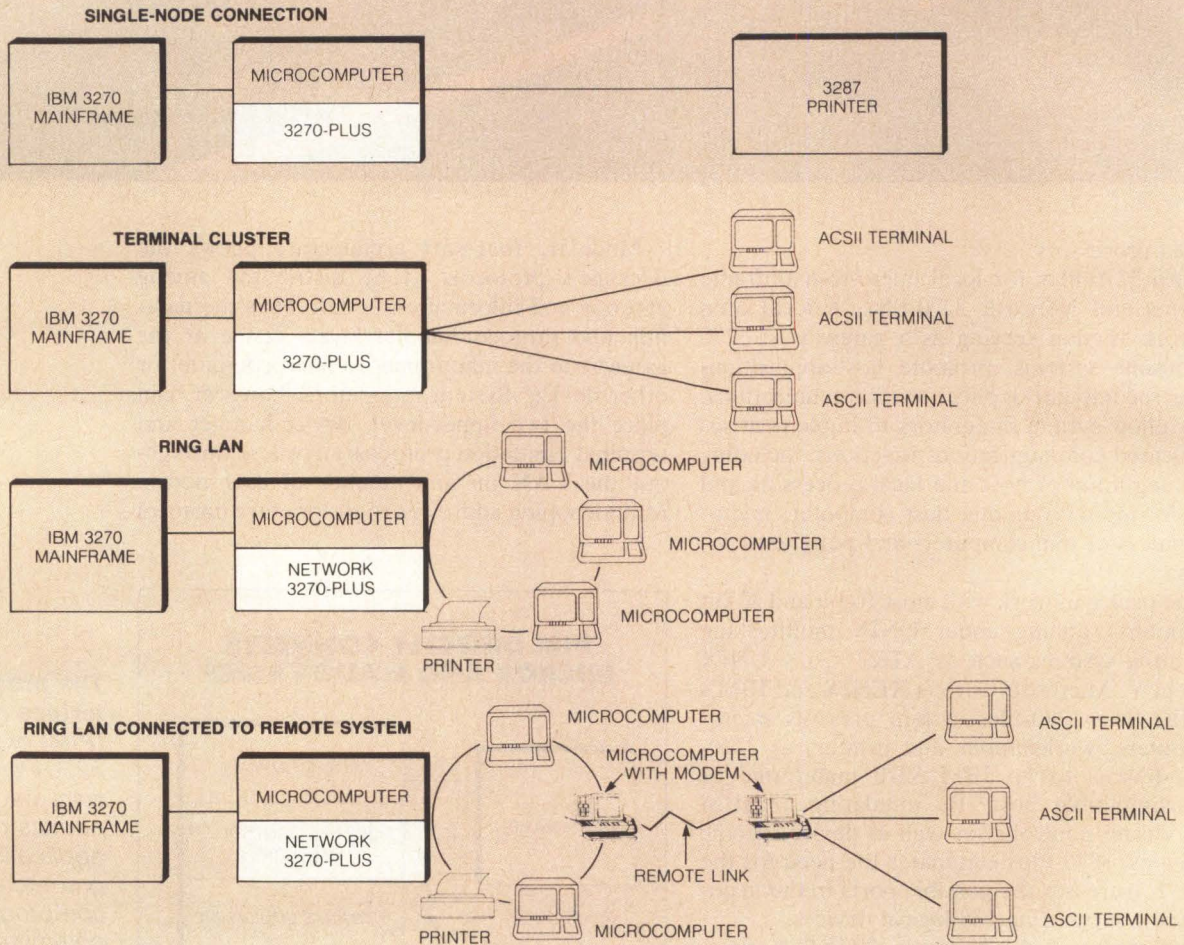
The micro-to-mainframe links thus permit system integrators to connect any number of devices to the mainframe in any network topology: one microcomputer, ASCII terminals in multi-user systems or using Network 3270-Plus, remote-computer systems. In contrast, coaxial links can connect, at most, four devices per cable.

The 3270-Plus link's capabilities improve on standard 3270 functions. A read-ahead feature reduces response time when the user is accessing

read-only screens from the host. It requests the next screen from the host while the user is viewing the current screen. A suspend/resume capability allows a user to suspend 3270 functions, freeing the screen and memory for local processing. It reduces the possibility of network outages by limiting the number of physical disconnects and reconnects.

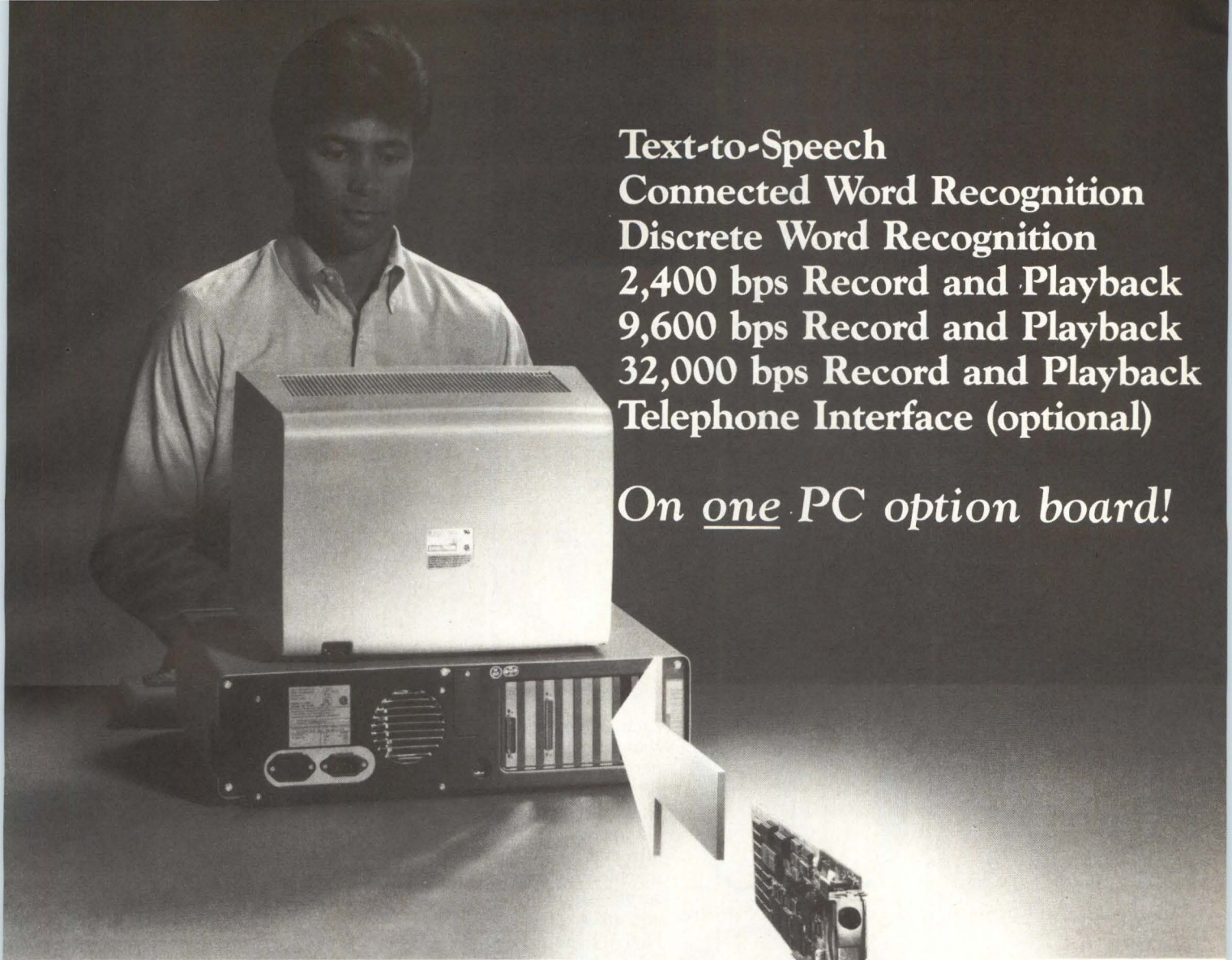
A browse feature permits users to page back and forth through previous screens to review data without additional host transmissions. A screen-to-printer command produces a hard copy of any screen without retransmission from

SOFTWARE IMPLEMENTS FLEXIBLE MICRO-TO-MAINFRAME LINKS



Built-in 3274-terminal-controller emulation allows microcomputers with Rabbit Software's 3270-Plus or Network 3270-Plus packages to communicate directly

with an IBM mainframe in a variety of micro-to-mainframe or LAN-to-mainframe configurations.



Text-to-Speech
Connected Word Recognition
Discrete Word Recognition
2,400 bps Record and Playback
9,600 bps Record and Playback
32,000 bps Record and Playback
Telephone Interface (optional)

On one PC option board!

The TI-Speech™ option says it all ...for under \$1,000.

The TI-Speech option gives you versatile speech capabilities on one plug-in option board—for both the Texas Instruments Professional Computer family and IBM® Personal Computer products.*

The Text-to-Speech capability allows any English information stored as ASCII text to be spoken—and the natural, computer-generated voice provides the flexibility of an unlimited vocabulary.

Connected word recognition lets the computer understand specific commands spoken in a natural, conversational manner. For situations that require it, discrete word recognition allows the computer to listen for specific commands spoken individually. In either case, spoken commands can replace a number of predetermined keystrokes.

You get a range of 2,400, 9,600, or a full 32,000 bps for voice storage and playback. This lets you balance the maximum recording time with high-quality, natural voice output, depending on your application requirements.

With the optional telephone interface, your computer can place a telephone call, send and receive Touch Tone® signals, or answer your phone. You may combine any of the telephone and speech functions to create applications that can dramatically extend the capabilities of your computer.

Let's start talking.

For more information on the TI-Speech option and how you can get started, call

us toll-free at 1-800-527-3500. If you want to hear an example of TI-Speech, call 1-512-250-4114 (this is a toll call).

*(Not for use on the TI Pro-Lite™ computer or the IBM PCjr™ computer.)

TI-Speech and Pro-Lite are trademarks of Texas Instruments. IBM is a registered trademark and PCjr. is a trademark of International Business Machines Corporation. Touch Tone is a registered trademark of AT&T.

© 1985 TI

TEXAS 
INSTRUMENTS

Creating useful products
and services for you.

CIRCLE NO. 60 ON INQUIRY CARD

FUJITSU BAND PRINTERS

The Numbers are Right.

Now you can find the reliability, the quietness and the form factor you need in the new Fujitsu family of band printers. And with our M3040, M3041, M3042 and M3043 series, you have a choice of speed ranging from 300 LPM to 1200 LPM.

1200

LPM is a
Fast Band
Printer.

6000

Hours MTBF is a Long Time without Failure.

Each model delivers consistently crisp, high-quality characters at a speed that only a Fujitsu high-performance band printer can provide.

High parts commonality is built right into every Fujitsu machine making service simple and quick. The Fujitsu band printers are surprisingly affordable and each sets a new standard in price/performance. For additional information, contact Fujitsu at 3055 Orchard Drive, San Jose, CA 95134, or give us a call. Our number is (800) 626-4686.

55

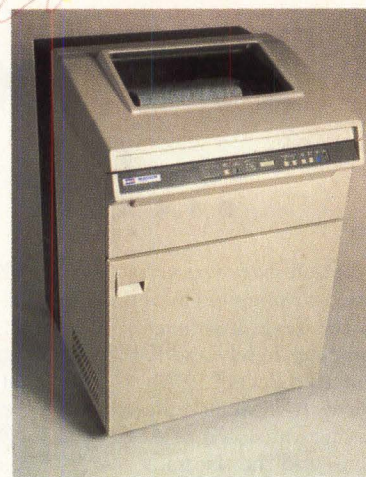
Decibels
is a Quiet
Machine.

43

27

is the Size of
our Compact
Printers.

35



(800) 626-4686.



FUJITSU AMERICA, INC.

CIRCLE NO. 61 ON INQUIRY CARD

© Fujitsu America, Inc. 1985
All Rights Reserved.

the host computer to the printer. With the screen-to-file capability, users can copy data for local applications. A multisession feature supports multiple host sessions on any terminal.

Local programs talking directly to host-computer programs unhampered by 3270 mainframe restrictions is the key to effective micro-to-mainframe communications. A forerunner of IBM's LU 6.2 protocol, the PIM feature of 3270-Plus generates this kind of dialogue on an application-to-application basis (see "LU 6.2 implements device-to device communications," below).

It thus allows communications between any two application programs regardless of the language employed. A programmer, therefore, does not have to know the language used in the host application to write a microprocessor-based program that shares information with it.

An implementation of a protocol boundary allowing programs to access the 3270-based presentation services layer of SNA, PIM also provides terminal and printer emulation as well as 3274 terminal-controller emulation. It permits users to move host data to local files or peripheral devices, such as printers, using simple

commands, without end users having to log in and log out of host sessions.

PIM allows application programs to call the 3270 emulator as a background subroutine, making it transparent to the user. Because the PIM interface is transparent to microcomputer users, MIS managers need only train them on application programs and not on the mainframe 3270 interface program.

Adapts to user demands

By incorporating modular, flexible-software architectures, 3270-Plus and Network 3270-Plus create data-communications channels that can easily be upgraded and adapted to specific user and computer-system requirements. System integrators can tailor 3270-Plus via four user-editable files referenced by the software's processes. They are:

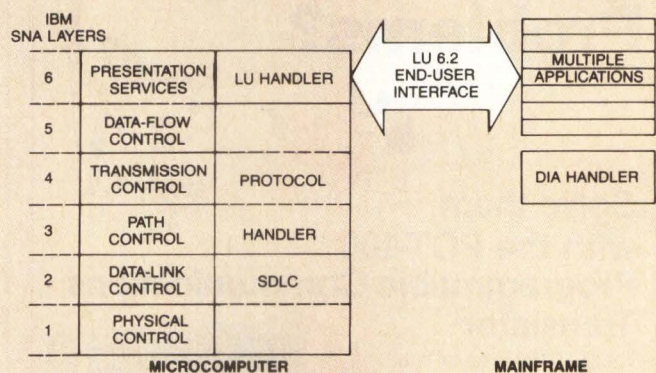
- A configuration profile defining the 3270 device type, screen size, buffer size and other attributes as they appear to the host computer. System integrators can use it to define configurations for as many as 128 system addresses. They can also specify passwords for all or some of the

LU 6.2 implements device-to-device communications

IBM Corp.'s logical unit (LU) type 6.2 protocol, also called advanced program-to-program communications, is a completion of the sixth, or presentation services, layer of IBM's Systems Network Architecture that governs communications among application programs across diverse device types and communications networks. It allows direct peer-to-peer and program-to-program communications among host computer, microcomputers, minicomputers and other devices in an SNA computer network. Introduced in 1983, it is supported by several IBM mainframe applications, including customer information control system and the information management system database.

Peer-to-peer communications permits any device supporting LU 6.2 to transfer information directly to any other device supporting the protocol without the mainframe directing communications access and data transfer. It thus replaces the master/slave relationship inherent in 3270 emulation micro-to-mainframe links. Using program-to-program communications, two application programs running on different machines can transfer data regardless of the languages employed.

Under an LU 6.2 implementation such as Rabbit Software Corp.'s SNA-Plus, data can be routed from node to node in a network without users knowing where the information resides. As a further advantage, LU 6.2 networks are not restricted to centralized star configurations centered on the host computer but can encompass ring networks based on SNA or local



Logical unit (LU) type 6.2 allows a microcomputer user to simultaneously request several conversations with different host applications under, for example, IBM's mainframe document interchange architecture (DIA). An implementation of the presentation services layer of SNA, LU 6.2 builds on earlier LU types that handle lower level SNA functions such as synchronous data link control (SDLC) and accommodation of network communications protocols.

area network configurations.

In addition, with the LU 6.2 protocol, microcomputer users can simultaneously request multiple conversations with different mainframe processes.

PIM allows application programs to call the 3270 emulator as a background subroutine, making it transparent to the user.

addresses to restrict data access.

- A terminal-option-set profile which defines parameters such as the data-I/O paths used to read from and write to the host computers, connections to local files and read-ahead specifications.

- A printer-option-set profile specifying I/O paths for the printers. A user can direct host output to a local file or a printer-spooler file, or directly to the printer. Multiple printer addresses are supported.

- A keyboard profile defining the value assigned to each key permits users or system integrators to customize keyboard configurations.

Microcomputer users, however, are not locked into the parameters set by the profiles. The package's on-line profile-change capability allows an operator, through menu screens, to temporarily alter these specifications during a 3270-Plus session. A user can thus turn on and off the screen read-ahead feature or designate a different printer-spooler file. Such changes last only for the life of the session; when the session

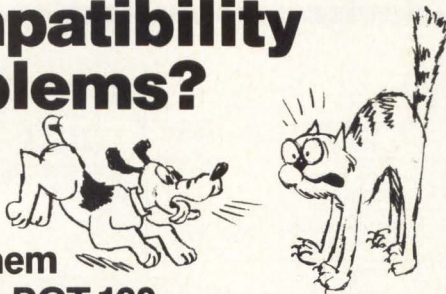
ends, the parameters revert back to the ones originally specified by the profiles.

These capabilities, when combined with Network 3270-Plus' modular architecture, permit flexible micro-to-mainframe communications that are adaptable to different users and applications, easy to use in a variety of microcomputer-to-host configurations and readily integrated with new devices and technologies.

John Doherty is vice president of marketing at Rabbit Software Corp., Malvern, Pa. Previously, he worked at Sequoia Systems Inc., Nixdorf Computer Corp. and Mohawk Data Sciences Corp. Doherty has a bachelor of science degree in economics and a master of business administration degree in finance and marketing from the Wharton School and the University of North Florida.

Interest Quotient (Circle One)
High 480 Medium 481 Low 482

Compatibility Problems?



Solve them with the PCT-100 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

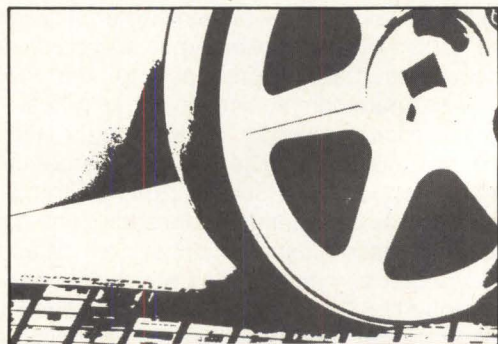


Method Systems Incorporated

3511 Lost Nation Road
Willoughby, Ohio 44094
(216) 942-2100

CIRCLE NO. 62 ON INQUIRY CARD

This Publication is available in Microform.



University Microfilms International

Please send additional information

for _____ (name of publication)

Name _____

Institution _____

Street _____

City _____

State _____ Zip _____

300 North Zeeb Road, Dept. P.R., Ann Arbor, Mi. 48106

CIRCLE NO. 63 ON INQUIRY CARD

The new Office Systems Printer from Newbury Data.

NLQ, Draft and Italic print styles.

Dual speed up to 200 cps.

9 and 12 needle print heads.

Full 7 color capability.

Fully PC-compatible.

Clip-in tractor feed.

Bit image graphics.

Interface flexibility.

Low noise levels (55dBA).

Integrated auto sheet feeder.

Integral 80 and 136 columns

Multi-lingual character sets.



Newbury Data
 A member of the DRI Group
 Plugging the world into peripherals

Newbury Data Recording Ltd., Head Office, Unit 4, Hawthorne Road, Staines, Middlesex U.K. Tel: (0784) 61500.
 USA: Massachusetts Tel: 617 551 0280 ITALY: Milan Tel: (039) 638811 FRANCE: Paris Tel: (3) 956 81 11
 NETHERLANDS: Almere Tel: (03240) 14716 GERMANY: Munich Tel: (089) 539401.

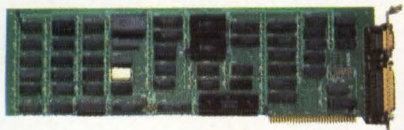
CIRCLE NO. 64 ON INQUIRY CARD

One great idea deserves another.

“My idea was
to give our PC users
a screen display identical
to the 5251.”



Our IDEAcomm 5251 is the only Twinax Emulator that lets him do it.



For users accustomed to an IBM 5251 terminal, our IDEAcomm 5251 with the D card option doesn't just approximate the 5251 screen display, it duplicates it. The full 32 display attributes of the 5251 are supported. And the D card is an exact replacement for IBM's monochrome display adapter, including a parallel port, so you don't lose an additional PC slot.

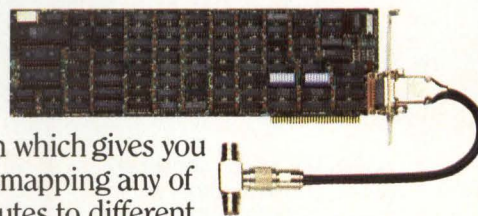
Our ideas for IBM System 34/36/38 users shouldn't surprise you. IDEA shipped the first fully functional 5251 twinax emulator last December. And since then we've added several new features you told us you were looking for.

Now, IDEA offers complete support for IBM's FSU and FTF programs on the host. In addition, many third party software packages support IDEAcomm 5251, including DecisionLink and Smart Link, giving you even greater file transfer options.

IDEAcomm 5251 works with the widest range of PC printers including Okidata, Epson, Hewlett-Packard, IBM, NEC and many more. The PC printer can be configured as the IBM 5224, 5225, or 5256—

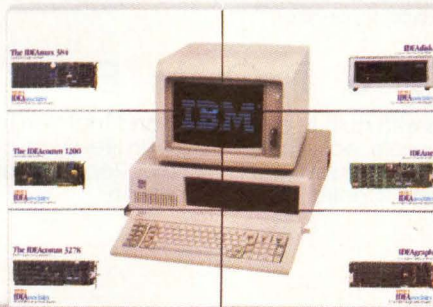
so it's compatible with many work environments.

And our ideas go even further. IDEAcomm 5251 supports four logical units so you can run four tasks simultaneously. Our programmatic interface lets programmers easily customize applications to the board through software. IDEAcomm 5251 can be configured for PC and 5250 keyboard modes and we provide templates for both. And we even have a color mapping option which gives you the choice of remapping any of the 5250 attributes to different colors.



Best of all, IDEAcomm 5251 uses only 30K of memory. So when you have a great idea for improving the communication capability of your IBM PC, look to IDEA to make it a reality.

Call us at 800-257-5027 for more information.



IDEA
IDEAassociates™
The best IDEAs for personal computers.
IDEAassociates, Inc., 35 Dunham Rd., Billerica, MA 01821.
(617) 663-6878, Telex 94-8245. IDEAassociates, S.A.,
Geneva, Switzerland (22) 86.11.19, Telex 428 388 KBSCH

IBM and the IBM logo are registered trademarks of International Business Machines Corporation. DecisionLink is a trademark of Laguna Laboratories Inc. Smart Link is a trademark of Software International. Epson is a registered trademark of Epson America, Inc. Okidata is a registered trademark of Oki America, Inc. IDEAcomm 5251 is a trademark of IDEAassociates, Inc.

CIRCLE NO. 65 ON INQUIRY CARD

NOW-GCR AND PE STREAMERS THAT REALLY DRIVE DOWN THE COST OF OWNERSHIP.

CHOICE OF DENSITIES: The 92181 runs at 25 ips start/stop and 100 ips streaming with ANSI Standard 1600 bpi, Phase-encoded (PE) format. The 92185 runs at 25 ips and 75 ips streaming with ANSI Standard 6250 bpi, Group Coded (GCR) format; 25 ips start/stop and 75 ips streaming with PE format.



TOLL FREE HOTLINE
1-800-828-8001
EXT. 82
IN MINNESOTA
(612) 921-4400

EASY TO OPERATE: touch sensitive switches and LED indicators with decimal readouts. Tape threading guides allow simple, fast loading.

MAINTAINABILITY MEANS RELIABILITY. Keystone tape units need no field adjustments of any kind. No scheduled preventive maintenance either.

AIR BEARINGS give better tape control, cut media stress and wear caused by spring-loaded guides and rollers. Tape rides on a cushion of air.

GCR TAPE PATH. Unique, patented tape path (only 13"), solid-state tension sensing, and μ P-controlled servos for precise high-density tape motion control.

SIMPLE MECHANICAL DESIGN. No tension arms, vacuum columns, capstan motors or guide rollers.

THE KEYSTONE™ SERIES

We designed the Keystone Series with built-in diagnostics and maintenance features that make it simple to operate, easy to service, low in life-cycle costs. For more information, call your local Control Data OEM Sales Representative or write: OEM Product Sales, MNB04A, Control Data Corporation, P.O. Box 0, Minneapolis, MN 55440.

GD CONTROL DATA

CIRCLE NO. 66 ON INQUIRY CARD



OPTIONS MULTIPLY FOR PC, PC-AT INTEGRATORS

A growing bus-based infrastructure offers integrators new opportunities in multiuser systems and high-performance workstations

Rick Dalrymple, Senior Editor

A deluge of IBM Corp. PC-AT compatibles is extending the de facto standards first set by products surrounding the PC into application areas previously untouched by personal computers. The worldwide installed base of PCs and PC compatibles now exceeds 2 million units. This pervasiveness, combined with a growing infrastructure (hardware for PC and PC-AT buses and software designed to run under PC-DOS or MS-DOS), has already set standards for workstations in the office, on the engineering bench, inside the factory and even in the laboratory. Several ways in which system integrators exploit this development were cited in the March issue of *Mini-Micro Systems* (MMS, March, Page 147).

The performance advantages of the IBM PC-AT and compatibles over the PC have made practical the use of PC-ATs as foundation modules in workstation clusters. Similarly, new coprocessor boards for the PC-AT bus have made possible the operation of PC-DOS or MS-DOS in conjunction with UNIX System V. And graphics coprocessor boards for both the PC and PC-AT buses allow workstations based on these buses to compete with existing graphics workstations (MMS, August, Page 113).

Benefits abound for integrators

Although the performance enhancements listed above are reasons enough to consider the PC and PC-AT buses for workstation integration, additional benefits for system integrators make these buses even more attractive:



OEMtek's OTI Model 2 features IBM PC-AT compatibility within a system module that is 50 percent smaller than the PC-AT. It consists of a 10 $\frac{3}{4}$ -by-16-by-15 $\frac{1}{2}$ -inch enclosure with eight expansion slots and space for six 5 $\frac{1}{4}$ -inch half-height drives (floppy, hard or streaming tape).

- Flexibility of integration from software-only to hardware configurations that build from the bus up
- Ability to customize in a manner that still permits end users to exploit a huge library of off-the-shelf software
- The growing installed base of PC, PC/XT, PC-AT and compatible systems will motivate software developers, add-in board manufacturers and add-on peripheral manufacturers to continue to develop products that build on this family of computer systems.

The simplest methods of PC and PC-AT bus integration merely add software, boards or pe-

Workstation clusters preserve all the functions of a personal computer.

ipherals to an IBM or IBM-compatible personal computer. These popular methods allow end users to configure systems themselves or expand systems originally configured by a system integrator. System integrators, of course, employ a wider variety of methods.

For example, you can build from the ground up by starting with a motherboard from companies such as Faraday Electronics, Sunnyvale, Calif.; Mostron Inc., Milpitas, Calif.; Seattle Telecom & Data Inc., Redmond, Wash.; and Wave Mate Inc., Hawthorne, Calif. The objective here is not to structure just another compatible clone, but rather to create a custom product that might neither look nor act like a personal computer, but which is nevertheless fully PC or PC-AT compatible.

Or the system integrator may turn to one of the new "PC OEMs" such as OEMtek, San Jose, Calif., and Personal Computers Products Inc., San Diego. These companies offer a variety of "mix-and-match" PC-compatible kits, which offer system integrators a wide selection of

boards, monitors, keyboards and disk drives (MMS, August, Page 89).

Yet another approach begins with an expansion unit and adds boards, disk and tape drives, monitors and keyboards. Expansion units, when combined with multiuser and multitasking software, suit workstation clustering—an option that allows integrators to configure multiuser systems using the PC and/or the PC-AT bus. Vendors producing these products are: Advanced Digital Corp., Huntington Beach, Calif.; Alloy Computer Products Inc., Framingham, Mass.; Anex Technology Inc., Congers, N.Y.; PC Technologies Inc., Ann Arbor, Mich.; and Sritek Inc., Cleveland.

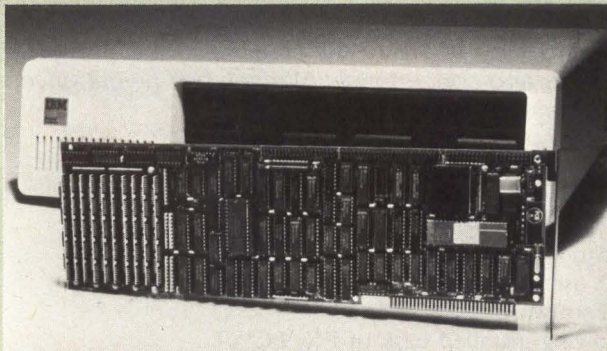
Clustering considered

Workstation clusters are neither single-user nor multiuser systems, but lie somewhere in between. They preserve all the functions of a personal computer and add capabilities usually available through a local area network or a multiuser system. Unlike PC LANs, workstation

Variations on the motherboard theme

Looking for a way to get PC-AT performance without buying an IBM Corp. PC-AT or compatible? Consider upgrading by replacing the motherboard in a PC or PC/XT. In fact, you may wish to go even further by choosing a processor that doubles PC-AT performance.

Seattle Telecom & Data Inc., Redmond, Wash., is currently offering both single-user and multiuser versions of its PC-286, an Intel Corp. 80286-based add-in board aimed at PC and PC/XT systems. Both



The PC-286 add-in board from Seattle Telecom & Data is available in two versions and offers a choice of 80286 CPUs. A single-user 6-MHz PC-286 with 640K bytes of RAM is priced at \$1,995. A multiuser 6-MHz PC-286 with 2.5M bytes of RAM is priced at \$3,575.

versions are available with 6-, 8- or 10-MHz 80286s. With 6 MHz, CPU speed is 30 percent faster than an IBM PC-AT; an 8- or 10-MHz 80286 increases CPU speed by 50 percent and 100 percent respectively. The single-user, 6-MHz version with 640K bytes of RAM sells for \$1,995; with 2.5M bytes, the price is \$3,575.

The installation of the PC-286 does not require removal of the entire motherboard. Instead, the only item that must be removed is the Intel 8088 microprocessor. Using a 40-10 cable, the 8088 socket is connected to the PC-286 board, which resides in one of the PC or PC/XT expansion slots. Because the PC-286 contains its own high-speed RAM, the RAM chips on the motherboard are disabled and the user may choose to unplug these chips for use on some other board.

The multiuser version of the PC-286 does not include multiuser, multitasking software. Seattle Telecom recommends Multi-Link from Software Link Inc., Atlanta. Multi-Link, an enhancement to PC-DOS, provides a multiuser, multitasking environment by using the same time-slice algorithm technique found in Multi-DOS from Anex Technology Inc., Congers, N.Y. Unlike Multi-DOS, Multi-Link has been written for RS232-based ASCII terminals and may also be used in an RS232-based, server/satellite local area network implemented with Software Link's LAN Link architecture.

Say good-bye to code...



FOREVER !

APPGEN™

Development without programming.

Thanks to APPGEN, UNIX business applications can be developed without programming. So you can throw away those long COBOL listings, and say good-bye to complex, cumbersome code.

APPGEN from Software Express lets you create any application by answering a series of English-language prompts, and eliminates debugging and recompiling. As a result, you can develop serious business applications **20 times faster than with COBOL.**

Hundreds of installations on 50 different UNIX and XENIX machines have proven that APPGEN can help you be more productive, and more profitable.

Come see for yourself how APPGEN can save you time and money. Call **(800) 231-0062** to make reservations for any of the following APPGEN seminars:

Sept. 10	Chicago	Oct. 4	Boston
Sept. 11	Dallas	Oct. 9	San Francisco
Sept. 24	Washington, D.C.	Oct. 10	Los Angeles
Oct. 2	Philadelphia	Oct. 17	Atlanta

SOFTWARE EXPRESS

2925 Briarpark, #700, Houston, TX 77042 (713)974-2298

UNIX is a trademark of AT&T Bell Labs XENIX is a trademark of Microsoft
APPGEN is a trademark of Software Express

CIRCLE NO. 67 ON INQUIRY CARD



"LATER" IS TOO LATE.

The window of opportunity in voice applications processing is wide open.

The billion-dollar digital voice processing market is emerging now. As an aggressive PBX or computer OEM, are you ready to get your share?

You can be—if you start now by investigating the new DSC-2000 VoiceServer™ from Digital Sound Corp. It's the only available all-digital end-to-end applications processing system optimized for real-time voice capabilities. And it's got some powerful advantages going for it.

EARLY MARKET ENTRY R&D in voice processing is costly and time-consuming. But at DSC, our scientists have years of hardware and software experience in speech processing, minimizing your product development time.

And because the VoiceServer uses only industry-standard computer and telephony interfaces, integrating it into your system is easy.

PRODUCT EXCLUSIVITY You don't want another "me too" product. With the VoiceServer's Open System Architecture™, Multibus and UNIX System V software, customization becomes simple. And our software packages for voice mail/file applications are just a starting point. Off-the-shelf software makes it easy to add concurrent voice, data and communications processing.

OBSOLETE PROOF DSC is already developing the next generation of digital voice applications: converting text to voice, recognizing spoken commands, and more. You can offer these enhancements to VoiceServer users as future options—without obsoleting your customer's system. Result: extended product life-cycle plus additional revenues for you.

MAXIMUM PROFITABILITY The VoiceServer costs about a fifth as much as other systems that don't do nearly as much. It delivers high-quality digitized speech at a third the bit rate of competitive products. It cost-effectively handles 200-4,000 stations.

Put all these figures together, and they spell low costs, and high profits for PBX or computer OEMs. We wouldn't want it any other way.

The window of opportunity in the digital voice applications market is wide open right now. Better call DSC and start locking in your share.



VOICESERVER™ by



Digital Sound Corporation
2030 Alameda Padre Serra
Santa Barbara, CA 93103
(805) 569-0700

Open System Architecture is a registered trademark of Digital Sound Corporation. Multibus is a registered trademark of Intel Corp. UNIX is a trademark of AT&T. ©1985 Digital Sound Corp.

CIRCLE NO. 68 ON INQUIRY CARD

clusters are created by attaching remote users—equipped with either a dumb ASCII terminal or a red-green-blue monitor and keyboard—to an expansion unit that, in turn, is attached to a host IBM PC, PC/XT, PC-AT or compatible.

Each workstation-cluster vendor has its own method of creating a multiuser, multitasking environment. Anex, for example, provides a software package for a PC-AT host—called Multi-DOS—that allows up to eight users to share the Intel Corp. 80286-based computer's processing power, storage and application software. By using a time-slice algorithm that connects and disconnects each user 50 times per second, Anex's Multi-DOS makes the system's original DOS think it is seeing only one keyboard, one video adapter and one bank of memory at a time. Anex has also rewritten the screen-handling routines and disk I/O so DOS, running under Multi-DOS, executes two times faster than without it. The combined time-slice algorithm and enhanced routines provide a response time so fast that it appears each user has

an 80286-based computer.

Multi-DOS also allows a user to access files created by other system users via a simple request by file name. Because only one user is connected to the 80286 at a time, there is no contention for the disk drive. By using an optional software package, users may also automatically lock files or records and assign passwords.

Instead of sharing the processor of the host personal computer, other workstation-cluster vendors add more processors. For instance, Alloy's PC-Plus dedicates an 8-MHz Intel 8088-based slave processor board to each user. (Advanced Digital offers these same slave boards under a license from Alloy.) To share files and data, as well as system resources such as disk drives, tape drives, printers and modems, Alloy's PC-RTNX software converts the host system's processor into a cluster master.

In a PC-Plus system, the host processor functions as the master I/O controller, allowing slave-board users to transparently access system

Some system integrators avoid selling hardware altogether.

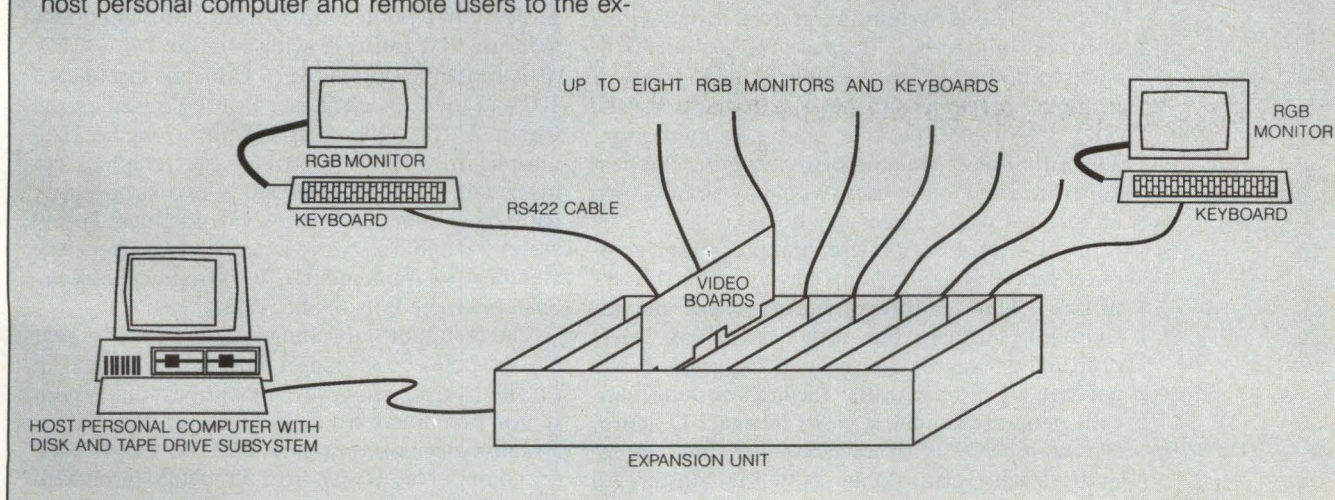
Workstation clusters—configuration choices aplenty

Workstation-cluster vendors provide only a small portion of the hardware required to configure personal computer-based multiuser systems. This restriction gives system integrators an opportunity to increase their profit margins by adding some or all of the necessary hardware items. Although the specific hardware required will vary among the workstation-cluster vendors, the Multi-AT from Anex Technology Inc., Congers, N.Y., serves as a useful example.

The only hardware items that a system integrator must purchase from Anex are an expansion unit and cables. The cables connect the expansion unit to the host personal computer and remote users to the ex-

pansion unit. All other hardware items may be provided by system integrators or end users.

Remote users on a Multi-AT system connect to the expansion unit using Anex's shielded twisted-pair RS422 cables (up to a maximum length of 500 feet). Each remote user must have an red-green-blue monitor, a keyboard and a video card placed in the expansion unit. The selection of each of these items is left to the system integrator along with the choice of the host (either an IBM PC-AT or compatible) plus any host add-in boards (RAM, Modem, PC Network interface) and add-on peripherals (disk and tape drives).



A notable disadvantage of the software-only approach is that system integrators must forgo the opportunity to profit on hardware sales.

resources while running PC-DOS or MS-DOS programs on their individual processors. Besides supporting selective file and record locking, Alloy's PC-RTNX software provides password facilities and allows disk volumes to be "hidden"—known only to a select group of users.

Still another method of creating a multiuser, multitasking environment on a host PC is to add a processor board set to the host plus a multiuser operating system. In these board sets, PC-DOS and MS-DOS programs run as "guests" under the host operating system. A major advantage of these products is that they offer software migration paths. For example, a user currently employing Ryan-McFarland Corp.'s RM COBOL programs and Commerical Operating System (RM-COS) on a minicomputer can now port those programs to a workstation-cluster system.

Examples include two products from Sritek, one based on the Motorola Inc. 68000 available with either RM-COS or UNIX System V, and another based on National Semiconductor Corp.'s 32016 and its GENIX 4.1 BSD operating system. In addition, PC Technologies offers an Intel 80186/80286-based board set using an operating system derived from Digital Research Inc.'s Concurrent DOS 3.1.

Is there a price advantage to clusters compared with a PC LAN? Absolutely. An eight-user workstation cluster can be configured for about half the cost of eight personal computers connected to a PC LAN. Because a variety of ways exist to configure workstation clusters—often mixing and matching items from a collection of vendors—workstation clustering is a task best handled by system integrators (see "Workstation clusters—configuration choices aplenty," Page 121).

Some integrators offer software only

Even with the hardware integration options available, some system integrators avoid selling hardware altogether. Because the system hardware components are available from a variety of vendors, software-only system integrators sell only a software package and documentation. This situation leaves the task of finding the best hardware deal to the user (who may already own all or most of the necessary items).

Several vendors of microcomputer-based computer-aided design systems have chosen this approach. Their software packages are neither solid nor surface, but rather so-called 2½-D drafting packages. In these packages, all the geometry is 2-D with the facilities to automatically generate isometric views from a 2-D figure. For example, Datagraphic Systems Inc., Plymouth, Mich., claims that its CAD Master 2.0

package can generate 1,000-line drawings in less than 4 minutes on the IBM PC-AT.

A nifty marketing tool used by many software vendors involves a self-demonstration kit. For example, ask for CADKEY, a package from Micro Control Systems Inc., Vernon, Conn. You will receive a kit containing two disks and complete demonstration instructions.

The instructions itemize the hardware required and guide the user through a routine that adapts the CADKEY program to the user's system configuration. (CADKEY supports the IBM PC, PC/XT, PC-AT and a variety of compatibles as well as a variety of monitors, graphics adapter cards and digitizers.) After system configuration, the user can view several self-running demonstrations. Then, the user can perform a hands-on session that presents the building blocks of the program. Next, the user can create custom drawings. Of course, the demonstration software does not allow drawing storage. To obtain that capability, users must purchase the package.

The software package/demo kit approach offers system integrators three key advantages. First, it avoids the problems of carrying a hardware inventory. Second, users feel they get the best hardware deal because they selected the hardware from a variety of products. And third, the demo kit allows the user to see the configuration in action before purchasing the software.

A notable disadvantage of the software-only approach is that system integrators must forgo the opportunity to profit on hardware sales.

Unlimited combinations beckon

A popular technique for combining hardware and software consists of bundling software along with an add-in card and a peripheral. Concept Technologies Inc., Portland, Ore., chose this technique. The company's Concept System, a professional publishing workstation, integrates Concept 100 software with an IBM PC, PC/XT or compatible computer, a Concept Graphcard 100 and the Concept Laser Printer, based on the Canon U.S.A. Inc. LBP-CX print engine. The Graphcard 100 is an 80186-based graphics coprocessor board that includes two proprietary gate-array chips and the ANSI graphical kernel system standard and virtual device interface standard as implemented by Graphic Software Systems Inc., Wilsonville, Ore.

The resultant publishing system combines text and graphics on screen exactly as they appear in finished form. However, this publishing system is not precluded from performing other tasks. Because the host system is an IBM PC, PC/XT or compatible, it can run PC-DOS- and MS-

It's not that COMPAQ is the fastest growing computer company in the world...

It's why.

In 1983, COMPAQ[®] Computer Corporation had the most successful first year in the history of American business. Last year, our sales grew over 196%, making COMPAQ the world's fastest growing computer company.* And this year we're setting more records.

The reason is simple. Our computers simply work better.

For example: Most manufacturers mount disk drives in a rigid manner that could destroy data if the computer is bumped, but COMPAQ protects all disk drives (and their data) with shock mounts. Not just in our portables, but in our desktops, too.

We probably don't have to go to these lengths. But we do. In every detail.

Our exclusive internal tape backup system can protect Megabytes of data in minutes instead of hours.

Our computers can run the world's largest library of business software.

And now our two newest products, the COMPAQ PORTABLE 286™ and COMPAQ DESKPRO 286,™ offer more speed, more storage, and

more memory than ever.

Our refusal to compromise is why COMPAQ computers are rated so highly by industry trade publications and over 300,000 satisfied users.

Visit an Authorized COMPAQ Dealer near you and you'll see what has become apparent to buyers all over the world: COMPAQ computers simply work better.

For a free brochure or the location of your nearest Autho-

rized Dealer, call toll-free 1-800-231-0900 (in Canada 416-449-8741) and ask for operator 8.

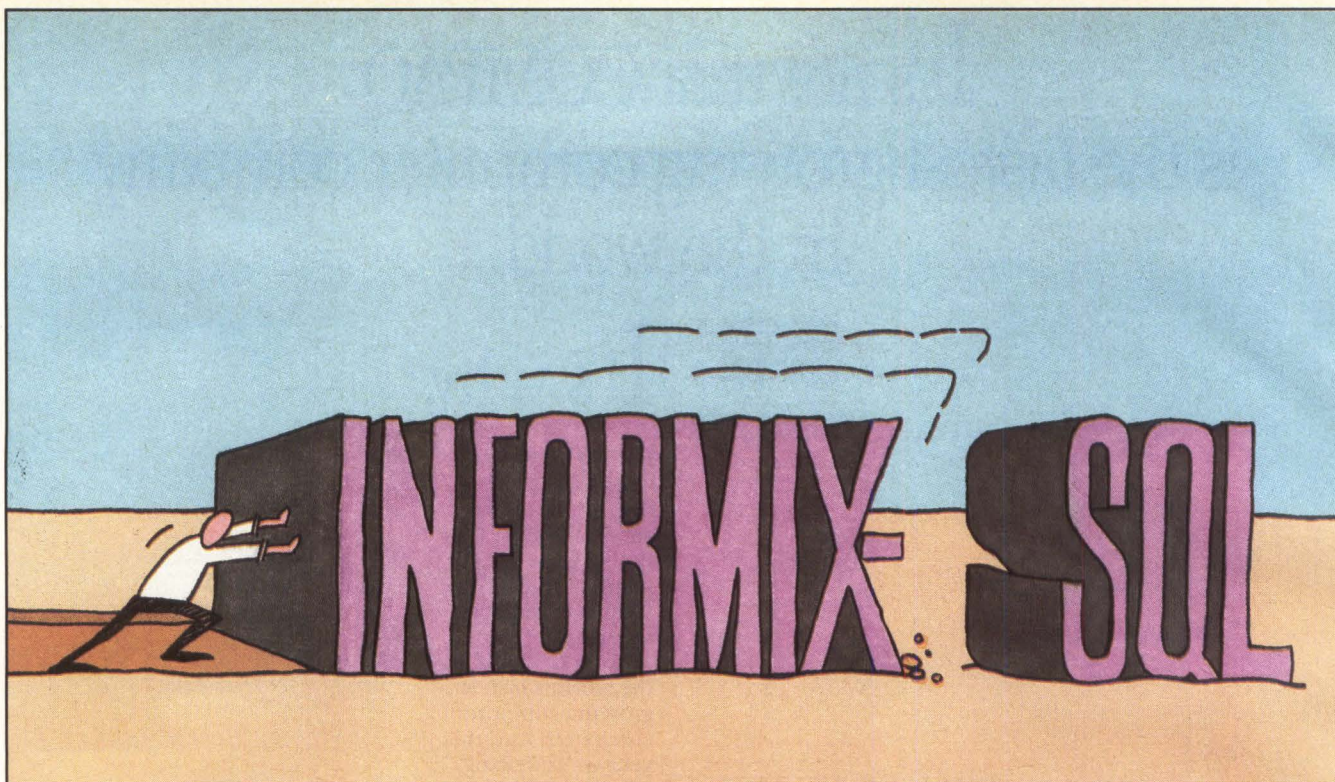
©1985 COMPAQ Computer Corporation. All rights reserved.

*Source: Datamation Magazine, June 1, 1985.



It simply works better.

COMPAQ[®]



How we improved Structured Query Language.

our products, but you can buy it separately. And when you choose RDS, you'll be in the company of some other good companies. Computer manufacturers including AT&T, Northern Telecom, Altos and over 60 others.

Actually, we didn't change a thing. We just combined it with the best relational database management system.

Introducing INFORMIX[®]SQL.

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

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

Like our embedded SQLs for C and COBOL. So you can easily link your programs with ours. File-it![™] our easy-to-use file manager. And C-ISAM[™], the de facto standard ISAM for UNIX. It's built into all

And major corporations like Anheuser Busch, First National Bank of Chicago and Pacific Bell.

Which makes sense. After all, only RDS offers a family of products that work so well together. As well as with so many industry standards.

So call us for a demo, a manual and a copy of our Independent Software Vendor Catalog. Software vendors be sure to ask about our new "Hooks" software integration program. Our number: 415/424-1300.

Or write RDS, 2471 East Bayshore Road, Palo Alto, CA 94303.

And we'll show you how we took a good idea and made it better.

INFORMIX is a registered trademark and RDS, C-ISAM and File-it! are trademarks of Relational Database Systems, Inc. IBM, UNIX and MS are trademarks of International Business Machines Corporation, AT&T Bell Laboratories and Microsoft, respectively. © 1985, Relational Database Systems, Inc.



RELATIONAL DATABASE SYSTEMS, INC.

DOS-based third-party software as well as take advantage of other add-in boards.

Another technique centers on forming an informal consortium of third-party vendors to configure workstations. Complete Technologies Corp. (CTC), Flint, Mich., pulled together a collection of vendors to provide products for CTC's System 5000/GWS, an IBM PC-AT-based graphics workstation that competes with IBM's own 3270 PC/G and PC/GX.

Aimed at automotive, industrial and laboratory engineers, the System 5000/GWS can download mainframe graphics files from IBM's Graphical Data Display Manager (GDDM), process the files locally in the workstation and upload the enhanced GDDM file back to the host mainframe. (GDDM is an "access method" programming technique created by IBM to store and receive graphics files on IBM host computers, the 3270 PC/G and PC/GX, and 3279-compatible graphics terminals.)

The key to System 5000/GWS is Enterconnect and Entergraphics software developed by Entertronics Research Inc., St. Louis. IBM contributed to the development of these products by providing sample GDDM files. IBM's 3270 PC/G and PC/GX use Enterconnect to load GDDM files into Entergraphics, which can then enhance the basic GDDM file by graphing data input from Lotus Development Corp.'s 1-2-3, Microsoft Corp.'s Multiplan or Paladine Software Corp.'s VisiCalc.

To develop the System 5000/GWS, Entertronics Research, in cooperation with Vetric Corp., Greensboro, N.C., modified its software so it would work with Vetric's VX/PC graphics board. CTC then integrated the Vetric VX/PC graphics board and the Forte-PJ 3270 emulation board, from Forte Data Systems, San Jose, into the IBM PC-AT along with Entertronics Research's Enterconnect and Entergraphics software.

The product concept for the System 5000/GWS came from Complete Technologies. The company expects to sell initial quantities of the System 5000/GWS to automotive manufacturing companies.

Board vendors cooperate

Unlike the early days of the personal computer business, add-in board manufacturers clearly recognize the opportunities presented in the value-added reseller channel. In addition to their marketing efforts in the retail and mail-order channels, many personal computer board manufacturers have created organizations to serve system integrators and computer manufacturers.

For example, AST Research Inc., Irvine,

Calif., manufacturer of a wide variety of personal computer add-in boards, has recently added an OEM Systems Group. The new organization is currently working with both computer manufacturers and system integrators to offer AST's engineering and manufacturing services in addition to AST products.

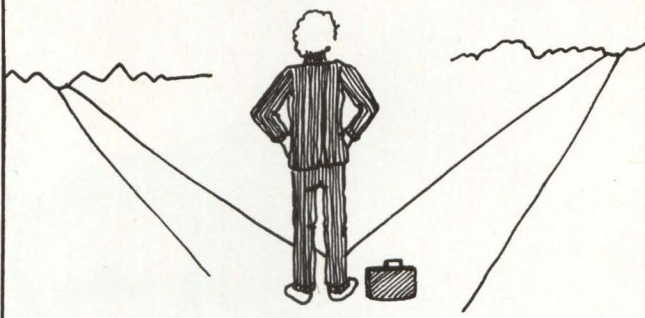
For large OEMs, AST's Systems Group will design and manufacture products on an exclusive basis. For other volume customers, the group will modify existing products, allowing system integrators to offer unique add-in board products. A good example of the latter category is the addition of software created by system integrators and placed on the board in the form of firmware ROMs.

The PC and PC-AT bus infrastructure clearly offers a multitude of choices. And, as it continues to grow, so do the chances that there is a combination that is just right for you. □

Another technique for combining hardware and software centers on forming an informal consortium of third-party vendors to configure workstations.

Interest Quotient (Circle One)
High 483 Medium 484 Low 485

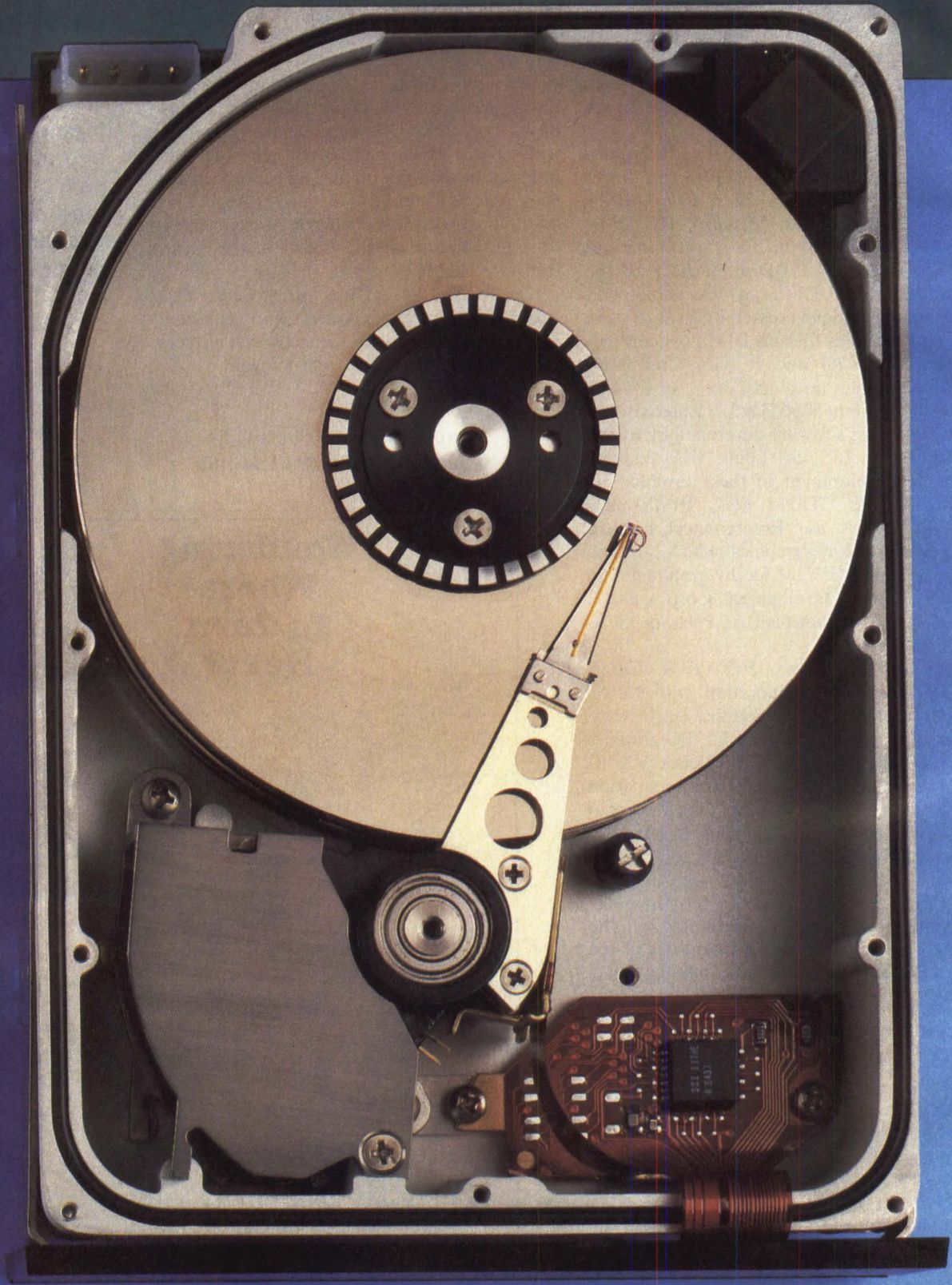
**Wondering
Where
To Turn
Next?**



**Turn To
Mini-MicroSystems
Career
Opportunities
Section**

CIRCLE NO. 71 ON INQUIRY CARD

Our brain



child.

Announcing the Q200™ intelligent disk drive.

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

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

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

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

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

Please call us for more information.

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

Quantum

CIRCLE NO. 72 ON INQUIRY CARD

IN THE BUSINESS WORLD, "BEAT THE CLOCK" ISN'T A GAME.

DELTA AIR EXPRESS. GUARANTEED SHIPMENT ON THE FLIGHT SPECIFIED.

The pressures of doing business are bad enough. Without having to worry about time running out, when your package has got to be there.

So take the easy way out. Delta Air Express.

Because you know that we'll get that shipment on the flight specified.

Or you'll pay the lower, regular freight rate. Guaranteed.

But what about the time wasted taking the package to the airport? Or arranging for a courier service?

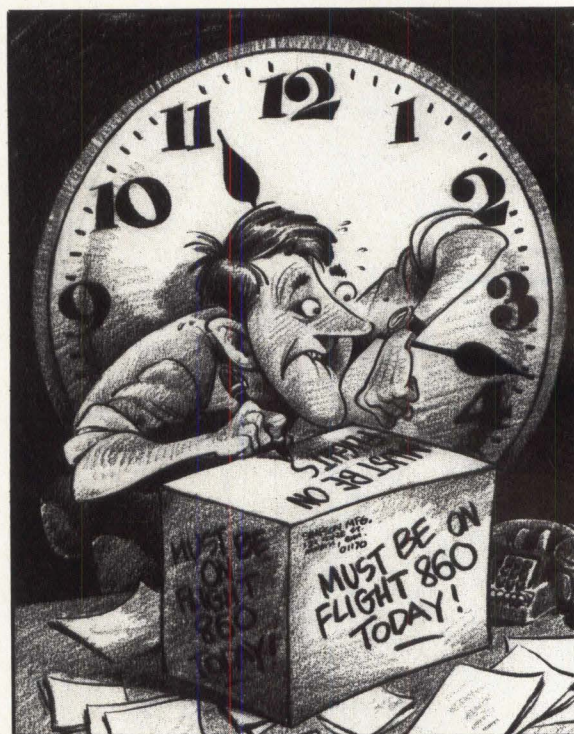
We've got that covered.

DOOR TO DOOR PICK UP AND DELIVERY.

Delta Air Express offers you door to door pick up and delivery. As well as airport to airport service. Leaving you time for more profitable matters.

Or a chance to leave the office at a decent hour for a change.

And Delta Air Express delivers all over the U.S. To 100 cities, 10,000 communities.



No shipment is too small. And you'd really have to make an effort to find a shipment too large for us.

Plus, we offer you other reliable freight services—like Delta DASH® for the same day delivery of packages under 70 lbs.

Let Delta take the load off your back. Contact your local Delta Air Cargo Office.

With Delta Air Express, time is on your side.



AIR EXPRESS. DELTA TAKES IT THERE.®

TOP 32-BIT BUSES CLAIM MULTIPROCESSING EDGE

Backers of Multibus II and VMEbus concede little merit in each other's systems in asserting multiprocessing superiority based on operating modes and arbitration methods

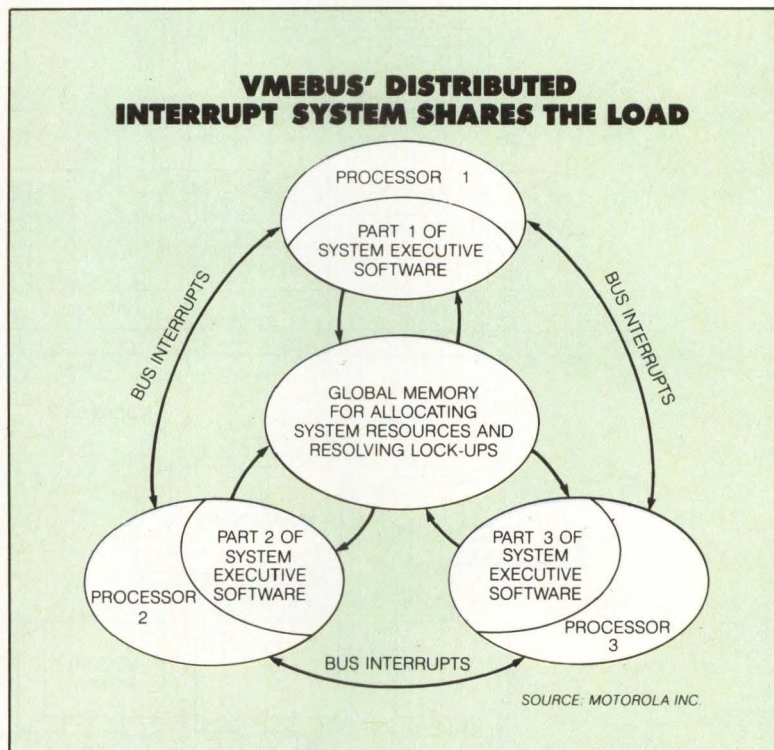
Jesse Victor, Associate Editor

The "bus war" is heating up. In their quest for market share, vendors of Multibus II and VMEbus products are becoming more strident in broadcasting claims of superiority. They tend to find multiple virtues, and no faults, in their respective buses' ability to handle the rigorous demands of multiprocessing systems. In reality, however, both buses have operational pluses and minuses associated with synchronous or asynchronous operation and different methods of arbitration.

Multibus II's primary bus, the parallel system bus (PSB), is synchronous and multiplexed. VMEbus' system bus, also called the VMEbus, is asynchronous and non-multiplexed. Multiplexing enables Multibus II to pack all the PSB's address and data lines into one 96-pin DIN connector; the VMEbus requires two connectors to implement 32-bit data transfers. Multiplexing also cuts in half the number of high-current drivers needed for the interface, reducing a Multibus II board's power requirements.

Multibus II vendors point out that the term "synchronous operation" can be easily misinterpreted. It does not mean that the bus clock controls all the devices on the bus or that they

This is the second of two articles comparing Multibus II with VMEbus. The first article appeared in the August issue of Mini-Micro Systems and focused on interrupt handling, message passing and 32-bit single-board-computer-based products.



A distributed-interrupt system apportions interrupt-handling tasks among processors for multiprocessor VMEbus systems. VMEbus' seven prioritized interrupt request lines are distributed among interrupt handlers on each processor board. Message passing among processors using the global memory prevents "lock-ups"—simultaneous attempts to access the same resource, such as a disk controller.

must run at the same clock rate. Processor and other boards on the bus must, however, synchronize with the system clock to transfer data.

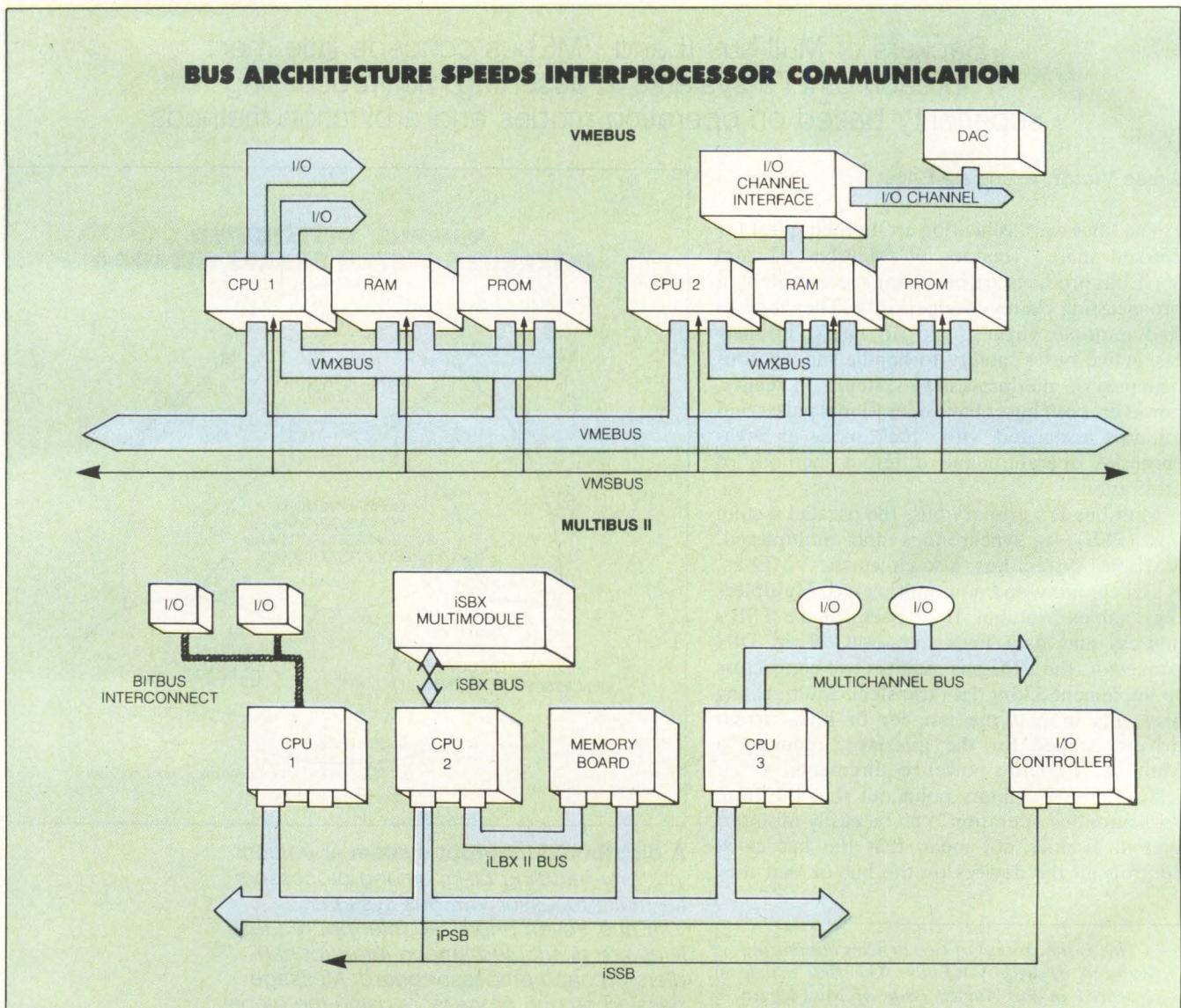
The case for synchronous

Multibus II advocates claim numerous benefits from the bus' synchronous operation, including higher reliability and noise immunity, enhanced data integrity and device testability and easier bus interface design.

"The synchronous protocol defines the sampling time when signals are sensed on the bus to an 8-nsec window," explains Joel Barthmaier, Multibus II marketing product manager at Intel

Corp., Hillsboro, Ore. "You are thus sampling the bus and making yourself vulnerable to noise bursts from external events, such as induction motors turning on, only approximately 8 percent of the time. You have higher reliability with a synchronous protocol." In contrast, asynchronous buses, claims Intel's technical marketing manager John Beaton, are vulnerable to noise at almost any point in a data transfer because each rising or falling edge on every control line has some significance.

Synchronous operation and parity checking are major factors in increasing Multibus II's reliability, asserts Jeff Roloff, president of Multi-



VMEbus and Multibus II architectures handle the demands of multiple processors and peripheral boards by assigning interprocessor communications

to the primary system buses (VMEbus; iPSB) and off-loading memory and I/O transfers to auxiliary data paths.



The UPS manufacturer that satisfies the toughest customers.

Some UPS manufacturers have two standards of quality—the ultra-exacting quality specifications for their government contracts, and the “other” quality they give their commercial customers. But not at GPS.

At General Power Systems, we know that only one customer is tougher than Uncle Sam—you, the OEM. That's why *all* GPS uninterruptible power supplies, both on-line and standby, are designed, produced, tested and inspected with the same stringent standards applied to our defense products. Components are traceable, reporting is exact, testing is multi-level and burn-in complete.

The result is the highest quality standards in the industry's most complete line of UPSs—the only UPS products directed specifically to OEM requirements. GPS on-line models span the range from 500VA to 50KVA, while standby units from 100VA to 2KVA are available. Inquire about our full line of options plus OEM customization.

All GPS uninterruptible power supplies have the high reliability, transistor technology pioneered by GPS, plus state-of-the-art operating features. Unusually fast transient response, low output impedance and excellent efficiency characterize the on-line models. Standby units have set the standard with 2ms transition time.

So don't settle for second rate quality. Buy the UPSs that satisfy the toughest customers—*designed for the OEM by General Power Systems.*

Call or write today for complete information. General Power Systems, 1400 N. Baxter St., Anaheim, CA 92806-1201, (714)956-9321, (800) 854-3469, TELEX 182283.



GENERAL POWER SYSTEMS

A Division of ALS Corporation

CIRCLE NO. 73 ON INQUIRY CARD

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

Increased data reliability through Trellis coding.

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

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

It's reliable. With Trellis coding for error-free communications. Erroneous noise is canceled in the receiver because the Trellis-coded modulation in the transmitter adds redundancy to the signal.

Possible bit errors are corrected over the line by a Viterbi algorithm scheme in the receiver. And the M1926L is designed for OEMs only. So your concerns always come first with us.

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

Seven LEDs, six network test loops and an integral test pattern generator and bit error rate detector perform diagnostics without external equipment or remote operators.

This kind of quality and customer care has made Fujitsu a world leader in data communications for more than 20 years. For modems you'll be proud to put your name on, call us at 408-946-8777.



FUJITSU

FUJITSU AMERICA, INC.
DATA PRODUCTS DIVISION
3055 ORCHARD DRIVE
SAN JOSE, CA 95134

CIRCLE NO. 74 ON INQUIRY CARD

bus II board vendor, Central Data Corp., Champaign, Ill. "We have a lot of large OEM customers. They are very concerned about reliability and serviceability and what features the next bus generation will add in those areas."

Roloff argues that synchronous operation increases reliability by eliminating unstable or metastable states. "When you have two signals that come in asymmetrically, randomly with respect to each other," he explains, "you have to synchronize them to determine which came in first, a typical arbitration problem." Thus, when several boards arbitrate to control the bus, Roloff notes, there is always going to be some question of "whether or not an unstable state will be settled out, depending on the time you take for arbitration."

If you take a sufficiently long time, Roloff adds, the probability of such a state will be low. But there is a trade-off between making the arbitration time shorter and reducing the probability to zero. Beaston echoes this assessment: "In asynchronous buses, metastable problems can pop up virtually anywhere in the bus interface depending on transfer and edge rates."

A synchronous bus is also more reliable, Roloff claims, because it allows all modules on the bus to be designed for a specific frequency of operation, the bus clock rate. "No glitches appear on the bus because everything is changing with respect to the same clock."

Testing seen easier

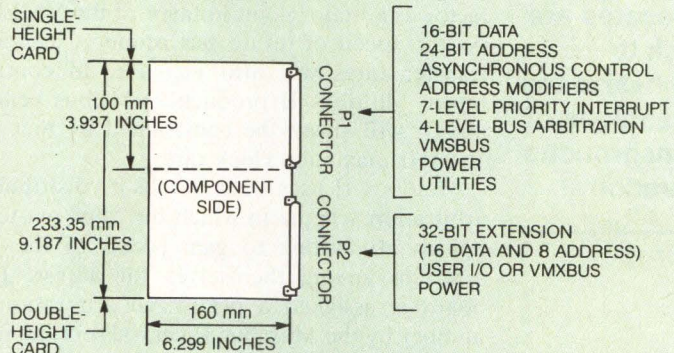
Synchronous operation, Multibus II backers point out, also makes it easier to test board-level systems using standard logic analyzers, and it permits all of a vendor's new boards—or upgrades to existing products—to be designed around a bus' selected clock frequency.

Synchronous bus interfaces are easier to design, says Beaston, because synchronous clocking makes it easier to take advantage of "top-down," structured design methods using computer-aided design and to implement VLSI components such as Intel's bus arbiter/controller and message interrupt controller.

That a synchronous bus interface is easier to design is one assessment, at least, echoed by a VMEbus vendor, Motorola Inc. Its publication, "A Microcomputer System Bus Technical Comparison," notes: "There is a drawback to an asynchronous system. More thought must be given to the design of an asynchronous interface than a synchronous one. The asynchronous interface is event-driven and requires experience in designing 'cause-effect' type logic to properly design boards."

VMEbus advocates are quick to emphasize

VMEBUS USES TWO CONNECTORS FOR 32-BIT TRANSFERS



SOURCE: MOTOROLA INC

The P1 connector on a VMEbus' single-height card furnishes non-multiplexed 16-bit data and 24-bit address paths, VMSbus signals and control and utility lines. A double-height card adds the P2 connector for 32-bit addressing and data.

the advantages of asynchronous operation and some of the drawbacks of a synchronous system. Both Multibus II and VMEbus claim to be processor independent, enabling single-board computers from different manufacturers running at different clock rates to operate on the bus. Asynchronous buses, VMEbus backers point out, allow each processor in a multiprocessor system to transfer data at its fastest possible rate. However, Multibus II and other synchronous buses require, for example, a 16-MHz Motorola 68020 to synchronize with Multibus II's maximum PSB clock rate of 10 MHz to transfer data, degrading data-transfer performance.

"It's like trying to take two spinning gear wheels and push them together," comments John Black Jr., manager of the systems and technology group at Motorola Microsystems Inc., Tempe, Ariz. "There is a delay involved in the synchronization process."

A synchronous bus could also impose a delay in a data transfer between a device controlling the bus, the current bus master, and a responding slave device, Black argues. "On synchronous buses, responses can occur only concurrently with the clock edge, which means that if you miss the clock edge on the slave, you have inserted a wait state of 100 nsec because you have to wait for the next one."

An asynchronous bus adapts itself better to new technology, Black asserts, because as in the

VMEbus advocates are quick to emphasize the advantages of asynchronous operation.

preceding example, the response time depends only on the responder rather than on a fixed protocol imposed by the bus. Black sees this factor as a major point in favor of the VMEbus: As the speed of future bus products increases, transfer rates will also increase. In contrast, future Multibus II products, VMEbus vendors assert, will always be constrained by that bus' 10-MHz maximum clock rate.

Multibus II uses what it calls a "distributed" arbitration scheme in which the "bus masters," boards attempting to gain access to the bus, arbitrate among themselves for access. Each board is assigned a prioritized arbitration ID number by the Multibus II central services module (CSM). During the resolution phase of the arbitration cycle, the board with the lowest number (highest priority) normally gets control of the bus first. When the first bus master begins its last data transfer, the remaining masters will re-arbitrate for bus control on the basis of priority. In high-priority mode, a board can force itself into the next resolution phase and, therefore, gain control of the bus before other requesting boards, regardless of their priority.

VMEbus' arbitration method is "centralized," to the extent that one global arbiter board, in

slot one of the card cage, handles bus-access requests over dedicated, daisy-chained bus-request and bus-grant lines to the other boards' requester circuitry. Boards sharing the same bus-request line are given priority by their slot position.

Intel claims Multibus II's arbitration scheme better suits the needs of multiprocessor systems. These systems can handle as many as 20 potential bus masters without the restrictions of dedicated lines because Multibus II's "no-starvation policy" of arbitrating bus requests means that each board has an equal opportunity of gaining access. VMEbus' "slot dependency," Intel charges, can allow an active board near the top of the daisy chain to lock out bus access from a board lower down. In addition, Intel says, Multibus II's distributed architecture is more tolerant to system faults or failures.

VMEbus defends its arbitration scheme

VMEbus vendors dispute these claims, calling some of them a matter of semantics. Schlomo Pri-Tal, staff engineer in Motorola Microsystems systems and technology group, denies that a board far down in the VMEbus daisy chain might never get serviced. "The only way a board


Separate buses reduce throughput bottlenecks

VMEbus and Multibus II use multiple buses serving dedicated functions to ensure the high throughput afforded by 32-bit-wide data paths. An upgrade of the 16-bit Multibus I, Multibus II includes five buses in its specification; VMEbus four. But there are functional similarities between them. Both have a parallel system bus (iPSB, VMEbus) for interboard communications and data movement, a local high-speed bus extension to memory (iLBX, VMXbus) and a lower cost serial alternative to the parallel system bus (iSSB, VMSbus).

Multibus II carries over two buses unchanged from Multibus I: the iSBX I/O expansion bus, permitting the addition of multimodules to processor and other system boards, and the Multichannel I/O bus for direct-memory-access block transfers to intelligent I/O devices.

VMEbus' I/O Channel, which serves local I/O expansion up to 12 feet, is similar to Multibus II's iSBX. Although not part of the Multibus II specification, Bitbus is designed for local industrial I/O to 30m using a synchronous data link control-like protocol and twisted-pair wiring.

	Function	Maximum data rate (bytes per sec.)	Type	Data width (bits)
Multibus II				
iPSB	parallel system bus	40M	synchronous, multiplexed	32
iLBX II	local high-speed memory extension	48M	synchronous, nonmultiplexed	32
iSBX	local I/O expansion	10M	asynchronous, nonmultiplexed	16
Multichannel I/O	remote DMA	8M	asynchronous, multiplexed	16
iSSB	lower cost serial system bus	2M	CSMA/CD protocol	1
Bitbus	local industrial I/O	2.4M	protocol similar to SDLC	16
VMEbus				
VMEbus	parallel system bus	40M	asynchronous	32
VMXbus	local high-speed memory and I/O extension	80M	asynchronous	32
I/O Channel	local I/O expansion	2M	asynchronous	8
VMSbus	lower cost serial system bus	3M	token-passing	1



"THERE ARE
THOUSANDS OF THEM.
AND THEY'RE ALL HEADED
FOR CONCORD!"

"AND RIGHTLY SO.
THEY'VE GOT THE
BEST 2400bps MODEMS
AROUND."

H. Pyle. Victory Parade, 1783. Courtesy The Bettman Archive.

If you're ready to join the ranks of thousands who are saving time and money with 2400bps dial line communications, go with the leader—Concord Data Systems. Our CDS 224[®] is today's largest selling 2400bps modem, chosen by companies such as Tymnet,[®] ADP[®] Autonet,SM Dysan and others. Surprising? Not when you realize that Concord Data was installing thousands of 2400bps modems throughout the world before most companies had their products off the drawing board.

Concord Data modems are built to give you years of trouble-free service. Based on *proven* VLSI designs and Concord ingenuity, our modems pack more high-performance features and time-saving options than any other 2400bps dial line modem on the market. You can choose automatic dialing, error protection, statistical multiplexing and more. We have stand-alone units, plug-in PC-compatible cards, and industry's only single-card rackmount modem that operates at 2400, 1200 and 300bps. With prices starting at \$450*, Concord Data modems are not only your best bet, they're your best buy. To get in step with the communications leaders, call us at (617) 890-1394 or write 303 Bear Hill Road, Waltham, MA 02154, telex 951793.

Concord Data Systems

Leading the Communications Revolution

*CDS 224, single unit price. Quantity discounts available. 224 is a registered trademark of Concord Data Systems, Inc.
Sign up to win a CDS modem at TCA, Sept. 17-18, Booth #835-838
CIRCLE NO. 75 ON INQUIRY CARD



THE PERSONAL CHOICE OF ALL IBM COMPATIBLES

Facit 4509 has all the benefits of the standard IBM PC printer. And more.

What benefits?

Different fonts, bold, underline, pin graphics, etc. With a print quality that can either be medium resolution one-pass or higher resolution two-pass (vertical bold).

All the features provided by the IBM/Epson and Epson RX80 command sets. But with a higher throughput.

How high?

60 full 80-character lines per minute. With lasting print quality.

For how long?

The printhead lasts over 100,000,000 characters. This equals several years of

normal use. The ribbon life is also very long. It's good for over 4,000,000 characters. Part of our reliability plan.

What reliability plan?

Like all Facit printers, every 4509 is subjected to rigorous pre-delivery tests and quality control. Pound for pound, we use more metal in our designs than other makes. This is true for every PC printer in the Facit family.

What Facit family?

A family of PC printers that meets your requirements. Whatever they may be. At highly competitive prices.

How competitive?

Find out from your nearest Facit representative.

**Printer
Perfect** 

FACIT

*IBM is a trademark of International Business Machines Corporation.

Head Office: *Facit AB, S-172 91 Sundbyberg, Sweden. Phone: (8) 764 30 00. USA: Facit Inc. P.O. Box 334, Merrimack, NH 03054. Phone: (603) 424-8000*

AUSTRALIA: EAI Electronics Associates Pty Ltd., 427-3322. AUSTRIA: Ericsson Information Systems GmbH, 0222-613641. BELGIUM: Ericsson S.A., 02-2438211. CANADA: Facit Canada Inc., 416-821-9400. CYPRUS: LBM (Lillytos) Ltd 5164634. DENMARK: Facit A/S, 02-922400. FINLAND: OY Facit, 90-42021. FRANCE: Facit S.A., 1-780 71 17. GREAT BRITAIN: Facit, 0634-401721. GREECE: Computer Application Co., Ltd., 01-6719722. HONGKONG: Gilman & Co. Ltd., 5-7909555. ICELAND: Gisli J. Johnsen HF, 354-1731 11. INDIA: Forbes Forbes Campbell & Co. Ltd., 22-268081. IRELAND: Memory Ireland Computers Ltd., 1-989733. ITALY: Facit Data Products S.p.A., 039-636331. JAPAN: Electrolux (Japan) Ltd., 03-479-3411. THE NETHERLANDS: Ericsson Information Systems B.V., 03480-709 11. NEW ZEALAND: McLean Information Technology Ltd., 501-801, 501-219. NORWAY: Ericsson Information Systems A/S, 02-355820. PORTUGAL: Regisconta Sarl, 1-560091. SINGAPORE: Far East Office Eqpts Pte Ltd., 745 8288. SPAIN: Facit, 91-457 11 11. SWEDEN: Ericsson Information Systems Sverige AB, 08-282860. SWITZERLAND: Ericsson Information Systems AG, 01-39197 11. USA: Facit Inc., 603-424-8000. WEST GERMANY: Ericsson Information Systems GmbH, 0211-61 090.

CIRCLE NO. 76 ON INQUIRY CARD

can be prevented from getting on the bus," Pri-Tal insists, "is if, say, board number two generates more interrupt requests than can be handled by the system. But that is not a problem caused by the daisy chain but is a more general bus problem."

Pri-Tal also rejects Intel's assertion that distributed architecture is more tolerant to faults or failures. "Any board on Multibus II that holds one of the arbitration lines low is going to stop the arbitration system completely," he argues. "VMEbus, in fact, is more tolerant to that type of failure. The system can continue to use the remaining lines."

Pri-Tal claims greater flexibility for VMEbus' more centralized approach and detects problems in Multibus II's method. "Both buses allow arbitration to be performed in parallel with data transfers over the bus," he stresses. But for the Multibus II system to start arbitration, the CSM has to initialize all the boards on the bus. It's therefore not as decentralized as its advocates claim, Pri-Tal contends.

The "decentralization" issue, Pri-Tal maintains, centers on where you put the control logic that does the arbitration. Multibus II puts part of the logic on each of the boards in the system. But, he says, "VMEbus can claim the same. We have requester circuitry on each board that determines when the current bus master gives up the bus."

The main problem with Multibus arbitration, Motorola's Black insists, centers on block data transfer. Multibus II has no way to determine how many potential bus masters are arbitrating for the bus or how long each master will hold the bus, he says.

"There is no limit to the block-transfer cycle," Black argues. "Once a master gets on the bus, you are not going to be able to service any interrupts until the block transfer is completed. That can be a real problem for real-time applications."

VMEbus' strength, Black says, is in the flexibility of its arbitration scheme, which allows four priority levels and three modes: "prioritized," round robin and single level. Prioritized arbitration assigns the bus to the board driving the highest priority bus-request line. In round robin, the arbiter assigns access on a rotating-priority basis, from highest to lowest. Single-level arbitration serves one level of priority, relying on the daisy-chained bus-grant lines to determine the order in which boards get access to the bus.

In weighing the claims of bus advocates, system integrators will rely heavily on prior experience with VMEbus or Multibus I in choosing boards for a particular industrial, scientific or

business application.

"The people who will innovate with Multibus II or VMEbus's 68020 are the same people who have innovated with Multibus I and 68000 boards," concludes Joe Ramunni, manager of marketing at VMEbus and Multibus II board vendor, Heurikon Corp., Madison, Wis. "Multibus II will focus on very heavy processing requirements and target high-end applications, such as signal and image processing. VMEbus is well-accepted in industrial markets and will continue to have strength in these applications." □

Interest Quotient (Circle One)
High 486 Medium 487 Low 488

LOOKING AHEAD IN MMS

- The October issue will cover mass storage memories and add-in/add-on boards.
- The Fall issue of the Peripherals Digest will arrive in mid November.

Multibus II uses a 'distributed' arbitration scheme in which the 'bus masters' arbitrate among themselves for access to the bus.

This Publication is available in Microform.



University Microfilms International

Please send additional information

for _____ (name of publication)

Name _____

Institution _____

Street _____

City _____

State _____ Zip _____

300 North Zeeb Road, Dept. P.R., Ann Arbor, Mi. 48106

CIRCLE NO. 77 ON INQUIRY CARD

Major improvements have taken place in the networking industry over the last several months. At last there is a network standard. Best of all, the standard works well and satisfies virtually everyone.

The heart of the emerging standard is DOS 3.1, the latest version of Microsoft's popular microcomputer operating system.

DOS 3.1 has been enhanced with multi-user primitives that control access between the application and the network. Every LAN that supports DOS 3.1 must use this standardized interface. And, any multiuser software package written for DOS 3.1 will run on any LAN that supports DOS 3.1.

From the LAN vendor side, the strength of the new standard can be seen from the fact that nearly every major LAN company has indicated an intent to eventually upgrade to DOS 3.1 compatibility.

Similarly, applications developers are enthusiastically endorsing the standard. Prior to this time, LANs have each used a different application-to-network interface. Applications developers had to create and maintain a separate version of their software for every LAN they wished to support.

Under the new standard, developers can reach a very large market with a single version of their software. We at Novell, and virtually all other network observers, look for this standardization to be a strong inducement to developers to get more active in the area of multiuser packages.

Besides the application-to-network interface that's been standardized, the LAN operating environment has been standardized as well. DOS 3.1 compatibility requires a file server environment.

In the file server system, disk I/O is managed by the file server software running on a single machine. Workstations send requests to the file server, but only the file server actually talks to the disk and manages directories and file allocation tables. This centralized data management system maintains data integrity equal to that of mainframe systems.

Network Design

While DOS 3.1 has defined the LAN standard, its role in networking is often misunderstood. DOS 3.1 supports some

Setting the LAN Standard.

DOS 3.1 and IBM, Microsoft and Novell.

networking functions, but it is not a network operating system. Several other functions are needed in a full network operating system.

In a file server environment, the main components of the network operating system are the file server program and the redirector. The redirector intercepts application requests and routes them to the local operating system or to the network file server.

The file server program manages network resources, including disk I/O and network security. The file server design is especially important in network performance.

One design option is to run the file server as an application of DOS. Requests are sent to the file server, then processed through DOS and sent to the disk.

"While DOS 3.1 has defined the LAN standard, its role in networking is often misunderstood."

DOS has some drawbacks when it comes to managing a network. The jobs that it normally does at a workstation tend to be wasted overhead in a network server. Also, DOS is not optimized for speed. It's especially slow when it comes to handling file directories. This overhead becomes critical in a multiuser environment.

The other way to set up the operating system is to move DOS out of the picture. Requests which come into the file server are processed and sent directly to the hard disk. Obviously, some of the functionality of DOS must now be built into the file server. The benefit is that now those functions are performed by a special purpose system designed for networking.

Microsoft Networks

Three network operating systems currently support the DOS 3.1 standard: Microsoft Networks, IBM PC Network Program and Novell NetWare.

Microsoft Networks (MS-NET) is Microsoft's full network operating system. Microsoft is now offering MS-NET to vendors who want a DOS 3.1 compatible environment.

DOS 3.1 is part of MS-NET. The other components are the redirector, which routes network requests, and the file server program, which manages disk I/O.

Functionally, MS-NET supports the access and synchronization tools supplied by DOS 3.1, the Extended Open and the Physical Lock. The machine running the MS-NET file server software must be a dedicated machine and cannot be used as a workstation while it's in operation as a server.

Error recovery on MS-NET is difficult. Under certain circumstances, a workstation can exit an application with record locks still in place on the data. On MS-NET, to clear these orphan locks the workstation must be restarted and the lock released by the workstation. The only alternative is for the server to be rebooted, a process that will stop all activity on the network.

Performance on MS-NET is limited because of its dependence upon DOS 3.1 at the server. The MS-NET file server is run as an application of DOS, creating the excessive overhead discussed earlier.

For security, MS-NET requires that every object on the network be assigned a name and a password. Any time an access is attempted, the person must log into the particular object. Part of the security scheme is that someone cannot get a directory listing of resources on the network, but must request each object by name.

In summary, MS-NET is not a retail product, but is the product that Microsoft is offering to OEMs. Products that are actually marketed to end-users will undoubtedly include many improvements over the basic MS-NET operating system.

IBM's PC Network Program is based on MS-NET and its current state is probably a good example of the types of improvements that OEMs must consider making.

IBM PC Network Program

Superficially, the PC Network Program looks very much like MS-NET. But IBM has added to the functionality and improved the user interface.

The IBM Redirector has been modified so that there are different user interfaces for different classes of user. Three types of interface are supported: a menu-driven interface for casual users, a DOS-like command line interface for experienced users, and a low-level interface for developers.

The security mechanisms in PC Network Program are similar to MS-NET. Names and passwords are assigned to network resources. Under the PC Network Program, names and users are not people. They are machines or devices. Each node on the network is assigned a unique identifier known by its permanent name.

The synchronization and sharing functions in PC Network Program are limited to the Extended Open and the Physical Lock. IBM has permitted the machine running the file server software to be used in concurrent mode, so that it can function as both a workstation and as a server.

On PC Network Program, an orphan lock can be cleared from the server without having to find the down station and bring it back up or restart the network.

As with MS-NET, the file server software in PC Network Program runs as an application of DOS, restricting the network performance.

Novell NetWare

Novell NetWare is compatible with the DOS 3.1 standard, but is designed to deliver high performance and functionality.

One of the keys to NetWare performance is that DOS is not part of the file server. Instead, NetWare uses a proprietary multitasking operating system that is enhanced for network file serving. DOS is run as an application of the file server, so that the server machine can be used concurrently as a workstation.

In addition to the basic DOS functions, NetWare also provides a set of extended functions.

NetWare supports a shared Physical Lock that can be used to increase the availability of data. The shared lock is a Read-Only record lock that permits others to use

"For OEM's Novell NetWare can upgrade existing LAN products so they are highly competitive with the IBM PC Network."

the record, but prohibits any user from modifying the record.

Applications written prior to DOS 3.1 typically use a mechanism called a semaphore for record locking. NetWare continues to support semaphores, also referred to as logical locks.

Another function included in NetWare is the timeout. If a record is already locked when a lock request is received, a timeout allows the request to be placed into a queue at the server. When the record finally becomes available, the server checks the queue and grants the lock to the next requester. This system places minimum overhead on the server and guarantees that the request is answered as soon as possible.

Security provisions in NetWare can be regulated through both user profiles and

file attributes. People log in to the network with their own unique name and password, at which time they can access individual directories and subdirectories to which they've been granted rights. Files can be protected with flags, such as Read-Only, that limit their use.

NetWare offers virtually unlimited expandability. A network can have multiple servers, and single workstations can be attached to as many as eight servers simultaneously. NetWare runs on all common LAN hardware systems, and these can all be internetworked using NetWare Bridges.

Summary

The importance of the new LAN software standard cannot be overestimated. It directly addresses the two major impediments to the growth of networking: the need for applications and the need for good data integrity.

Of the three operating systems which currently support the standard, Microsoft Networks is an OEM product that requires considerable upgrading to attain the functionality needed in today's LANs.

The IBM PC Network Program provides adequate functionality for many environments. However, its reliance on the Extended Open and the Physical Lock restricts its potential in multiuser applications. Both MS-NET and PC Network Program are deficient in performance.

Novell NetWare is designed for high performance and functionality. For end-users, NetWare offers a way to upgrade their current LAN to the new DOS 3.1 standard without changing their current LAN hardware. At the same time, end-users will see their performance and functionality improve by several magnitudes. With NetWare installed, end-users can create almost limitless internetwork topologies.

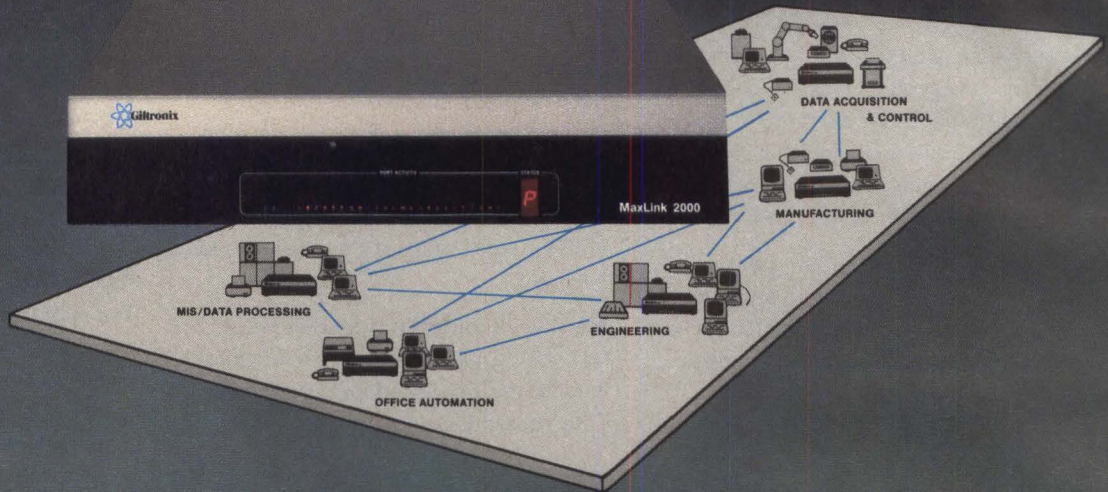
For OEMs, NetWare has the capability of upgrading LAN products to the point where they are highly competitive with the IBM PC Network.

For more information, order the 1985 LAN Software Report by writing or calling:

Novell, Inc., 748 North 1340 West
Orem, Utah 84057 (801) 226-8202

 **NOVELL**
CIRCLE NO. 78 ON INQUIRY CARD

MaxLink 2000™



Are You Caught Between a Rock and a Hard Place Over LANs, Voice/Data PBXs and Multi-User Approaches?

You Don't Have To Be! Giltronix's MaxLink 2000™ Multiple Access Exchange will link together all your departmental workgroup devices today and tomorrow . . . and at a price per port that is unheard of in the industry.

We'll make your life simpler whether your requirements are in office automation, MIS, data processing, engineering, manufacturing, data acquisition & control, data communications, telecommunications, service and support, education, accounting, or in any other application environment.

An Economical Solution: Without a large up-front capital expense, MaxLink 2000 provides a cost-effective departmental workgroup branch that can be linked to backbone networks or high-end systems. Departmental equipment resources can be matrix switch connected intelligently from under \$100 per port. And when it's time to add more devices, personnel, and departments, expansion costs are minimal. Special hardware, software, or programming isn't required . . . and you

won't have to purchase expensive interface boards for every personal computer either.

An Immediate Solution: MaxLink 2000 can be installed today allowing standard RS-232/V.24 and IBM parallel (Centronics) matrix switch interconnections of your installed equipment regardless of vendor. We've eliminated the high risks of nonstandardization and network incompatibilities found in other alternatives.

Maximum Performance: With up to 42 asynchronous and 2 parallel ports per MaxLink 2000 and individual port speeds up to 19.2K bps, all your workgroup needs can be fulfilled. You can even build or modify your own network design by interconnecting MaxLink clusters for both local and remote communications. At 6,000 characters per second throughput, the MaxLink cluster is highly efficient. Having a comprehensive list of high-performance features such as dynamic buffering, auto DTE/DCE switching, and message broadcasting, MaxLink 2000 will make your departments more productive.

Simplicity: Installation and operation doesn't come any easier because MaxLink 2000 requires only simple cabling and provides complete user transparency to network operations. You can even select from among tabletop, 19-inch rack mount, or tower floor console models to suit your mixed environments.

Security: With MaxLink 2000, you can maintain local and remote network security controllable by MIS or a central management facility. Downline loadable configuration and up to 4 levels of security per port provide for all the control you'll need for data security in a variety of environments.

Giltronix is the quality industry leader in providing cost-effective networking solutions with a full product line of manual, automatic, secure, and intelligent matrix switching equipment.

Direct Sales and Worldwide Distributors. Call or write today for complete information.

We'll Set You Free!



Order Hot-Line: 1-800-531-1300 (Outside California)

CIRCLE NO. 79 ON INQUIRY CARD

Headquarters
3780 Fabian Way
Palo Alto, CA 94303
(415) 493-1300
Telex 345542

LAN SOFTWARE LINKS DIVERSE MACHINES, OS's

System integrators can build inexpensive LANs with PC/NOS, a communications software package that acts as a network operating system

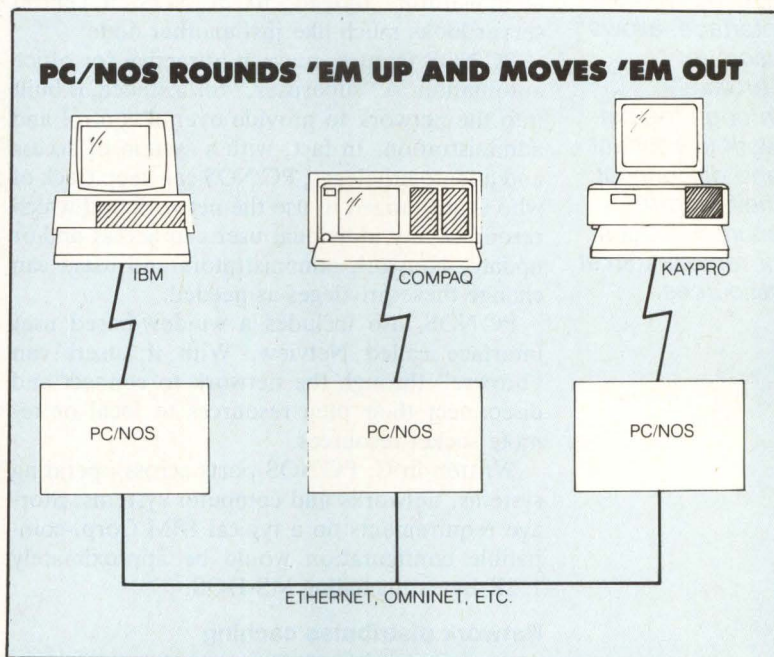
John Row, Applied Intelligence Inc.

Increasingly, office systems integrators must deal not with single minicomputers but with networks of many personal computers. A typical workplace now contains any number of employees performing vastly different tasks with the aid of vastly different computers—all running on vastly different operating systems. It's both convenient and mandatory that those computers be linked so data and resources can be shared.

Until recently, linking computers into a common network has been expensive and complex. A company usually had to either buy a pre-networked computer system with one central server and many terminals—and waste the personal computer resources already in place—or hire expensive software experts to create a reliable link between differing operating systems.

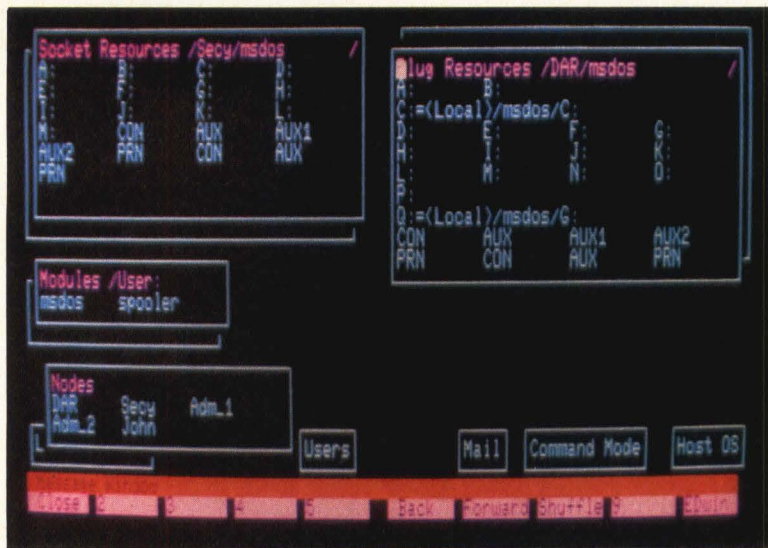
As a result, system integrators have begun to experiment with alternate methods of linking computers. Most promising of these is to install a communications software package that functions in a network the way a local operating system functions in a standalone computer. This network operating system can then provide a standardized connection language and message-passing protocol among the individual operating systems of the networked machines. This method requires little programmer intervention, and the user is thus free to create and implement application programs and to access network resources.

One such network operating system available to OEMs is PC/NOS from Applied Intelligence Inc., Mountain View, Calif.



PC/NOS converts the host operating system of any node computer into a message-based system and the network into a multiprocessor system. It runs in every node of the network. Thus, a PC/NOS-driven network doesn't need a central server.

Basically, PC/NOS converts the host operating system of each machine in a network into a message-based system and the network as a whole, into a multiprocessor system. Because it runs in every node, PC/NOS-driven networks



Netview, PC/NOS' window-based user interface, allows users to "browse" through the network to connect and disconnect their plug resources to local or remote socket resources.

don't need a central server or a single system administrator. Indeed, to PC/NOS, a central server looks much like just another node.

PC/NOS features make it attractive for office automation. A "superuser," for instance, is built into the network to provide overall control and administration. In fact, with a system of access and update privileges, PC/NOS can keep track of who is authorized to use the network and which resources any individual user can access and/or update. Network administrators and users can change these privileges as needed.

PC/NOS also includes a window-based user interface called Netview. With it, users can "browse" through the network to connect and disconnect their plug resources to local or remote socket resources.

Written in C, PC/NOS ports across operating systems, networks and computer systems. Storage requirements on a typical IBM Corp.-compatible configuration would be approximately 112K bytes, including MS-DOS.

Network distributes caching

Because PC/NOS is not tied to a particular operating system or hardware design, it overcomes the incompatibility of network entities. But like all network operating systems, PC/NOS faces the problem of how to distribute and manage data shared by all network users, and how to do so quickly and efficiently. Its approach to the problem is a distributed caching scheme based on the concept of equivalence.

Equivalence, in this instance, means the ability of the distributed caching scheme to simultaneously store identical copies of data in more than one network address space. Many conventional computer concepts relate to equivalence.

For example, virtual memory, caching, blocking, deblocking and I/O read and write all involve keeping copies of the same data in more than one address space.

In PC/NOS, an address space can be virtual, such as a host operating system file, or physical, such as a RAM buffer or a disk. To establish and maintain equivalence between address spaces, each space must be linked so data can flow freely among them. They can exist in the same physical address space or at different network locations.

Because in this sort of network a file server is simply another node, any user node or workstation can function as a server. This means that the resources available at each network node are accessible to every other node with no restrictions other than the access privileges determined by the system administrator for each user.

Because the initial version of PC/NOS targets CP/M and MS-DOS machines, the minimum sector size for transfers between address spaces—or "granularity,"—is configured as 128 bytes for front-end modules. The normal block size for network transfers depends on the host hardware, but is typically 1K or 2K bytes. However, the programmer has complete flexibility in determining both the block size for transfers and the granularity appropriate to any host operating system.

Granularity has a direct impact on performance because it controls how much data moves across the network in front-end modules and how much data is read off the disk in back-end modules. Too much or too little data slows performance time on the network.

The overseer for communication between address spaces is the address space manager (ASM), a software code that functions as an interface between the user and PC/NOS. Every address space in the network has its own ASM, which coordinates with other ASMs to establish and maintain equivalences. Whereas the ASM itself is transparent to the user, the programmer can access it via the packet manager interface, which is roughly analogous to the basic kernel or operating-system call defined by most operating systems.

The programmer sends transactions to defined plugs and sockets, connected to such network resources as disk volumes and printers. When the network system is initially configured, each network resource is assigned an address at a node socket in association with the packet manager.

The ASM facilitates updates and controls establishing, maintaining and relinquishing equivalence. To accomplish these functions, the ASM maintains, at each node, equivalence tables for

Promote your Data General.

Announcing 5 Star controllers to pack powerhouse performance into every DG Nova, Eclipse and MV series.

Take charge with high speed, high performance 2.5 MB/sec. transfer rates—at lower costs.

- ★ New Spectra 27-Plus multifunction disk/tape BMC/DCH Controller.
- ★ New Spectra 17-Plus disk BMC/DCH Controller.
- ★ New Spectra 120-Plus multifunction disk/tape DCH Controller.
- ★ New Spectra 210-Plus disk DCH Controller.
- ★ New Spectra AOS and AOS/VS Expanded Emulation.

Give your General a field promotion today.

CONTROLLER MAPPING			
FUJITSU	AMPEX	NEC	CDC
2294 as 6122 2298 as 2X 6122 2361 as 6214 2312 as 6160 2333 as 2X 6161 2322 as 2X 6160	CAP-330 as 6122	2246 as 6160 2257 as 6161	9715-340 as 6122 9715-500 as 2X 6061 9771(XMD) as 2X 6122
CAPACITY USING EXPANDED EMULATION			
FUJITSU	AMPEX	NEC	CDC
2294=293 MB 2298=587 MB 2351=414 MB	CAP-330=293 MB	2268=295 MB 2352=443 MB	9715-340=306 MB 9715-500=419 MB 9771-XMD=705 MB

Call (415) 964-2211 for more.

SPECTRA LOGIC
A CIPHER DATA PRODUCTS COMPANY

Spectra Logic Corporation, 297 North Bernardo Avenue, Mountain View, California 94043. TWX 910-339-9566. Telex 172524 SPL MNTV.
International Sales Office: The Netherlands (31) 23 273744, Telex 71080 SPECL.

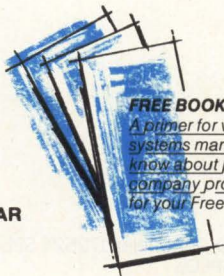
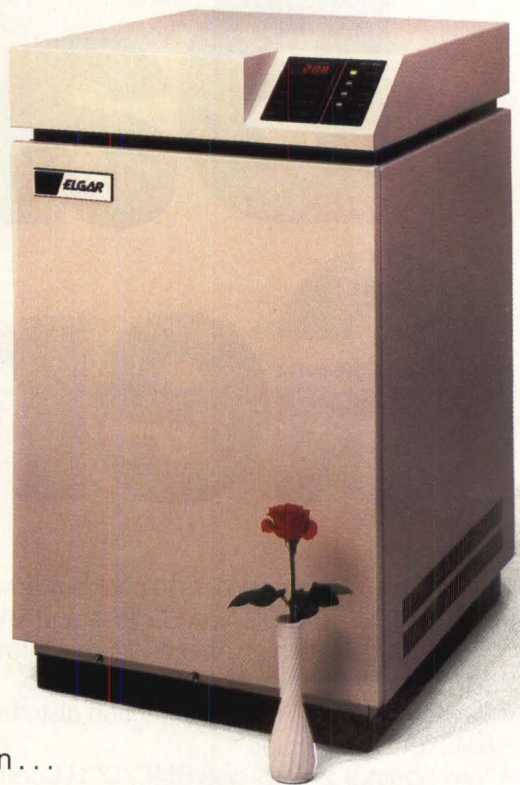
CIRCLE NO. 80 ON INQUIRY CARD

You may ask why Elgar's new UPS looks just like an IBM System/36?

...Why indeed!

- Our new UPS is indeed a perfect match for IBM. It provides the kind of power protection necessary for IBM systems. And only Elgar is plug-in compatible with both the CPU and peripherals for fast, easy installation.
- Our new UPS is packed with quality features for trouble-free performance. Only Elgar has $\pm 4\%$ dynamic power regulation. We deliver more precise power to your computer than any other UPS you can buy. Our new UPS costs less to install . . . to run . . . and maintain.
- Want more? It fits in your office. It's so quiet you'll hardly know it's running. And it's backed by a no-nonsense TWO YEAR WARRANTY from Elgar . . . the leader in quality power protection systems.
- Get the full story on our new T-Series UPS for mini computers.

Call toll free: 800-854-2213, Dept. 8.



FREE BOOKLET OFFER
*A primer for what every
systems manager needs to
know about power and
company profits. Call today
for your Free Copy.*



ELGAR

ELGAR

An Onan Operating Unit

9250 Brown Deer Road
San Diego, California 92121
(619) 450-0085 Telex 211063

CIRCLE NO. 81 ON INQUIRY CARD

its address space. These tables keep track of where various data reside in the network. If a disk read of a file is requested, for instance, the ASM may discover via its equivalence tables that a copy of the data exists in a local RAM buffer or address space. The ASM can then access the data in a fraction of the time required for it to be read from disk.

In the PC/NOS' nomenclature, a cache is simply an equivalence between two address spaces; one virtual and the other physical, usually a RAM buffer. A cache control block (CCB) contained within the address space describes and manages the equivalence between addresses.

In PC/NOS, the terms "update" and "establish equivalence" are used, rather than simply "read" and "write," because the operating system is a distributed asynchronous system, whereas reads and writes are generally conceived of as sequential operations. A conventional read involves passing a read request to a controller or buffer manager and then waiting for the read to complete. PC/NOS splits this sequence of operations into separate asynchronous messages. The read request becomes a message saying, "establish equivalence between the source and destination address spaces."

The operating system expands the possibilities of linked virtual and physical address spaces so that data can travel from any point in the distributed system to any other point. It also stores equivalences over a period of time with different kinds of messages. In most standard sequentially oriented designs, once a read operation has begun, the system (and the user) must wait for the read to complete before another operation can begin. In contrast, the asynchronous message-passing orientation of PC/NOS allows an ASM to stream data from processor to processor in a distributed environment by generating many packets in parallel.

ASM overcomes 'read before write'

The ASMs also address the "read before write" constraint. In most systems, if the user wishes to change 1 byte on a 512 byte disk sector, the entire 512 bytes must be read first, then the new byte written, and finally the entire 512 bytes written again. This approach severely degrades local area network performance.

PC/NOS deals with the problem by defining a minimum granularity between linked address spaces via the CCB. This solution means that even if the normal block size on the net is 1,024 bytes, the minimum update size can be as low as 1 byte.

The ASM keeps a "partial equivalence" table to record which bytes within a block have been

Spec summary

- **Model:** PC/NOS
- **Manufacturer:** Applied Intelligence Inc., 1043 Stierlin Road, Mountain View, Calif. 94043
- **Networks supported:** Omninet, Ethernet, Arcnet, IBM PC Network
- **Operating systems supported:** MS-DOS, PC-DOS, CP/M
- **Computers supported:** IBM Corp. PC and compatibles and computers from Fujitsu America Inc., Kaypro Corp. and Morrow Designs Inc.
- **Security:** File and record locking, passwords
- **Price:** Approximately \$75 per node

updated. Thus, only the updated portions are sent to the next ASM in a chain. If an application or operating-system interface stays within the defined granularity, it can avoid read before write difficulties on the network.

Updates larger than the defined granularity can still be processed without a read before write constraint. In this case, the update is passed on the next ASM in the chain and performs a local maintain equivalence operation.

Data is transferred and manipulated by the ASM and the other network operating system entities in packets. These packets are either sent directly to a destination (which can be multiple nodes that receive information from the instructions), or routed through one or more socket subaddresses.

All packets have a common transmission header that indicates the destination node and socket, user number and packet type. Four packet types are relevant to address spaces and equivalences: update, establish equivalence, maintain equivalence and relinquish equivalence.

An update request, which causes the data in the packet to overwrite data in a designated address space is responsible for changes in stored data. Host operating system interface routines translate write requests into PC/NOS update packets. The update packet contains the network address of the destination address space, the address to write the data, an update parameter that is a function of the destination ASM and the data itself.

Depending on the system, the ASM does one of several things. In the simplest case, the ASM stores an update packet in its own RAM. In a situation where the virtual and physical address spaces are linked in a network, the ASM propagates the Update packet "down the chain" to designated destination ASMs. The ASM may also check its equivalence tables to see if other copies exist, in which case it links to other caches



SEE YOUR WAY CLEAR.

On screen. Or paper. Or transparency film. You'll see your data represented with unmatched visual acuity.

For instance, look into the family of Seiko color graphics terminals. You'll get high resolution. From 1024 x 780 on our GR-1100 Series to 1280 x 1024 on our GR-2400 Series. Plus you'll choose the features you want most. Like 2D transformations, zoom and pan with true magnification, TEK 401x Plot 10 compatibility, interactive tablet support and mouse. You can even get enhanced VT100 video terminal emulation with a true VT100 keyboard.

If you want a record of your data for later analysis or presentation, just push the

button on your CH-5201 color hard copier. You'll get curves that look like curves. Details that remain sharp. And a built-in frame buffer that captures the image and instantly frees your terminal. So you can go on working while the 5201 gives you up to 99 copies off line.

Of course, there's more. So see your way clear to making a phone call, we'll make sure you see your data clearer than ever before. Call Martin Nelson at (408) 943-9100 today.

SEIKO
INSTRUMENTS

© 1985 Seiko Instruments U.S.A., Inc. TEK and Plot 10 are registered trademarks of Tektronix. VT100 is a trademark of Digital Equipment Corp. Image Credits: PDA Engineering; Swanson Analysis Systems; Lasergraphics.

CIRCLE NO. 82 ON INQUIRY CARD

and propagates Maintain Equivalence packets "up the chain" to where equivalences exist. Rather than wasting time transferring the entire data memory around the net, the ASM remains on the lookout for copies that merely need to be updated.

When a program or piece of data is to be transferred from physical memory to some other location in the network, equivalence must be established between the original location—for example a hard disk—and the destination—perhaps remote RAM. In this case, the remote ASM sends an establish equivalence packet, which is really a request for an Update packet, to the destination address. This packet contains the source and destination address to be made equivalent, a byte count of the equivalence and the starting address of the data to be made equivalent.

If the destination is a virtual address space, the address is translated and transferred on to the next ASM in the chain until the destination is a physical ASM.

Basic to the concept of equivalence is the ability of an ASM to maintain identical copies of data at more than one address over a period of time. When a change or Update is sent to a piece of data that is held in common by several network entities, the ASM must ensure that the changes are sent to every copy or equivalence of that data in the network. The source ASM sends a maintain equivalence packet that contains the destination address to be maintained and a parameter that is a function of the destination ASMs.

When a copy of data is no longer needed at a given address—i.e., the user wishes to remove a file—the destination ASM receives a relinquish equivalence packet that flushes the cache and unlinks it from the chain of equivalences.

Networks address security

Certain safeguards are essential in a distributed system: protection of sensitive data and programs, control of simultaneous access to multiplexed or shared sockets (such as those linked to shared disk volumes) and control of user access to unshared network resources.

PC/NOS provides access security for all networked resources. Access to resources is based on a resources access privilege and the user's assigned privileges. A password is used for user log-on to validate the user ID, but this password does not affect the user's privileges. This approach allows the user to control his own password without impairing user access to resources. Users may also be assigned to groups.

Controlling simultaneous updates in shared

data—a more complex situation than updates in unshared data—is handled through PC/NOS modules that communicate with the Address Space Managers. The back-end modules filter file/access requests via individual host operating systems to provide file and record locking. PC/NOS provides file and record locking. Implicit and explicit file and record locking are provided.

Locking schemes such as these, combined with a distributed processing cache approach, improve the overall performance of both the disk and the network, making the entire system more flexible and efficient. In short, PC/NOS provides an environment for the development of multi-user applications on a solid base of single-user host operating systems. In an age when networking is increasingly the path to system integrators' profits, such network operating systems are bound to play an increasingly important role.



John Row is vice president of research and development at Applied Intelligence Inc., Mountain View, Calif. Previously, he worked for Keybrook Business Systems and Control Data Corp.

Interest Quotient (Circle One)
High 489 Medium 490 Low 491

Your low-cost direct line to the value-added market

Mini-Micro Systems
DIRECT RESPONSE INFORMATION CARDS

- Sell products and services directly
- Introduce new products
- Distribute catalogs and literature
- Investigate new applications
- Develop quality sales leads

Format
Loose Card Deck / Card
Size—3½" × 5½", Live
Copy—3½" × 5½"

1984 Postcard Schedule
Materials Closing Date:
2/7 4/13 8/10 10/8
Mailing Date:
March May Sept. Nov.

Mechanical Requirements	Rates	Advertisers	
		Non-advertisers	Advertisers
Negatives—right reading emulsion side down. Camera ready	1 card	1350	1600
mechanicals—110 line screen	2 cards	1300	1550
	3 or more cards	1250	1500

Contact: Carol Anderson, Sales Manager
Mini-Micro Systems
Direct Response Postcards
221 Columbus Avenue, Boston, MA 02116
(617)536-7780

CIRCLE NO. 83 ON INQUIRY CARD

One new terminal offers exceptional reliability through advanced technology.



The new TeleVideo 955.

This begins a new generation of superior quality machines from the world's number one independent terminal maker.

At its heart is an incredibly hard working custom microchip that has permitted us to eliminate many of the components found in other less advanced terminals. And many of the problems they caused.

So the 955 is a more reliable terminal which promises less down time and remarkably low cost of ownership.

What's more, this is the first TeleVideo® terminal to be warranted for one full year.

950 Family compatibility.

The 955 works with our extremely popular 950 Family standard and offers two sets of 32, a total 64, function keys you can customize with ease. As well as up to four pages of display memory at 80 or 132 characters.

This is the only terminal with upgrade flexibility built in. And its comfortable new keyboard has earned twice the reliability rating of earlier models.

Improved pinpoint resolution.

Advanced technology is also responsible for a high contrast, 14 inch, tilt and swivel screen (amber optional) that's dramatically

easier to read than the ordinary CRT.

The new TeleVideo is \$699.

The new 955. Unequaled value from a terminal company with the experience and resources to be your single source for guidance, hardware and support.

Call (800) 521-4897 or, in California, (800) 821-3774. Ask for Operator 7.



Terminals
© TeleVideo Systems, Inc.

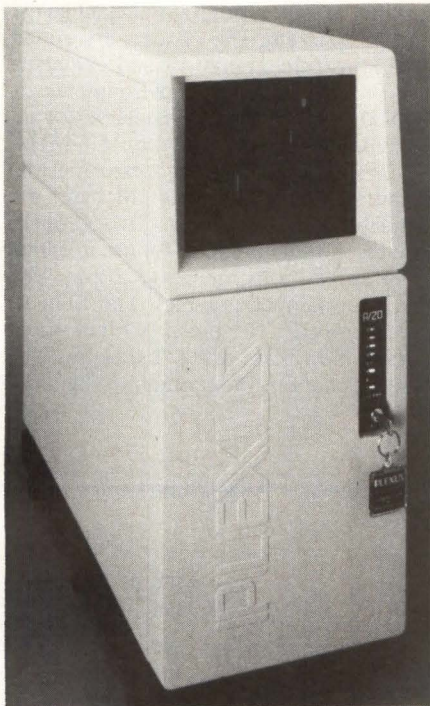
Regional Sales Offices: California/Santa Ana (714) 476-0244, California/San Jose (408) 971-0255, Georgia/Atlanta (404) 447-1231, Illinois/Chicago (312) 397-5400, Massachusetts/Boston (617) 890-3282, New York/New York (516) 496-4777, Texas/Dallas (214) 258-6776.

CIRCLE NO. 84 ON INQUIRY CARD

NEW PRODUCTS

SYSTEMS

Eileen Milauskas, Assistant Editor

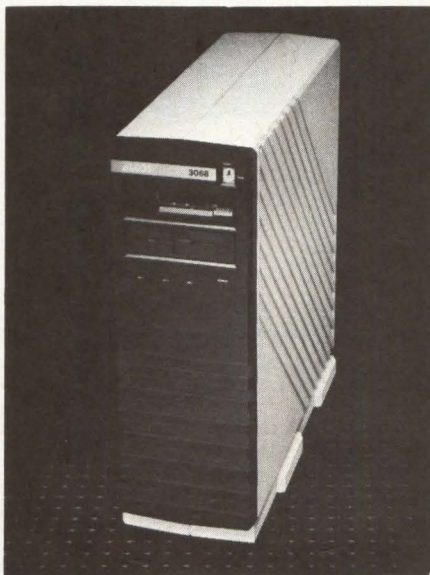


Multuser system employs UNIX

- Dual 68010 CPUs
- SCSI, Multibus
- 24M-byte hard disk

Serving office-automation, transaction-processing and industrial applications, the P/20 multuser microcomputer runs the UNIX System V version 2.0 operating system. Using dual 68010, 10-MHz microprocessors, it incorporates a job processor and a supplementary DMA controller for I/O. Two buses, SCSI and Multibus, come standard. The SCSI bus accepts up to seven storage devices; the Multibus accommodates an 8-serial-port controller board to provide up to 16 ports and an Ethernet controller. The eight-user system has a 24M-byte hard disk drive, a 1M-byte, unformatted floppy disk drive and 0.5M bytes of memory, expandable to 2M bytes. Three sensors protect against adverse operating conditions and an automatic

reset feature preserves data structure on the hard disk. \$6,025. **Plexus Computers Inc.**, 3833 N. First St., San Jose, Calif. 95134. (408) 943-9433. **Circle 300**

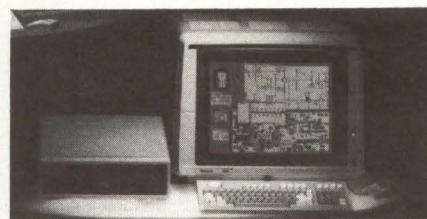


UNIX system handles 30 users

- UNIX System V
- 68020 microprocessor
- 1M-byte RAM

Employing the 68020 microprocessor and the UNIX System V operating system, the model 3008 multiuser, 32-bit supermicrocomputer system accommodates up to 30 users. Operating as a standalone system or in a distributed network, the system connects to other systems via the proprietary WorkNet LAN and to mainframe computers via 3270 Bisynch, SNA, X.25 and 3780 communications options. System configuration consists of 1M byte of RAM, a 20M-byte hard disk drive and a 1.2M-byte floppy disk drive supporting up to 10 users. RAM is expandable to 16M bytes in 1M-, 2M- or 4M-byte increments. Hard disks are upgradeable to 240M bytes in 20M-, 60M- or 80M-byte

increments. Eight board slots and horizontal applications software, including the proprietary AOE office-automation package, come with the system. \$7,000. **Altos Computer Systems**, 2641 Orchard Parkway, San Jose, Calif. 95234, (408) 946-6700. **Circle 301**



Systems target AI development

- 13-, 19-inch screens
- C compiler
- ANSI X3.64 emulation

Using a Motorola 68020 microprocessor and a 68881 floating-point coprocessor, models 4405 and 4406 Artificial Intelligence Systems serve as AI development tools and delivery systems for complex applications. The 4406 displays 1,280 by 1,024 pixels on a 19-inch, 60-Hz screen and offers 2M bytes of RAM (expandable to 4M bytes), a 32M-byte virtual memory address space, a 90M-byte hard disk drive and a 5¼-inch floppy drive. Model 4405 comes with a 13-inch, 60-Hz screen with a 640-by-480-pixel, viewable display that acts as a window to the 1,024-by-1,024-pixel, addressable bit map. RAM capacity is 1M byte, expandable to 4M bytes. Virtual memory address space is 8M bytes. The 4405 includes a 45M-byte, hard disk drive and a 5¼-inch floppy drive. Standard software is Xerox's Smalltalk-80 programming environment, a UNIX-like operating system and a C compiler. Both models provide an RS232 and a Centronics interface, keyboard, mouse and ANSI X3.64 terminal emulation. \$23,950, 4406; \$14,950, 4405. **Tektronix Inc.**, P.O. Box 500, Beaverton, Ore. 97077, (503) 664-0161. **Circle 302**

Industrial computers protect against extremes

- 80286 CPU
- 512K-byte memory
- 1.2M-byte disk drive

The floor-standing model 7531 and the 19-inch, rack-mount model 7532 industrial computers find use in machine-monitoring, production-control and distributed-numerical control applications. The 80286-based systems offer protection against temperature extremes, vibration and shock, voltage transients and particulates. Storing 512K bytes of memory, expandable to 3M bytes, the systems include a 1.2M-byte floppy disk drive, seven expansion slots, clock/calendar with battery backup, ROM-based BASIC language, three programmable timers, 16-level interrupt and 24-bit addressing. A video display adapter and a display for video output are required. \$6,145, 7531;



\$6,370, 7532. **IBM Corp.**, Manufacturing Systems Products, P.O. Box 1328, Boca Raton, Fla. 33432, (305) 982-2659.

Circle 303

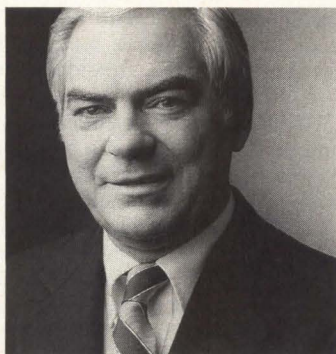
Tech workstations aid instrument control

- 68010, 68020 CPU
- Up to 7.5M-byte RAM
- 12-, 17-, 19-inch monitors

The 300 Series of technical workstations offer a choice of CPUs, displays, systems software, programming language and peripherals. The systems are aimed at the instrument-control and engineering- or technical-design environments. A 10-MHz, 68010 CPU is available for an entry-level system, while a 16.6-MHz, 68020 suits high-speed processor performance. RAM capacity is 1M byte, expandable to 7.5M bytes. Two 12-inch, low-resolution monitors, for use in entry-level applications, generate 512-by-400-pixel, bit-mapped graphics. The 19-inch, color and 17-inch, black-and-white monitors offer 1,024-by-768-pixel resolution. Programming languages

The first 8" disk the extended

"This is the intelligence you



Norman B. Petersen
President, Storage and Peripheral Products
Fujitsu America, Inc.

The Fujitsu M1053A Intelligent Disk Controller (IDC) can keep pace with the most sophisticated multi-host, multi-tasking SCSI-based system you can design.

With it, you can at last have a high-performance, 8" disk drive subsystem that takes full advantage of the extended performance features of SCSI, including the disconnect/reselect and arbitration commands.

You'll also be able to achieve even better system throughput and performance because the IDC handles all your device level chores. And you can do it in either synchronous or asynchronous mode, with a synchronous data transfer rate of 2.4 MB/second.

But that's just part of the story.

You can use the Fujitsu IDC to put up to four of our high-performance 8" disk drives—1.3 gigabytes of storage—on a single SCSI connection. In a multi-drive configuration, that represents significant savings in controller cost. And you can build in expansion capacity without using up valuable connections to your SCSI bus.

and operating systems include BASIC version 4.0, Pascal 3.1 and HP-UZ, the proprietary version of the UNIX operating system. \$5,500, entry-level configuration; \$55,000, high-end configuration. **Hewlett-Packard Co.**, 1820 Embarcadero Road, Palo Alto, Calif. 94303, (415) 857-1501. **Circle 304**

expandable to 16M bytes. The basic configuration also includes an 80M-byte hard disk drive; a 1.2M-byte, floppy disk drive; a 60M-byte, streaming tape unit, an Altos III terminal and eight board slots. \$19,990. **Altos Computer Systems**, 2641 Orchard Parkway, San Jose, Calif. 95134, (408) 946-6700. **Circle 305**

300 series support the UNIX operating system, color or monochrome displays and Ethernet protocols. The 32/110 uses the proprietary standard CPU and comes with 4M bytes of memory, four RS232 ports, a 78M-byte disk drive and a 1M-byte floppy disk. The 32/130 uses a high-performance CPU with floating-point capability and offers 4M bytes of memory, four expansion slots, a 150M-byte disk drive and a 1M-byte floppy disk. The 32/310, based on the standard CPU, includes a 150M-byte hard disk, a 1M-byte floppy disk, 4M bytes of main memory and nine expansion slots. The high-end 32/330 employs the high-performance CPU, stores 8M bytes of memory, and offers eight expansion slots, a 150M-byte hard disk drive and a 1M-byte floppy disk drive. \$39,000, 32/110; \$47,000, 32/130; \$56,000, 32/310; \$69,000, 32/330. **Ridge Computers**, 2451 Mission College Blvd., Santa Clara, Calif. 95054, (408) 986-8500. **Circle 306**

Micro supports 20 users

- XENIX OS
- 80286 CPU
- 2M-byte RAM

A supermicrocomputer accommodating up to 20 users, the model 2086 uses the 8-MHz 80286 microprocessor and runs the XENIX operating system. Communications protocols supported include 3270 Bisynch, 2780 Bisynch and 3270 SNA/SDLC. The 2M bytes of RAM are

Systems suit CAD applications

- 1M-byte floppy disk
- Four RS232 ports
- 4M- to 8M-byte memory

Based on a reduced instruction set computer architecture, models 32/110, 32/130, 32/310 and 32/330 computers are aimed at computationally intensive applications such as mechanical and electrical CAD, animation and imaging and scientific research. Both the 100 series and the

drive controller to use
features of SCSI.

get from a leader."

The performance of the Fujitsu disk drive itself is equally important. Just take a look at the specs we've included here.

We've achieved performance levels that set the industry standard. And because we've done it using proven technologies, you can be sure Fujitsu drives will keep performing.

For more information about Fujitsu's IDC and 8" drives, call (408) 946-8777. Or write Fujitsu America, Inc., Storage Products Division, 3055 Orchard Drive, San Jose, CA 95134-2017.

If you want 8" disk drives intelligent enough to enhance your SCSI design, you'll need to talk to us—Fujitsu America.

Fujitsu 8" Disk Drives	M2331KS	M2333KS
Capacity Unformatted (MB)	168	336
Transfer rate (MB/sec) (synchronous)	2.458	
Ave. Positioning Time	20 msec	
MTBF	20,000 hours	
Interface	High-speed SMD	

We're developing technology for you.

CIRCLE NO. 85 ON INQUIRY CARD



FUJITSU AMERICA, INC.



“To reach the right business buyers, I can mix and match half a dozen computer publications. Or I can buy *BUSINESS COMPUTER SYSTEMS*.”

—Ellen Freeman, Vice-President and Media Director, Gray Strayton International, on advertising in *Business Computer Systems*

Ellen Freeman is Vice-President and Media Director for one of the country's hottest high-tech agencies. Her clients market everything from add-in boards to software. And they market to business.

For many of them, she recommends *Business Computer Systems*

Business Computer Buyers

“Today the mix of business computer buyers is different than it was five years ago. Or even one year ago. Today they come from all over the company—not just MIS.

“The hardest part of the job can be finding them. Because you can't tell by job title anymore.

“*Business Computer Systems* reaches this new mix of decision-makers. It reflects the way businesses buy computers today. Inter-departmentally. By committee or management team.”

In-depth Information

“*Business Computer Systems* finds these decision-makers by function, title, business application, even make and model number of computers in place. And this is audited information—not just projected as it is with many publications.

“The depth of information I can get for every single reader is remarkable. And these are 100% buyers and specifiers—and 100% qualified within one year.”

The Magazine For Today's Market

“The case for *Business Computer Systems* is very simple. It delivers the business audience my clients need to reach: the business audience that's buying *today*.”

BUSINESS COMPUTER SYSTEMS

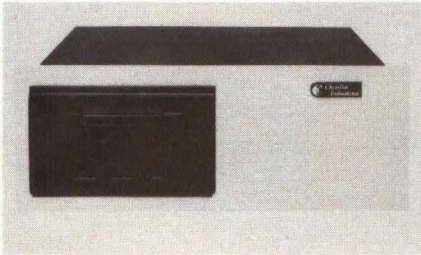


Today!

Our Circulation is the Market

CAHNERS PUBLISHING Cahners Publishing Company Cahners Building, 275 Washington Street, Newton, MA 02158-1630
Publishers of 38 specialized business magazines in Building & Construction Electronics & Computers Foodservice Manufacturing Health Care

CIRCLE NO. 104 ON INQUIRY CARD



Subsystem backs up DEC systems

- 70M bytes
- DMA controller
- 55 ips

The CI-TOK25 tape-cartridge subsystem for DEC LSI-11 or MicroVAX systems backs up 70M bytes of data in 20 minutes. Employing a quad-height, 22-bit, DMA controller, the unit emulates the DEC TQK25 subsystem and uses the MS handler software on DEC operating systems. This emulation permits software-transparent operation under RSTS-E, RSX11M, RSX11M+, RT11, Ultrix and MicroVMS operating systems. Drive rotational speed is 55 ips. Features include formatting capability and self diagnostics. \$3,545. **Chrislin Industries Inc.**, 31352 Via Colinas, #101, Westlake Village, Calif. 91362, (818) 991-2254. **Circle 307**



Series offers multiple system emulation

- 332M, 265M, 199M bytes
- 8-inch drive
- SMD-compatible

For multiuser, multiaccess applications, the DX-332 series of 8-inch Winchester disk drives stores 332M, 265M and 199M bytes. Compatible with SMD, MMD, RM03, DF980 and BD80 systems, the drives emulate four 82.9M-byte drives, two 165.9M-byte drives or one 315.2M-byte drive. A single-port version provides ANSI and SMD interfaces; the dual-port version comes with an SMD

interface. All three models record 1,083 tpi at 12,022 bpi on 1,649 tracks per surface. Average access time is 22 msec; data-transfer rate, 9.67 MHz. The 332M, 265M and 199M-byte versions use six, five or four disks, respectively, with 10, eight or six heads. The drives' positioner includes an automatic head retraction to

a dedicated landing zone. MTBF is 20,000 hours. \$4,300, 199M-byte version; \$4,650, 265M-byte version; \$5,000, 332M-byte version. **Pertec Peripherals Corp.**, 9610 DeSoto Ave., P.O. Box 2198, Chatsworth, Calif. 91311, (818) 717-3474.

Circle 308

The lean, clean protection machines.

At last—Total protection from all power problems at the best price.

The Line Tamer™ Power Conditioner's advanced ferroresonant design protects your sensitive equipment against brownouts, overvoltages, spikes, transients, and noise. And only the Z-Phase Line Tamer offers the same design to protect both line-to-line and line-to-neutral loads in three-phase applications.

You get the best of both worlds: The most reliable line isolation, voltage regulation and surge suppression in the business... and a surprisingly low cost. And with sizes up to 250 kVA single-phase and up to 75 kVA three-phase, there's a Line Tamer right for your computers, PBX systems, instruments and other power-sensitive equipment.

Line Tamers use little space and need no complicated wiring. Nor do you need expensive step up/step down transformers. Plus you save the high cost of a dedicated electrical line.

Contact us today for complete specifications and the Line Tamer distributor nearest you.

SHAPE
MAGNETRONICS, INC.

THE CLEAN
POWER
SOURCE

904 DuPage Avenue, Lombard, IL 60148
Phone 1 312 620-8394 • TWX 910-991-2352



Line Tamer is a trademark of Shape Magnetronics, Inc.

Before you buy
a 2400 baud modem,
check the one with
89 years of reliability
built in.



Introducing the CTS 2424AD modem

CTS has been manufacturing reliable products since 1896 when we introduced our first hand cranked, wall mounted, wooden telephone. Today, we're introducing a sophisticated, full duplex, autodial, 2400 baud modem, and our **promise of reliability** stays the same.

The CTS 2424AD modem offers **technological reliability** in its signal processor. Originally designed for more expensive and complex modems, the patent pending CTS signal processor provides integral adaptive equalizing for noticeably clearer, error free transmissions.

Our 2424AD meets CCITT V.22bis requirements and operates both synchronously and asynchronously at 2400 and 1200 bits per second. Other features include autodial with memory storage of up to ten telephone numbers (40 characters per number).

The CTS 2424AD offers **field reliability** with its two year warranty. And we demand our distributors provide you with the service you deserve.

Brand reliability is important at CTS, because it's important to you. That's why we suggest you check out our 2424AD before you buy a 2400 baud modem. You'll find what's built in to a CTS DATACOMM product is what you're looking for.

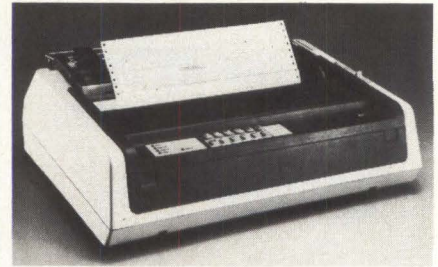
CTS

DATACOMM Products Division
6900 Shady Oak Road
Eden Prairie, MN 55344

800-328-6104

NEW TO THE INDUSTRY SINCE 1896.

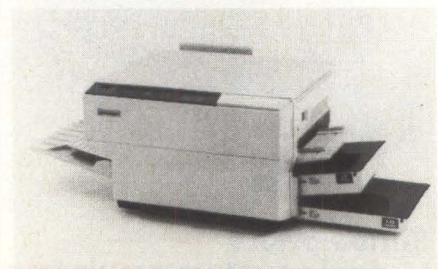
NEW PRODUCTS PRINTERS



Color printer runs at 400 cps

- 57 dB(a)
- 15 colors
- Serial, parallel interface

Printing at 400 cps, draft quality, 100 cps, correspondence quality, and 2,400 dps, dual-resolution graphics speeds, the C7500 dot-matrix printer interfaces with microcomputers and minicomputers. Both serial and parallel interfaces are included. Using a four-color ribbon, it produces 15 colors at a 57-dB(a) noise level. The unit accepts fanfold or cut-sheet paper and offers a demand-document printing feature that tears the paper off within 0.5-inches of the last printed line. A park feature places the continuous fanfold paper in a standby mode and prints on cutsheets. The printer stores two sets of print parameters for recall at any time. \$2,495. **Facit Inc.**, 9 Executive Drive, Merrimack, N.H. 03054, (603) 424-8000. **Circle 309**

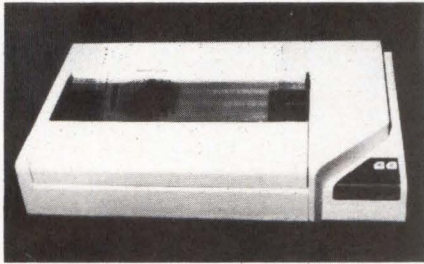


Laser printers produce CAD graphics

- 26 ppm
- 300 dpi
- Two input cassettes

The LZR 2650 and 2655 laser printers for graphics workstations serve the needs of computer-aided publishing and typesetting, CAD, CAE and business-graphics applications. Both support RIPrint, a page-composition and printer-control language. They print 26 ppm, or 1,700 lpm, at 300 dpi. The LZR 2655 supports

a single, ledger-sized image (11 by 17 inches) or dual-buffered, letter-sized images. The LZR 2650 supports single letter- and legal-sized images. Both models come with two input cassettes and a manual feed tray. The upper cassette holds 500 sheets; the lower, 250. \$11,080, LZR 2650; \$12,320, LZR 2655. **Data-products Corp.**, 6200 Canoga Ave., Woodland Hills, Calif. 91365, (213) 887-8451. **Circle 310**



Printer targets data processing

- 700 cps
- 4K buffer
- 100 by 69 dpi

A 700-cps, serial dot-matrix printer for microcomputers and minicomputers, the model OT-700 offers correspondence-quality printing at 350 cps and dot-addressable graphics capability. Graphics resolution is 50 by 69 dpi for high-speed output or 100 by 69 dpi for high-resolution copies. It serves high-volume output needs of data-processing environments and has no duty-cycle limitations. At 10 cpi, the unit prints 136 cpl; at 16.6 cpi, 226 condensed characters; at 8.3 cpi, 116 enhanced characters; and at 5 cpi, 68 enlarged characters. Centronics and RS232C interfaces are standard. Features include a 4K buffer, 96-character ASCII set, 136-column carriage width with adjustable sprocket feed tractors and LED indicator lights. \$2,000. **Output Technology Corp.**, E. 9922 Montgomery, Spokane, Wash. 99206, (509) 926-3855. **Circle 311**

Dot-matrix printer supports IBM PC programs

- 140 cps, draft
- 27 cps, NLQ
- Parallel interface

The A-40 impact dot-matrix printer supporting IBM PC application pro-

grams comes with the IBM Graphics Printer character set and provides escape codes compatible with the IBM Graphics Printer. Printing 140 cps in draft mode and 27 cps in near-letter-quality (NLQ) mode, the unit accommodates 10-inch-wide cutsheet, fanfold or multipart paper. It operates bidirectionally in text mode and unidirectionally in image

mode. The printhead lasts for 100 million characters. Print fonts include standard, enlarged, condensed, condensed enlarged, NLQ pica and NLQ pica enlarged. Features include a 1.4K-byte buffer and an 8-bit parallel interface. \$349. **Canon U.S.A. Inc.**, Printer Division, 1 Canon Plaza, Lake Success, N.Y. 11042, (516) 488-6700. **Circle 312**

Ethernet TCP/IP for VAX/VMSTM Off the Shelf! Complete package for \$8,795

Excelan offers a complete high-performance communications package including hardware, software, transceiver and all cables. Everything you need to perform high speed file transfers or do remote logins via Ethernet from a VAX running VMS or UNIX System V to UNIX 4.2 BSD machines and vice versa. Software includes TCP/IP protocols, and standard FTP (file transfer) and Telnet (virtual terminal) applications.

The entire VAX/VMS package is only \$8,795, including the EXOS 204 Ethernet controller (quad-size Unibus board), EXOS 8040 TCP/IP software, EXOS 1100 transceiver and cables. And the entire UNIX System V package is only \$7,295.

Excelan also offers similar packages for DEC PDPs, UNIX supermicros, and the IBM PC, XT and AT.

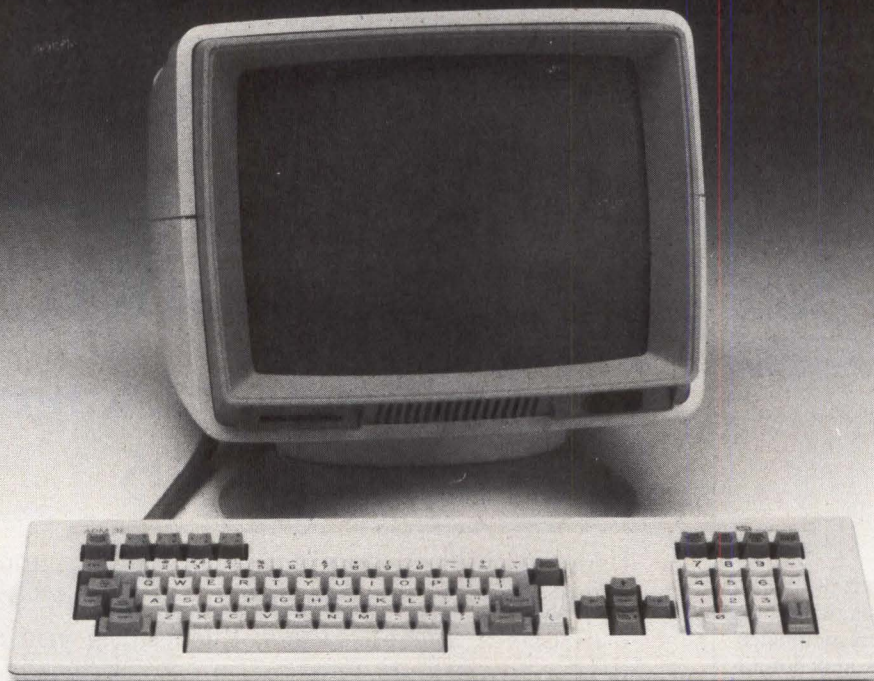
EXCELAN

2180 Fortune Dr. San Jose, CA 95131
Phone (408) 434-2300 Telex 176610

UNIX is a trademark of AT&T Bell Laboratories.
Unibus, VAX, VMS, and PDP are trademarks of Digital Equipment Corporation.

CIRCLE NO. 88 ON INQUIRY CARD

A NEW LOW FROM LEAR SIEGLER.



Introducing the ADM 3E for under \$400.

When it comes to quality display terminals, absolutely no one sets a higher standard than Lear Siegler.

So it may raise a few eyebrows when word spreads that we've reached an all-time low. It's the new ADM 3E and, at under \$400, it will change forever the way you think of low-end terminals.

For starters, we've included a wide variety of features you'd expect to pay more for.

Like a superior keyboard design with seven programmable keys shiftable for fourteen non-volatile functions. Dynamically allocated function key memory. Plus, a 14" screen in your choice of green or amber—all standard.

You get compatibility with our ADM 3A and ADM 5 terminals, as well as ADDS Viewpoint. There's even a bidirectional printer port with independent baud rate available. All this with legendary Lear Siegler quality.

Give us a call today. And find out why we're so high on our new low.

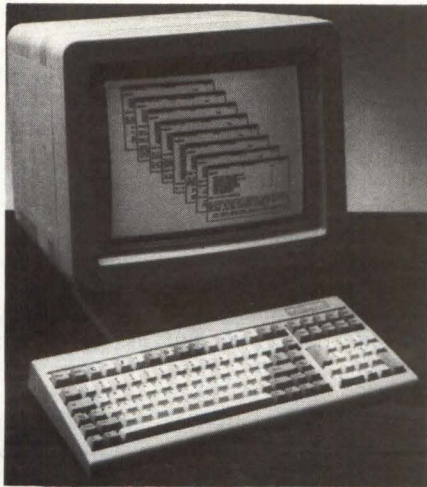
800-LEAR-DPD (800-532-7373).

 **LEAR SIEGLER, INC.**
DATA PRODUCTS DIVISION

901 E. Ball Road, Anaheim, CA 92805, (714) 778-3500

ADDS Viewpoint is a trademark of Applied Digital Data Systems, Inc.
© 1985 Lear Siegler, Inc.

CIRCLE NO. 89 ON INQUIRY CARD



Alphanumeric terminal supports four hosts

- ANSI-standard
- 80 to 160 columns
- 30 to 60 lines

Working with up to four hosts simultaneously, the VXL ANSI-standard alphanumeric terminal is DEC software-compatible and emulates the Tektronix 4010 and 4014 terminals. It provides 20K bytes of local display memory, which can be divided into eight pages of up to 255 columns and 512 lines. Pages can be dynamically connected or disconnected to any host, and the keyboard can be switched from host to host. The 15-inch monitor displays one window per page. Windows may be displayed fully or can be partially overlapped. Each window is a viewport to its underlying page. The unit shows up to two 8½-by-11-inch sheets, each with 80 to 160 columns and 36 to 60 lines. The keyboard is programmable up to eight shift levels. \$2,795. **Ann Arbor Terminals Inc.**, 6175 Jackson Road, Ann Arbor, Mich. 48103, (313) 663-8000. **Circle 313**

Graphics terminals provide alphanumerics

- Tektronix 4014 emulation
- 1,024 by 800 pixels
- Vector mode

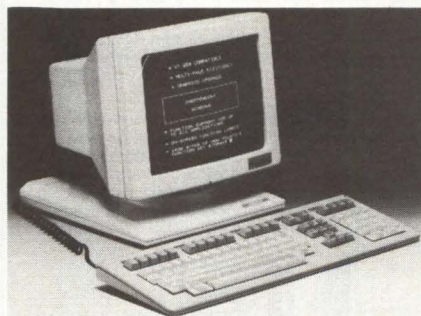
Achieving a vector drawing rate of 1 million pixels per second, the series 1500 graphics display terminals provide Tektronix 4010 and 4014 emulation and alphanumerics compatibility. Model 1575 is DEC VT102 compatible; model 1550, ADM, TVI, ADDS and Hazeltine compatible. Display resolution is 1,024 by

800 pixels with a 1,024-by-1,024 physical memory area. Transmission rate is 38.4K baud. Tektronix 4010/4014 features include GIN mode, vector mode, point plot, incremental point plot, multiple character sizes and line styles. The 14-inch, green or amber screen produces 24 rows by 80 or 132 columns with four-speed, smooth scrolling. Capabilities include pan and zoom functions, block-mode transmission, 32 programmable function keys, soft setup mode and a printer port. \$2,395, model 1575; \$2,295, model 1550. **Cleveland Codonics Inc.**, 18001 Englewood Drive, Cleveland, Ohio 44130, (216) 243-1198. **Circle 314**

Monitor displays 16 to 64 colors

- 13-inch
- Dual-scan
- 16, 64 colors

For use with the IBM Enhanced Graphic Adapter and its compatibles, the CM-1380, 13-inch, color monitor accepts RGB or TTL input. At a 15.75-kHz scan frequency, the unit offers 16 colors; at 21.85 kHz, 64 colors. Resolution is 640 dots horizontal, 200 or 350 lines vertical. The display is switch-selectable from a color screen to an all-green screen for word-processing applications. A switching-mode power supply offers wide-range power input and low power dissipation. \$849. **Tatung Co. of America**, 2850 El Presidio St., Long Beach, Calif. 90810, (213) 637-2105. **Circle XXX**



Terminal works with DEC VT220

- Multipage feature
- 14-inch screen
- Green, amber

DEC VT220-compatible, the Vision II-3220 terminal suits program-development or multiapplication processing

CAHNERS PUBLISHING COMPANY

Cahners Magazine Division

publishes the following 34 specialized business magazines, directories and newsletters:

Building/Construction Group

*Brick & Clay Record
Building Design & Construction
Building Supply Home Centers
Ceramic Industry
Construction Equipment
Corporate Design & Realty
Interior Design
Professional Builder
Security Distributing & Marketing
Security World
Specifying Engineer*

Foodservice Group

*Bar Business
Foodservice Equipment Specialist
Hotels & Restaurants International
Restaurants & Institutions*

Electronic/Computer Group

*Business Computer Systems
EDN
Electronic Business
Electronic Packaging & Production
Mini-Micro Systems
PC Products
Semiconductor International*

Manufacturing Industries Group

*Appliance Manufacturer
CPI Purchasing
Design News
Design News Directories
Modern Materials Handling
Packaging
Plastics World
Purchasing
Traffic Management
U.S. Industrial Directory*

Medical-Health Care Group

*Cardiovascular Medicine
Emergency Medicine
Physicians Travel & Meeting Guide*

Newsletter Division

*Electronic Business Forecast
Plastics Business News
Buying Strategy Forecast
Early Warning Forecast
Oil Spill Intelligence Report
Tradeshaw Week
Energy Design Update
CIM Strategies
Communications In Medicine*

Cahners Exposition Group

is the largest producer, operator and manager of trade and consumer shows in the world . . . with over 100 shows, 6,000,000 square feet of exhibition space and total annual attendance of over three million.

CAHNERS PUBLISHING COMPANY

275 Washington Street
Newton, MA 02158
617/964-3030

CIRCLE NO. 90 ON INQUIRY CARD

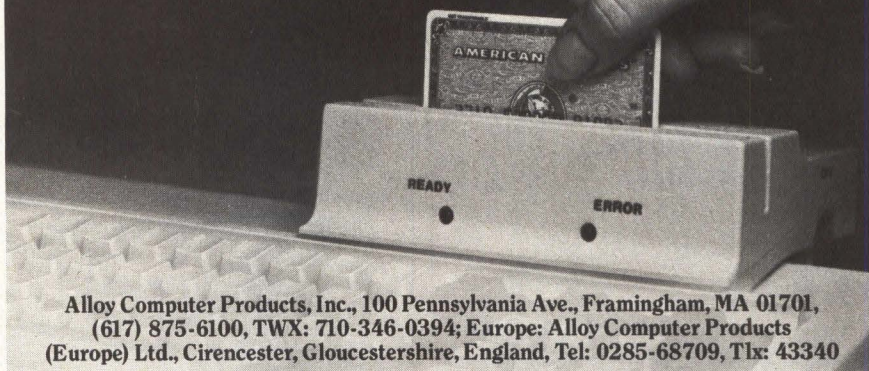
There's a fortune in reading cards.

Alloy's PC-CARD automatically reads credit card data.

Alloy's PC-CARD is a hand operated magnetic stripe card reader that reads standard magnetically encoded credit card and security badge data into your IBM or compatible PC without using the keyboard.

Use PC-CARD for: Security access control. Password validation. Credit card sales and transactions. Data logging.

Make your fortune with the card reader from Alloy. Call (617) 875-6100 today.



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

CIRCLE NO. 91 ON INQUIRY CARD

do you know! ⚡

INFORMATION ABOUT SAVING YOUR ELECTRONIC EQUIPMENT

Your Data Lines and Equipment are in Danger!

And they need protection...24 hours a day! At any time, in microseconds, your data lines, equipment and/or your data base, itself, can be destroyed.

The Cause High Voltage Transients. These destructive surges can be caused by lightning, power company switching, heavy machinery, etc. Directly coupled into a data line, these transients can cause immediate and cumulative damage to lines, sensitive equipment, or data base.

The Solution MCG Data Line Protectors. This mature, field proven family of protectors is expressly designed to guard signal/data/telephone equipment against transient overvoltage surges. The protectors interface between the data lines and the sensitive circuits to provide a sophisticated blend of high speed (5ns) voltage limiting and brute force protection. After each operation, they recover to a stand-by mode automatically.



MCG Data Line Protectors are designed for use with coaxial cable, single or twisted pairs, RS-232, -422 and -423, 20 ma loops and video lines.

Total Protection MCG provides the widest variety of data line protection devices available (protecting over 5,000,000 circuits to date). There is probably an existing model ideally suited to fulfill your particular need. So call or write today for cost effective insurance against data error and equipment downtime.



Call or write for our FREE CATALOG

MCG

ELECTRONICS INC. 12 Burt Drive, Deer Park, NY 11729 • (516) 586-5125

Specialists in Circuit Protectors, Transients, Lightning & Surges.

CIRCLE NO. 92 ON INQUIRY CARD

NEW PRODUCTS TERMINALS

needs. A multipage feature permits programming of both length and width of individual pages, mixing 80- and 132-column formats from one to 97 lines in length. Screen size is 14 inches, green or amber. An Intelligent Function System accesses six levels of pre-programmed functions, allowing freedom to switch applications without reloading function-key contents. Each of the 96 programmable functions are routed individually by the host computer, locally by the terminal, or both. \$1,020. **Lanpar Technologies Inc.**, 85 Torbay Road, Markham, Ontario, L3R 1G7, Canada, (416) 475-9123. **Circle 315**



Monitors plug into IBM PC-AT

- 20-MHz bandwidth
- 720 dots by 350 lines
- 12-inch screen

The green phosphor JB-1280DA and amber phosphor JB-1285DA are both plug-compatible with IBM PCs and PC-compatibles. The 12-inch monitors connect to the IBM PC-AT and compatibles equipped with a monochrome display adapter card. Active display area is 210 mm wide by 150 mm high. Video bandwidth is 20 MHz for a resolution of 720 horizontal dots by 350 vertical lines. The 14-pound units produce 80 columns by 25 lines and accommodate TTL positive video signals. Front panels indicate power, contrast and brightness. \$199, both models. **NEC Home Electronics Inc.**, Personal Computer Division, Suite 10, 700 Nicholas Blvd., Elk Grove Village, Ill. 60007, (312) 228-5900.

Circle 316

Innovation

A system that protects
your customers' data as well
as your reputation.



GTX-100. Computer security so advanced, it could even foil Mata Hari.

Computer thieves are becoming smarter and bolder all the time. They're continually prowling the telephone lines to tamper with data stored in computers. They can steal information. Or erase it. Or

alter it to their advantage.

That's why you should keep GTX-100 in mind when you design or recommend computer systems.

GTX-100 is a new kind of security subsystem developed from Lockheed's years of experience with high technology and strict security.

GTX-100 not only gives your customers the protection they need, it also protects your reputation.

No system you design should ever talk to strangers. And GTX-100 eliminates that possibility by putting an electronic wall around your client's sensitive files. What's more, it has built-in value added and an attractive margin.

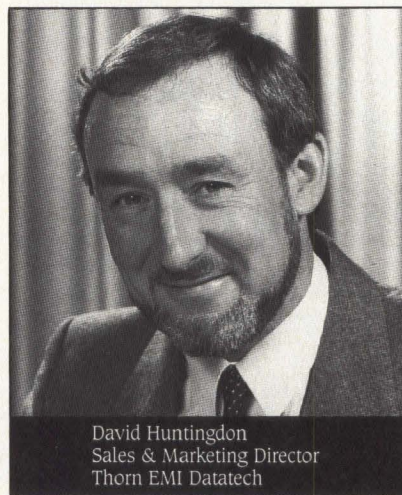
For details and the name of the GTX-100 distributor nearest you, phone (404) 951-0878. Or write: Lockheed-GETEX, Suite 945, 1100 Circle 75 Parkway, Atlanta, GA 30339.

 **Lockheed-GETEX**
Giving shape to imagination.

"The Invitational Computer Conferences bring to you the latest high-tech information you need to hear, and the major OEM products you need to see. We'll be there!"

And you'll find other top OEM manufacturers, such as Tandberg Data, Western Digital, SEI, Cipher Data Products, Xylogics, to name but a few.

Celebrating its 15th year, the "OEM Only" ICCs bring you, the volume buying decision makers, together with the key suppliers of computer and peripheral products. The ICCs also bring you a full day of high-tech seminars, explaining the latest in computer product technologies and what they mean to you, the systems design engineer. As an invited guest, there is no charge to attend the seminars or product displays.



David Huntingdon
Sales & Marketing Director
Thorn EMI Datatech

One of the ICCs, a one day regional conference, is convenient to where you work. The small, exclusive setting makes it easy for you to meet potential suppliers one-on-one.

Hear what the OEM manufacturers have to say, learn about new technologies, and remember, you may attend "by invitation only."

Call your local OEM supplier for your invitation or fill out the coupon

1986 International ICC Locations

Tokyo, Japan	January 21
Hong Kong	January 27
Singapore	February 4
Sydney, Australia	February 10
London, England	February 20
Frankfurt, Germany	February 25
Zurich, Switzerland	February 27
Paris, France	March 4
Tel Aviv, Israel	March 10

EUROPEAN LIAISON:

*C. J. Nicholl and Associates Ltd.
37 Brompton Road
London SW3 1DE, England
Phone: 01-581 2326
Telex: 888068 CJNAD G*

HEADQUARTERS:

*B. J. Johnson & Associates, Inc.
3151 Airway Avenue, #C-2
Costa Mesa, CA 92626, USA
Phone: (714) 957-0171
Telex: 5101002189 BJ JOHN*



Yes, I need an invitation to your "OEM Only" ICC. The nearest ICC to me is: _____

I buy in volume:

- Computers
- Disk/Tape Drives
- Controllers/Interfaces
- Terminals/Graphic Displays
- Software
- Printers
- Memory Boards
- Modems/Multiplexers
- Power Supplies

Name _____

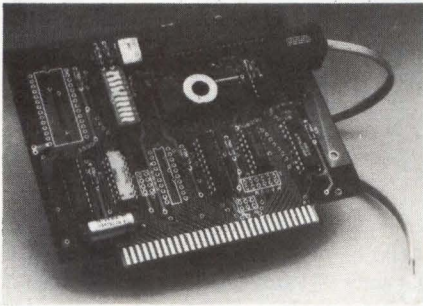
Title _____

Company/Division _____

Address _____

City _____ State/Zip _____ Country _____

Mail To: B. J. Johnson & Associates, Inc., 3151 Airway Avenue, #C-2, Costa Mesa, CA 92626, USA

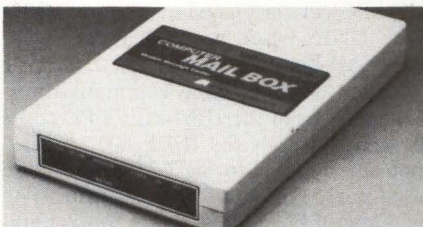


**LAN links
 32 IBM PCs**

- 1M bps
- 256K-byte RAM requirement
- File locking

A baseband network utilizing twisted-pair, telephone-type wiring, the Quadnet II LAN links up to 32 IBM PCs and compatibles. The network supports the carrier sense multiple access with collision avoidance communications protocol, transferring data at 1M bps. It permits the sharing of data files, output devices and software programs. Features include password security, file- and record-locking, print spooling, disk caching and help facilities. Required are an IBM PC or compatible with a hard disk, an 8088 CPU, 256K bytes of RAM for a dedicated machine or 385K bytes for a non-dedicated machine, and an operating system supporting DOS 1.1 and DOS 2.0. \$1,095, Master Kit (network interface card, user manual, operating software and key card); \$395, User Kit (interface card); \$95, Starter Kit (cabling to connect three workstations). **Quadram Corp.**, 4355 International Blvd., Norcross, Ga. 30093, (404) 923-6666.

Circle 317



**Unit executes
 electronic mail**

- 64K-byte memory
- Three passwords
- Remote access

The Signalman Computer Mailbox, a modem-message-center unit, receives

and stores incoming messages without requiring the computer to be on line, and provides remote access and message pickup with multilevel password protection. Storing 64K bytes of memory, the unit features a message-waiting visual indicator and three passwords allowing message storage, access to stored messages and the option to change the first two passwords and clear the buffer. \$299. **Anchor Automation Inc.**, 6913 Valjean Ave., Van Nuys, Calif. 91406, (818) 997-7758. **Circle 318**

**Switching system
 operates at 40M bps**

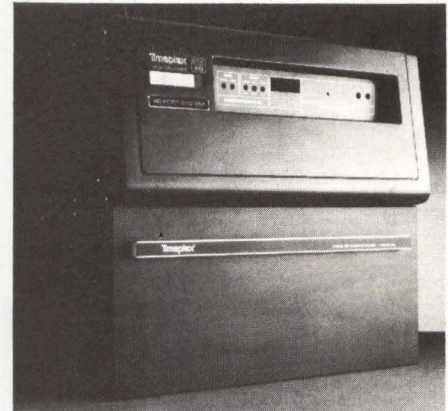
- Supports 4,000 devices
- Locates faults
- 9,600 bps

Operating at T1 speeds over all facilities and at 40M bps over a fiber-optics switch bus, the INX4400 Intelligent Network Exchange and INX4200 Network Control Matrix Switch provide data switching, networking, network control and LAN capabilities. The INX4400 disk-based electronic switch supports 4,000 devices connected to remote INX4400 slaves in a ring network with 2-km segments. Data-transfer rate is 35M bps on a time/diversity switch bus. The INX4200 locates faults, isolates problems, restores service and manages information. Finding use in synchronous, on-line, real-time environments, the switch handles 1,000 cross connections at 9,600 bps. A fiber-optic interface links 64 remote locations. \$5,500 both models. **Infotron Systems Corp.**, Cherry Hill Industrial Center, Cherry Hill, N.J. 08003, (609) 424-9400. **Circle 319**

**Multiplexer runs
 at 64K bps**

- Selective repeat
- Time division
- 48-user support

The DTM48 is a wideband statistical multiplexer combined with an internal, time-division multiplexer. Supporting up to 48 user ports for point-to-point applications requiring data link speeds of 64K bps, the statistical multiplexer transmits synchronous and asynchronous data. Buffer memories handle traffic loads that exceed data-link capacity. An automatic request for repetition feature aids links



that have significant delay. A selective repeat feature retransmits only faulty data frames. The internal, time-division multiplexer transparently handles synchronous protocols. TDM bandwidth can be dynamically allocated or permanently assigned on a per-port basis. Network security features include isolation techniques and signal alarms. Diagnostic capabilities include hardware and firmware tests, local and remote port and data-link loopbacks and test messages. \$6,600. **Timeplex Inc.**, 400 Chestnut Ridge Road, Woodcliff Lake, N.J. 07675, (201) 391-1111. **Circle 320**

**Board combines
 modem, protocol converter**

- 9,600 bps
- PU2 emulation
- Dial-up operation

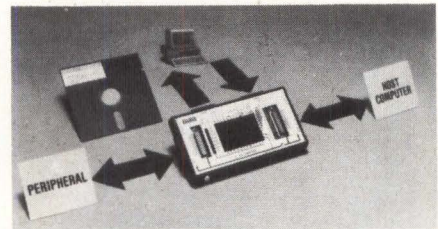
The ZIPmodem is a combined 9,600-baud, dial-up, synchronous modem and an SNA/SDLC protocol converter on an IBM plug-in board. Requiring one floppy disk, it comes with software and a communications program for on-line, mainframe computing. The protocol converter, in SNA/SDLC 3270 interactive or batch mode, emulates a PU2 with one LU2 terminal and one LU2 or LU3 printer. The modem transfers data at 9,600, 7,200 or 4,800 bps, CCITT V.29 specification, and 4,800 or 2,400 bps, CCITT V.27 specification. Features include error monitoring with automatic fallback to lower speeds, a speaker that monitors the phone line during initial connection and a permissive or programmed telephone interface option. \$2,995, personal computer and standalone version; \$1,995, mainframe version. **DecaTek Inc.**, P.O. Box 569, Stone Mountain, Ga. 30086-0569, (404) 493-7273. **Circle 321**

**System converts
 PC to protocol analyzer**

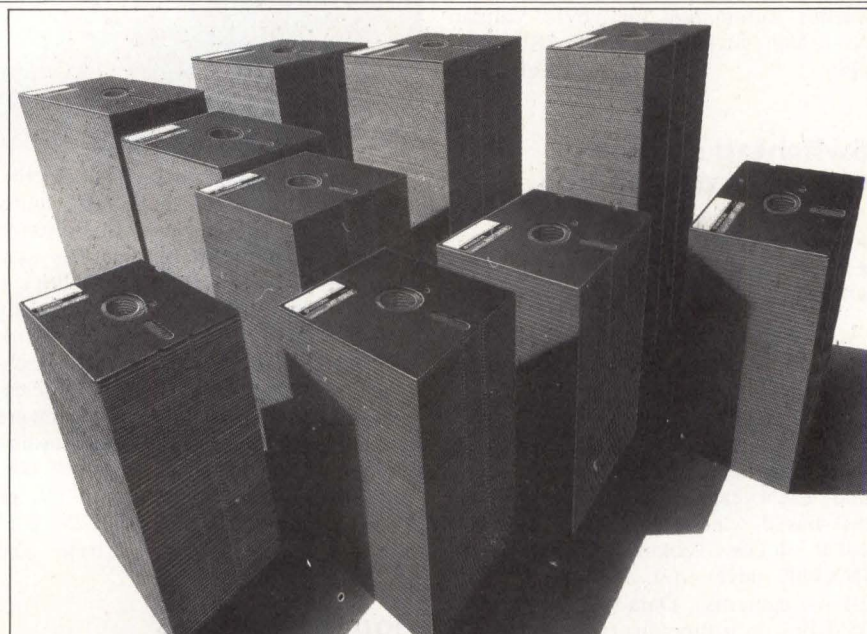
- 9,600 baud
- 1,024-character buffer
- ASCII character set

The Datametric System, consisting of software and hardware, permits personal

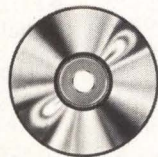
computers to display and record data characters traveling over RS232 communications lines to resolve protocol incompatibilities or to control line problems, measure bit-error rates and monitor line conditions. The system includes a hardware adapter, which in itself is an RS232 breakout box. Half- or full-duplex data can be received using any 5-, 6-, 7- or



8-bit character set. Maximum data rate is 9,600 baud, full duplex. Buffer memory capacity is 1,024 characters (ASCII and user-definable). Error conditions detected include parity, overrun, training and break. The software, using a five-menu format, provides help screens. The system requires one communications port, a monochrome or color adapter and 200K bytes of memory. \$495, Datametric system; \$350, software system without hardware adapter. **Burr-Brown Corp.**, International Airport Industrial Park, P.O. Box 11400, Tucson, Ariz. 85734, (602) 746-1111. **Circle 322**



1,000 floppies hold a lot.



Exactly the same as 1 thin CD-ROM disk!

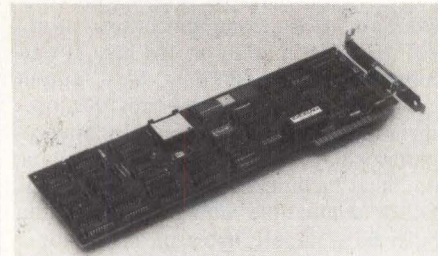
The new memory storage medium CD-ROM can store 270,000 pages! That's as much as one thousand single-sided minifloppies. Since it's the same size as an ordinary music digital disk, the savings in space are enormous. And if you consider distribution and mailing costs for 1,000 pages, let alone two-hundred times that amount, it's clear that the CD-ROM's 552 Mbytes can dramatically cut costs. Ideal for massive storage, CD-ROM data can't be destroyed by magnetic fields. Text, graphics, voice and music can be stored for new software applications. And the ideal drive for this new medium is definitely Hitachi's CDR-1502S. Hitachi's

new custom LSI assures hard read error under 10^{-12} without layered ECC. And since the drive adopts the same proven electro-mechanical technology as our mass-produced audio CD players, you can be sure the CDR-1502S is bug-free from the beginning. You can offer our drive for your product line either as a stand-alone unit or built-in. We will supply the 8-bit parallel interface card for DMA for most personal computers to make life easier. And more profitable.



HITACHI SALES CORPORATION OF AMERICA
 Industrial Division Eastern Regional Office: 1200 Wall Street West, Lyndhurst, NJ 07071 Phone: (201) 935-5300
 Western Regional Office: 401 West Artesia Blvd, Compton, CA 90220 Phone: (213) 537-8383

CIRCLE NO. 95 ON INQUIRY CARD



**Board connects
 PC to host via Ethernet**

- Dual-ported
- 128K-byte memory
- IBM-compatible

Working with the proprietary transmission control protocol/internet protocol (TCP/IP) software, the EXOS 205 front-end processor board connects IBM PCs, PC/XTs or PC-ATs and compatibles with UNIX-based systems, DEC PDPs, DEC VAXes and others via Ethernet. The board offloads the communications functions from the IBM PC's CPU to its 8-MHz, 80186-based IEEE 802.3 Ethernet controller. Storing 128K bytes, the dual-ported board requires a 16K-byte window of PC address space for communications processing. The EXOS 8050 and 8011 TCP/IP software consists of the protocol module, which executes the processor board, and file-transfer and Telnet (virtual terminal) applications. \$995, EXOS 205; \$350, 8050 and 8011 software. **Exelan Inc.**, 2180 Fortune Drive, San Jose, Calif. 95131, (408) 945-9526. **Circle 323**

Last year, people like you got away with
nearly \$200 million from us.



Hewlett-Packard's VAR discounts added up to some pretty good getaway money. Enough for a lot of trips to exotic, faraway places.

Take a look at Hewlett-Packard's commercial VAR Program and think how far you could go.

It offers discounts up to 35% on HP 3000 computers and peripherals. 40% discounts on demo/development systems. 10% credits on system upgrades if your customer decides to upgrade through us.

Of course, Hewlett-Packard's commercial VAR Program offers more than discounts. For instance, worldwide service and support, rated #1 by Datapro four years in a row.

And one of our strongest selling points: the new HP 3000 Series 37.

It's a full-fledged mini-computer, expandable from 2 to 28 users. But the price for CPU, 1/2 Mbyte memory (expandable to 2 Mbyte), system software, console, 55 Mbyte disc drive and 67 Mbyte cartridge tape drive is just \$21,950 (before quantity discounts).

So first get it all from Hewlett-Packard. Then get away from it all.



The HP Program for Value-Added Resellers

- Send me information on your commercial VAR program and the HP 3000 Series 37.
- Have an HP representative call me right away.

Name _____

Company _____

Address _____

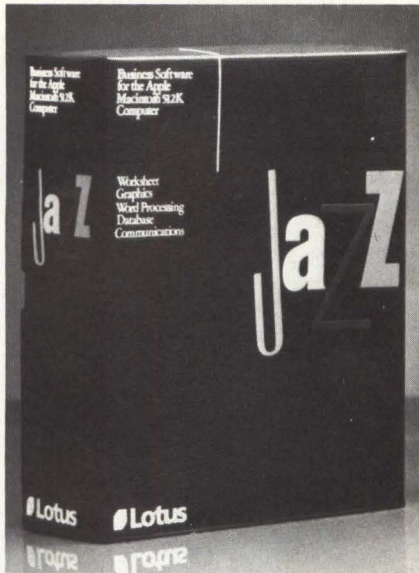
City/State/Zip _____

Phone _____

Mail to: Bob Hall, Hewlett-Packard, Dept. 008223,
10520 Ridgeview Court, Cupertino, CA 95014 ISO 2516



CIRCLE NO. 96 ON INQUIRY CARD



Macintosh package integrates five functions

- Word processing
- Worksheet function
- Graphics

An integrated business software package operating on the 512K-byte Apple Macintosh, Jazz incorporates five stand-alone functions. The Worksheet function, used for annual reports, income forecasts and sales projections, produces 8,192 rows by 256 columns to build large numerical models and to make calculations on spreadsheets. Its capabilities include text manipulation, calendar and financial, statistical, logical and mathematical functions. Word-processing features include search and replace, automatic word-wrap and control underlining and printer output. Its HotView function integrates word processing with the Worksheet, Database and Graphics functions. Information from the Database or Worksheet can be retrieved and transformed into graphics. Graphics functions include pie charts, line graphs, bar graphs, area graphs, scatter charts and percent graphs. The Database stores, retrieves, views, sorts and updates data. The Communications feature converts Lotus 1-2-3, Symphony and Multiplan into Jazz files. It offers telephone auto-dial and auto-answer, stored baud rates, parity, word length, stop bits, pulse and tone dialing and local echo. \$595. **Lotus Development Corp.**, 55 Cambridge Parkway, Cambridge, Mass. 02142, (617) 577-8500. **Circle 324**

Spreadsheet combines graphics, database

- Runs on Macintosh
- Automatic macros
- Integrated charting

The Excel spreadsheet combines automatic macros, user-defined functions, array handling and two-way file compatibility while incorporating business graphics and an on-sheet database. Operating on the 512K-byte Macintosh microcomputer, the package's graphic interface generates 16,384 rows by 256 columns. It builds interactive, visible links between worksheets, connecting their contents. Macros automate commonly performed tasks; a macro language writes automated applications, automated templates and user-defined functions. Charts and spreadsheets can be viewed simultaneously and are interactively linked with an integrated charting function, one of 42 built-in chart functions in the spreadsheet. An array-handling capability performs linear programming and problem solving. Addressing needs of number processors to extract data for analysis, the integrated database queries, extracts and sorts data. Offering two-way file compatibility with Lotus 1-2-3 on the IBM PC, the package is also compatible with Microsoft Chart and Multiplan for the Macintosh. \$395. **Microsoft Corp.**, 10700 Northup Way, Box 97200, Bellevue, Wash. 98009, (206) 828-7400. **Circle 325**

OS addresses 16M bytes of memory

- Real-time management
- 80286 CPU-compatible
- Process-control

The iRMX 286 Release 1.0 real-time, multitasking, multiprogramming operating system addresses up to 16M bytes of memory. Its applications include process control, communications and simulation. Working with the 80286 microprocessor, the iRMX 286 is application-source-code-compatible with the iRMX 86 operating system. Applications developed on the iRMX 86 operating system can be ported to the iRMX 286 by recompiling application source code through iAPX 286 compilers. The operating system's hardware traps automatically identify typical programming errors. To ensure

that code segments cannot be overwritten by other tasks, the operating system marks code segments as "executable-only." Features include device drivers for Multibus controllers, support of 80287 processor extension and debugging utilities. \$7,500, initial license fee. **Intel Corp.**, 5200 N.E. Elam Young Parkway, Hillsboro, Ore. 97123, (503) 640-7147. **Circle 326**

System builds menu in 7 minutes

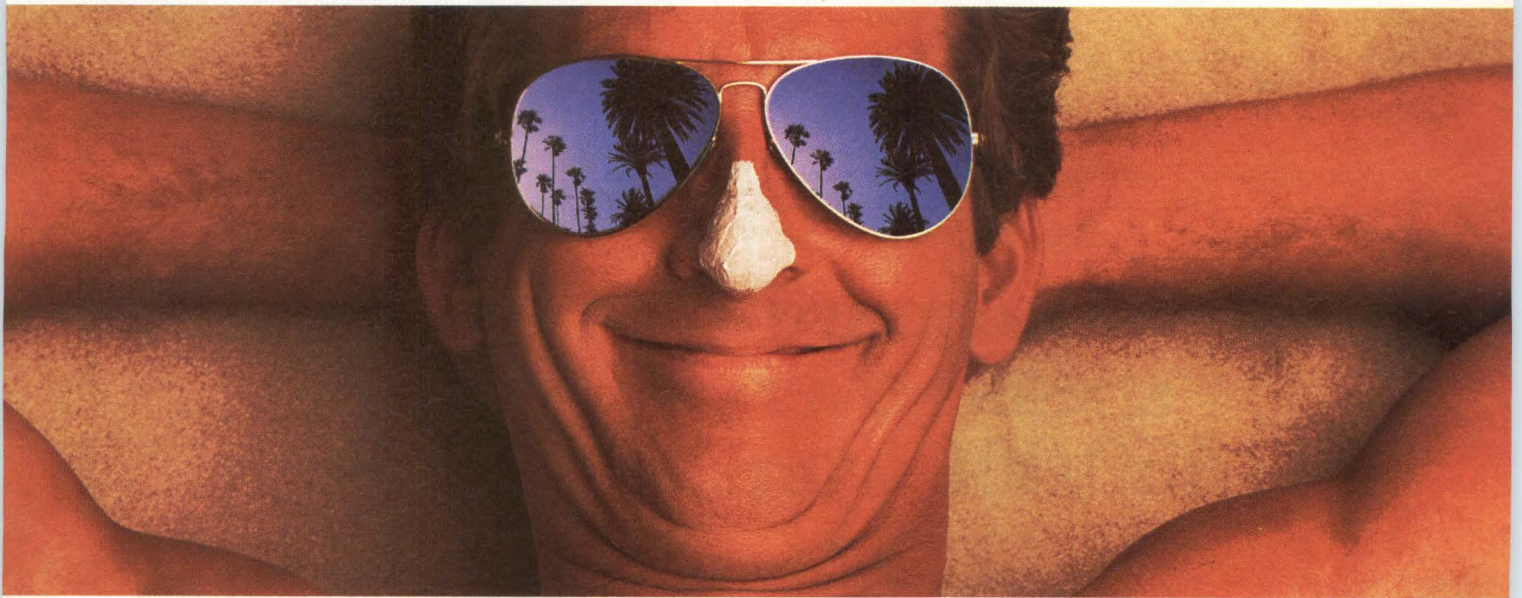
- Application Express
- FileGateway
- 256K-byte requirement

The R:base 5000 database-management system for microcomputers builds a customer tracking menu in 7 minutes. Its Application Express menu-driven feature prompts into a visual-define mode which provides a graphic presentation of a database table. Applications are generated with automated screen, menu builders, data entry forms and reports and pre-written commands. Program development tools include a procedural language, custom macros, report writer and compiler. A FileGateway feature transfers data from Lotus 1-2-3, dBASE II or ASCII files into R:base format without programming or re-keying. The software operates on an IBM PC, PC/XT, PC-AT or compatibles requiring 256K bytes of memory. \$700. **Microrim Inc.**, 3380 146th Place S.E., Bellevue, Wash. 98007, (206) 641-6619. **Circle 327**

ANSWERS TO AUGUST'S PUZZLE

B	A		A		M	O	P		T	R	E	E
U	S		C	L	O	N	E		R	U	S	E
S	C	A	R		N	E	W	S		B	U	G
	I		E	F	I		S	E	T	S		S
D	I	T		A	T	E			A		B	
U	E	R	R	O	R		S	P	L	I	T	
M	R	S		C	R	A	S	H		E	T	A
P	A	T	C	H		S	T	O	R	E	L	
	M		R			E	O	N		S	F	C
C		S	T	A	B		R	E	D		I	
E	P	H		D	A	T	A		I	T	E	M
L	I	E	D		U	R	G	E	S		L	A
L	E	A	F		D	Y	E		K		D	P

We have 2400 feet to stick in the door.
So you can put yours in the sand.



You've all been working around the clock on the new software. It's finished. It's terrific. And you're exhausted.

You really need a vacation. But, first you have to get out there and drum up business. Unless, of course, you'd rather Hewlett-Packard did the drumming for you.

Join our commercial Software Supplier program, and that's exactly what happens. Our worldwide sales force will go to work, opening doors you may never know existed.

Your side of the bargain is to write software to run on HP 3000 business computers. For any kind of business you choose. Then help us close the deals.

For this, we'll give you a bonus of up to 6% of the HP hardware price on any system sale leveraged by your software. That's on top of your full price to the customer.

The HP Program for Software Suppliers is full of nice incentives like this. To find out about all of them, send in the coupon for our brochure.

Pretty soon, you could be on your way somewhere they've never even heard of computers. While we take care of business.



The HP Program for Software Suppliers

Send me details of your commercial HP 3000 Software Supplier Program. Maybe we have been working too hard.

Have an HP representative call me.

Name _____

Company _____

Address _____

City/State/Zip _____

Phone _____

Mail to: Bob Hall, Hewlett-Packard, Dept. 008224,
10520 Ridgeview Court, Cupertino, CA 95014 ISO 2517



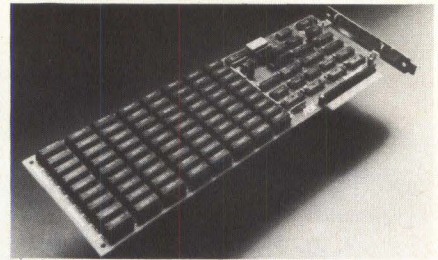
CIRCLE NO. 97 ON INQUIRY CARD

Memory board holds 2M bytes

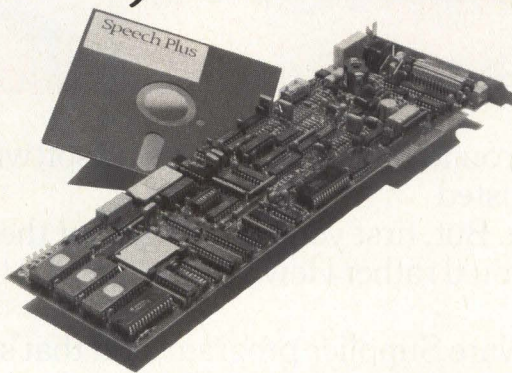
- Split memory addressing
- Software driver
- 640K-byte paging

RAMpage!, a 2M-byte expanded memory specification board for the IBM

PC, utilizes an enhanced superset of the Lotus/Intel specification to boost the performance of application and multiuser software requiring large amounts of memory. Capabilities include paging directly into memory addressed in the 0K-to-640K-byte range. Included with the board is a software driver, the Expanded Memory Manager, which accesses the



One board speaks over 450,000 words.



CallText™ Voice Synthesizers have an Unlimited Vocabulary

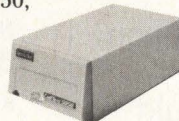
With CallText Voice Synthesizers, your computer can *speak* electronic mail, stock quotations, sales status, weather reports or any vital information. And CallText products include a telephone interface, so people can call in and listen as any ASCII text file is converted to speech in real time.

Advanced technology gives CallText Voice Synthesizers full command of the entire English language — nearly a half million words.

For a live, interactive demonstration of how data can be delivered in voice, call (415) 969-6257.

Features

- High quality text-to-speech conversion.
- FCC-registered telephone interface with Touch-Tone decoding and generation.
- Speaker amplifier for local monitoring.
- Two models now available:
 - CallText 5000, IBM PC/XT compatible card. Includes I/O drivers; BASIC, C, Assembly languages.
 - CallText 5050, RS-232C computer peripheral.



Speech Plus[®]
INCORPORATED

461 NORTH BERNARDO AVENUE, MOUNTAIN VIEW, CA 94039-7461
TELEPHONE (415) 964-7023

CIRCLE NO. 98 ON INQUIRY CARD

added memory in 16K-byte pages. The board allows the application program to exchange data into the available 16K-byte blocks between 640K and 1M byte. Split memory addressing rounds out conventional memory to 640K bytes in an IBM PC with 64K bytes or more installed. Four boards can be installed in an IBM PC. \$595. **AST Research Inc.**, 2121 Alton Ave., Irvine, Calif. 92714, (714) 863-1333. **Circle 328**

Display controller serves CAD/CAM needs

- 640 by 480 pixels
- 20,000 vectors per second
- 256 colors

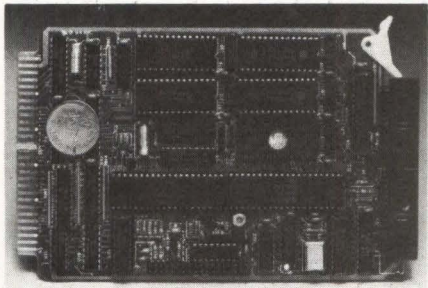
The PG-640 color graphics board set for the IBM PC/XT or PC-AT bus serves as a display controller for applications requiring CAD/CAM, engineering workstations and presentation graphics. Providing a 640-by-480-pixel resolution with 8 bits per pixel, the board produces 256 colors from a palette of 4,096 with a 60-Hz non-interlaced refresh rate. Software compatible with the IBM Professional Graphics Controller, the unit's features include a 32/16-bit display list processor, VLSI drawing processor and an instruction set that includes text windows, stroke text and raster operations. The board operates at 20,000 vectors per second, 5,000 cps and 1 million pixels per second for raster operation. \$2,495. **Matrox Electronic Systems Ltd.**, 1055 St. Regis Blvd., Dorval, Quebec, H9P 2T4, Canada, (514) 685-2630. **Circle 329**

SBC suits STDbus

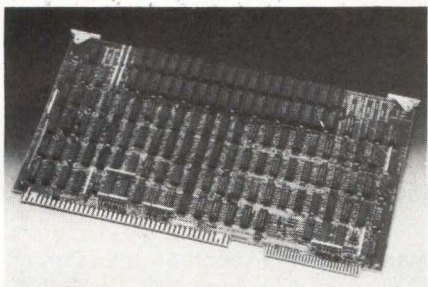
- 64K-byte RAM
- 32K-byte EPROM
- Z80 CPU

A single-board computer (SBC) providing multiprocessing for the STDbus, the model CPU-9 uses a Z80 CPU opera-

NEW PRODUCTS SUBASSEMBLIES



ting at 6 MHz. The board stores 64K bytes of RAM and 32K bytes of EPROM with ghosting capability. Features include a real-time, battery-backed clock/calendar, two programmable RS232/RS422 ports, one Centronics printer port, two 16-bit counter/timer channels with interrupts and a piggyback Intel SBX connector. The board finds use in distributed-control applications where multiple CPUs work in parallel and share common data. \$250. **Computer Dynamics Inc.**, 105 S. Main St., Greer, S.C. 29651, (803) 877-7471. **Circle 330**



RAM board operates with no wait states

- Multibus-compatible
- IEEE-796 interface
- 1M-byte RAM

With the DBR50-1M, 1M-byte, dual-bus RAM board, 16-bit single-board computers (SBCs) can be supported with additional megabytes of RAM. The Multibus-compatible board interfaces with an SBC via the IEEE 796 bus on the P1 connector and runs with no wait states for 16-bit CPUs with dual port and 16M-byte expandability. Data is organized into 8- and 16-bit words with byte exchange or swapping. Features include read/modify/write cycles, parity generation and check, interrupt on parity error, error isolation register, burst-mode capability and interleaved memory support. \$3,495. **Microbar Systems Inc.**, 785 Lucerne Drive, Sunnyvale, Calif. 94086, (408) 720-9300. **Circle 331**



Think of a Viking workstation as another way to add value.

If you're not integrating ergonomic support furniture in your system, you may be missing an easy way to increase margins and add even more value. Users don't like shopping around to complete the system any more than you do. Try buying a good workstation in your area sometime. It's tough, and it sometimes opens the door to competition and criticism.

We think a lot of users care about the system environment, and well-designed support furniture can make your system more comfortable. And therefore more useful and productive.

Call us on our toll-free line. Everyone wins: users get good furniture at no more cost; you increase margins; and we win through economy of scale, even if the scale is just a few units a month.

Call today, or write our OEM Department:
Viking Acoustical, Airlake Industrial Park,
Lakeville, MN 55044. 612/469-3405, or Telex 290693.

VIKING

Call toll free
1-800-328-8385

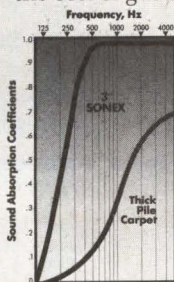
CIRCLE NO. 99 ON INQUIRY CARD

SONEX sweeps carpet costs less money, kills more noise.

You might think that because SONEX is a professional acoustic foam, specifically designed to kill industrial noise, it would cost more than carpet. Logical but wrong.

At just \$16/yard, SONEX is one-third the cost of good quality carpeting. Yet it's twice as deadly to noise. And even if you order special SONEX in low quantities, it's still only half the cost of carpet. And 3 times deadlier. So you can't lose. It's

less expensive, yet more effective. Call or write for the SONEX brochure, complete with acoustic charts and all the facts: 3800 Washington Ave. North, Minneapolis, MN 55412. (612) 521-3555



\$50/yard

\$16/yard

illbruck

CIRCLE NO. 100 ON INQUIRY CARD

REGIONAL SALES OFFICES

BOSTON

Robert K. Singer
National Sales Manager
Norma E. Lindahl
Assistant To The National
Sales Manager

John J. Fahey
Regional Manager
Katie Kress
Sales Coordinator
275 Washington St.
Newton, MA 02158
(617) 964-3030

PHILADELPHIA

Stephen B. Donohue
Regional Manager
1873 Route 70, Suite 302
Cherry Hill, NJ 08003
(609) 751-0170

ATLANTA

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

CHICAGO

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

DALLAS

Don Ward, Regional Manager
13740 Midway Suite 515
Dallas, TX 75234
(214) 980-0318

DENVER

John Huff
Regional Manager
270 St. Paul St.
Denver, CO 80206
(303) 388-4511

LOS ANGELES

Len Ganz
Regional Manager
12233 West Olympic Blvd.
Suite 236
Los Angeles, CA 90064
(213) 826-5818

ORANGE COUNTY

Debra Huisken
Regional Manager
2041 Business Center Dr.
Suite 109
Irvine, CA 92715
(714) 851-9422

SAN FRANCISCO

Frank Barbagallo
Northwestern Region Sales Manager
Rick Jamison
Regional Manager
Kathleen Maxwell
Sales Coordinator
Sherman Building, Suite 100
3031 Tisch Way
San Jose, CA 95128
(408) 243-8838

AUSTRIA

Elan Marketing Group
Neutor g. 2
P.O. Box 84
1013 Vienna, Austria
Tel: 43-222-663012 or -638461

BENELUX

Elan Marketing Group
Boschdijk 199B
5612 HB Eindhoven
The Netherlands
Tel: 31-40-455724

ISRAEL

Elan Marketing Group
13 Haifa St., P.O. Box 33439
Tel Aviv, Israel
Tel: 972-3-252967 or -268020
Telex: 341667

JAPAN

Kaoru Hara
General Manager
Trade Media Japan Inc.
R. 212 Azabu Heights
1-5-10 Roppongi Minato-ku,
106, Japan
Tel: (03) 587-0581

TAIWAN

Mr. Donald H. Shapiro
Trade Winds, 2nd Floor
132 Hsin Yi Road, Sec. 2
Taipei, Taiwan

UNITED KINGDOM

Elan Marketing Group
5th Floor, Suite 10
Chesham House
136 Regent St.
London W1R 5FA
Tel: 437-6900
Telex: 267653

SWEDEN

Elan Marketing Group
Humlegardsgatan Nr. 5
11446 Stockholm, Sweden
Tel: 46-8-677243 or -676243

WEST GERMANY

Elan Marketing Group
Sudring 53
7240 Norb/Neckar, West Germany
Tel: 49-7451-7828

Mini-Micro Marketplace

Norma Lindahl
275 Washington St.
Newton, MA 02158
(617) 964-3030

Direct-Response Postcards

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

Career Opportunities

Norma Lindahl
Recruitment Advertising Manager
275 Washington St.
Newton, MA 02158
(617) 964-3030

Cahners Magazine Division

William Platt, President
T.M. McDermott, Vice President
Electronics/Computer Group
Tom Dellamaria, VP/Production
Ira Siegel, VP/Research

Promotion Staff

Susan Rapaport
Marketing Communications Director
Mary Gregory
Promotion Manager
Elizabeth Phillips
Marketing Assistant

Circulation

Denver, CO:
(303) 388-4511
Sherri Gronli
Group Manager

CALENDAR

OCTOBER

- 2-4 First International Conference in Japan on Optical Storage Technology**, Keidanren Kaikan, Tokyo, Japan, sponsored by the Technology Opportunity Conference (TOC). Contact: TOC, P.O. Box 14817, San Francisco, Calif. 94114-0817, (415) 626-1133.
- 7-10 IEEE International Conference on Computer Design: VLSI in Computers**, Port Chester, N.Y., sponsored by the IEEE Circuits and Systems Society and the IEEE Computer Society. Contact: ICCD '85, Suite 300, 1109 Spring St., Silver Spring, Md. 20910, (301) 589-8142.
- 8-11 Design Engineering Show and Conference**, National Exhibition Centre, Birmingham, England, organized by Cahners Exhibitions Ltd. Contact: Cahners Exhibitions Ltd., Chatsworth House, 59-61 London Road, Twickenham, TW13SZ, England, 01-891-5051.
- 14-16 Corporate Electronic Publishing Systems: A Showcase and Conference (CEPS)**, Sheraton Centre Hotel, New York, sponsored by Cahners Exposition Group. Contact: Maura Fitzgerald, The Sterling PR Group, 222 Third St., Cambridge, Mass. (617) 661-7220.
- 14-17 Information Management Exposition and Conference (INFO)**, New York Coliseum, New York, sponsored by Cahners Exposition Group. Contact: CEG Client Services, 999 Summer St., Stamford, Conn. 06905, (203) 964-8287.
- 15-17 Ohmcon '85 High-Technology Electronics Exhibition and Convention**, Cobo Hall, Detroit, sponsored by the Electronic Representatives Association and the IEEE. Contact: Ohmcon '85, P.O. Box 699, Utica, Mich. 48087-0699, (313) 781-4551.
- 18-20 Great Southern Computer and Electronics Show**, Orlando, Fla., sponsored by Great Southern Shows. Contact: Great Southern Shows, P.O. Box 655, Jacksonville, Fla. 32201, (904) 743-8000.
- 21-24 American Society for Information Science (ASIS) '85**, MGM Grand Hotel, Las Vegas, Nev., sponsored by ASIS. Contact: Betty Foley, manager of conferences, ASIS, 1010 16th St., N.W., Washington, D.C. 20036, (202) 659-3644.
- 21-24 Computer Graphics '85**, Atlanta, cosponsored by The World Computer Graphics Association and The National Computer Graphics Association. Contact: Christine A. Radiske or Holly Siprelle, NCGA, 8401 Arlington Blvd., Fairfax, Va. 22031, (703) 698-960

- 22-24 Northcon/85 High-Technology Electronics Exhibition and Convention**, Portland Memorial Coliseum, Portland, Ore., sponsored by Electronic Conventions Management. Contact: Jerry Fossler or Nancy Hogan, Electronic Conventions Management, 8110 Airport Blvd., Los Angeles, Calif. 90045, (213) 772-2965.
- 23-25 The First Optical Disc Read-Only Memory Forum**, Pentagon Quality Inn, Arlington, Va., sponsored by the Learning Technology Institute, 50 Culpeper St., Warrenton, Va. 22186, (703) 347-0055.
- 25-27 UCSD p-System User's Society Fall National Meeting**, Omni International Hotel, Baltimore, Md., offered by the UCSD p-System User's Society. Contact: Carl Van Dyke, VP Member Services, P.O. Box 1148, La Jolla, Calif. 92038, (804) 320-2561.
- 28-30 DPMA Houston '85**, Albert Thomas Hall, Houston, sponsored by the Data Processing Management Association International (DPMA). Contact: Conference Manager, Data Processing Management Association, 505 Busse Highway, Park Ridge, Ill. 60068-3191, (312) 825-8124.
- 28-29 Robotics Technology Conference**, Hyatt Regency, Chicago, offered by Dataquest Inc., a subsidiary of A.C. Nielsen Co. Contact: Gail van Tubergen, manager, conferences, Dataquest Inc., 1290 Ridder Park Drive, San Jose, Calif. 95131, (408) 971-9000.
- 29-30 Flat Information Displays Conference**, Red Lion Inn, San Jose, Calif., organized by Stanford Resources Inc. and International Planning Information (IPI) Inc. Contact: Murray Disman, president, IPI Inc., 164 Pecora Way, Portola Valley, Calif. 94025, (415) 854-7306.
- 29-31 The Sixth Annual Federal Office Automation Conference**, Washington Convention Center, sponsored by the National Council for Education and Information Strategies. Contact: Dallas Kinnéy, Conference Communications, P.O. Box N, Wayland, Mass. 01778, (617) 536-5356

NOVEMBER

- 5-8 The National Database and 4th Generation Language Symposium (DB & 4GL)**, Dallas, sponsored by Software Institute of America and conducted by Digital Consulting Associates Inc. Contact: Kristin Kittle Lynch, Digital Consulting Associates Inc., 6 Windsor St., Andover, Mass. 01810, (617) 470-3870. Also to be held Dec. 3-6, Boston.



**DATA
ENTRY**

VAX·PDP·IBM·PC
VARIOUS UNIX, OTHERS

- USER FORMATTED "FILL-IN-THE-BLANKS" DATA INPUT
- REPLACES KEY PUNCHES AND KEY-DISCS
- TERMINAL INDEPENDENT
- MEETS HIGH VOLUME / HIGH SPEED DATA ENTRY REQUIREMENTS
- NO PROGRAMMING REQUIRED
- EFFICIENT, FLEXIBLE

VIKING DATA ENTRY SYSTEM

VAX, PDP are trademarks of Digital Equipment Corporation.
IBM-PC is a trademark of International Business Machines Corporation.
UNIX is a trademark of AT&T.



CALL:
(918) 745-6550

**VIKING
Software Services**
2815 E. Skelly Dr., Suite 816
Tulsa, OK 74105

CAREER OPPORTUNITIES/ RECRUITMENT ADVERTISING



RADAR ENGINEERS

The Navy's largest, research, development, test, and evaluation activity, located at the foot of the Sierra Nevada, has immediate openings for experienced ENGINEERS to work on RADAR SYSTEMS.

Candidates with degrees in Engineering, Mathematics, or other appropriate disciplines, and experience in the following areas are encouraged to apply by 1 November 1985.

- * TRANSMITTER & RECEIVER DESIGN
- * ANTENNAS & ANTENNA PLATFORMS
- * COMPUTERS FOR MISSILE SYSTEMS
- * SIGNAL PROCESSING AS APPLIED TO RADAR GUIDED MISSILES

SALARY TO \$47,000



Naval Weapons Center
ANN-092-395-85
China Lake, CA 93555-6001

An Equal Opportunity Employer / U.S. Citizenship Required

CIRCLE NO. 240 ON INQUIRY CARD

More and more advertisers of minicomputers, microcomputers, CRT terminals, printers, disk drives, memories, modems, distributed data processing systems, etc., are consistently turning to

MINI-MICRO SYSTEMS.

Call

Norma Lindahl

at

(617) 964-3030



To place your ad in **Mini-Micro Systems**

call or write:
Norma Lindahl
Recruitment Manager

CAHNERS PUBLISHING CO.

275 Washington Street
Newton, MA 02158
(617) 964-3030

FACTORY AUTOMATION D.E.C. SPECIALISTS

DANIEL AUTOMATION SERVICES is a division of a major engineering company supplying turnkey projects for leading companies in the biotechnology, chemicals, pharmaceuticals, electronics, paper, metals processing and allied industries. Due to our strong growth, the Manufacturing Information Systems Department has opportunities for the following computer systems professionals.

SYSTEMS ENGINEER-VAX

Strong VMS and utilities experience required. Should be knowledgeable in hardware configuration and system sizing. Experience in DecNet implementation desirable. Exposure to database management packages an asset. Major project experience required.

SYSTEMS ENGINEER-PDP

Strong RSX and utilities experience required. Should be knowledgeable in hardware configuration including special purpose peripherals. Experience in system performance tuning desirable. MACRO capability. Background in real-time projects such as interfacing to programmable controllers is an asset.

SENIOR SYSTEMS ANALYST

Must have broad background in factory applications for either assembly or process operations. Should have experience with packaged and custom systems. Background involving networking of micros, minis, and mainframes is a plus. Some non-DEC experience desirable. Responsible for writing system development proposals and system functional descriptions. Background in structured analysis techniques desirable. Project estimating and scheduling ability required.

DATABASE ARCHITECT

Experience with relational or codasyl packages required. Will be responsible for immediate selection and implementation of a D/B package for a major manufacturing system. Broad applications background desirable. Ability to interface with users to define and document system requirements is essential.

PROGRAMMERS

FORTRAN, C or equivalent; MACRO desirable. Applications span both interactive and real-time programming; maintenance programming rarely needed. Background using database management packages beneficial. Exposure to graphics workstations a plus.

Selected candidates will have the opportunity to conceive and implement state-of-the-art factory automation projects using any justifiable hardware or software available. All positions require appropriate education and strong project credentials. **DANIEL** offers a nationally competitive salary structure, a comprehensive benefit package, and access to the adjacent fitness center.

If you are looking for a new challenge and meet the above requirements, please submit your resume including salary history to: John Ervin, **DANIEL**, Dept. 2-5246, Daniel Building, Greenville, SC 29602.

DANIEL

Equal Opportunity Employer

CIRCLE NO. 241 ON INQUIRY CARD

STAFF POSITION AVAILABLE with

Kentucky-based consulting firm specializing in the design & implementation of automated mapping & G.I.S. Requisites; 3-5 yrs exp. in design, procurement & operations of mapping systems for municipalities, utilities & military-based applications; (alternatively) 3-5 yrs exp. in systems analysis, systems configuration & execution of database linkage between/among graphics and mainframe systems. Exceptional verbal & writing skills required. Salary based on exp. **Forward resume, salary history & requirements to P.O. Box 161, Frankfort, KY 40602.**

*A small ad here
can attract
a lot of attention!*

SDC Promises To Be As Demanding Of You As The Government Is Of Us.

We're a subsidiary of the Burroughs Corporation. And we custom-design computer and intelligence systems for the toughest customer in the world—the U.S. Government.

Because the Government is so demanding of us, we can't afford to be any less demanding of you. Currently, the kind of people in demand here include software and systems professionals so good, they can custom-design anything from an individual workstation to an entire communications network.

The challenge is tremendous. But the rewards are excellent. They include the stimulation of a team working environment where responsibilities may change from month to month. And the excitement of sharing in projects that are of national importance.

Software Engineering

- Microprocessor-Based Multi-Processing, Multi-Tasking Development
- Test Plans, Procedures, Simulator and Tool Development
- OS: UNIX™, MS-DOS, CPIM, CTOS/BTOS
- Language: Pascal, PLM or C required; Ada, Fortran or COBOL helpful
- Intel Multibus Controller Experience; Peripheral Drivers

Systems Engineering

- Systems Design/Analysis
- Fault Tolerant Systems
- System Performance Analysis (Utilization, Throughput Response Time)
- System Simulation
- System Performance Measurement
- LANS/Packet Switched Networks
- DoD Protocols and Application
- Real Time Systems

SDC employees enjoy competitive salaries and superb company-paid benefits. Qualified candidates should send their resume, complete with salary history to:



System Development Corporation
A Burroughs Company
Affirmative Action Employer
U.S. Citizenship Required

UNIX is a trademark of AT&T Bell Labs

Stephen Kaplan
Manager Employment
System Development
Corporation
Custom Products Group
P.O. Box 517
Dept. MM-0985
Paoli, PA 19301

CIRCLE NO. 242 ON INQUIRY CARD

SOFTWARE ENGINEERS for Data Communications R&D — Join Racal-Milgo NOW in beautiful Ft. Lauderdale.

Racal-Milgo, one of the largest data communications companies in the world, has an enviable record of three decades of continuous growth. Our large, integrated network management systems are preferred by major Fortune 500 companies, the military, and government agencies.

Advanced software development... all of the current R&D "tools"... career growth... challenge... continuous learning... participation in decision making — they can all be YOURS when you join Racal-Milgo.

MULTIPLE OPENINGS AT MULTIPLE LEVELS — Fellow, Principal, Senior Software Engineers. Minimum requirements: MSCS degree and 3 years experience... or BSCS with 5 years... and developed skills in at least one of these disciplines:

- Communications Protocols
- Network Management System Software
- UNIX™ Operating System Kernel
- Real-Time Database Management
- Interprocessor Communication
- UNIX™ Tools and Utilities
- System Integrity/Fault Recovery
- System Testing

Racal-Milgo offers excellent salaries and complete company benefits, including 3 weeks of paid vacation, 100% paid tuition, life/medical/dental insurance, and a liberal relocation policy which includes MORTGAGE INTEREST DIFFERENTIAL.

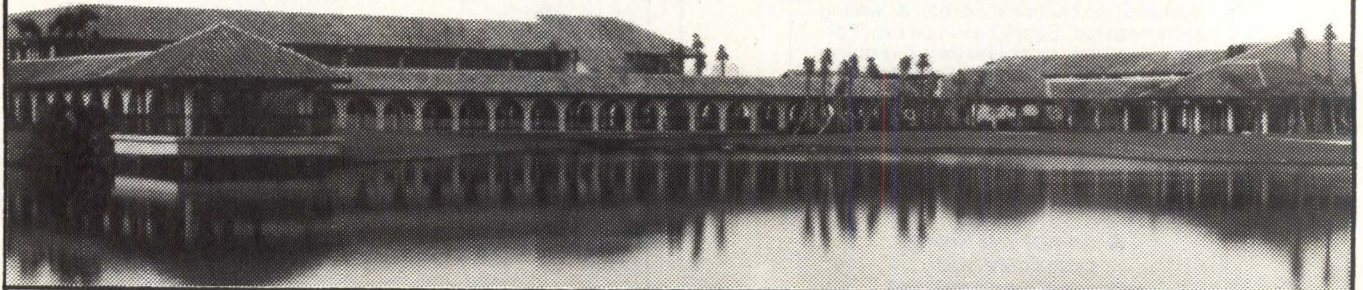
For an interview, call Patrick Ahern
COLLECT: (305) 476-5439 — or
send your resume to:

Racal-Milgo®

P.O. Box 407044 (13611) • Ft. Lauderdale, FL 33340

An EEO/Affirmative Action Employer UNIX is a trademark of Bell Labs.

Racal-Milgo employs over 3400 people. Our new 100-acre Harrison Park headquarters complex in Ft. Lauderdale provides an exceptionally attractive work environment.



CIRCLE NO. 243 ON INQUIRY CARD

RESUME FORWARDING SERVICE

To have your resume forwarded on to the company of your choice advertised in the Career Opportunities section, simply write in the box at the right the name of the company that interests you.

Complete the following brief resume and mail to: Norma Lindahl

MINI-MICRO SYSTEMS
CAHNERS PUBLISHING CO.
221 COLUMBUS AVE.
BOSTON, MA 02116

Forward my brief resume to:

(Never more than 3 companies, please)

(Please type, or print using all caps in dark ink.)

1.

Last Name _____ First _____ Middle Initial _____

Home Address (Street, City, State, Zip) _____

Home Phone (Area Code) _____ Other (Area Code) _____

2. EDUCATION INFORMATION: Schools Attended

Name _____ Location: _____ Degree: _____

Name _____ Location: _____ Degree: _____

3. EMPLOYMENT INFORMATION:

Name & Address of Present Employer (Will not be contacted) _____

Position (Please give brief description of your title and current job assignment) _____

Length of time with current employer _____

4. Are you willing to relocate? _____

What are your geographical preferences? _____

5. Please Check One:

U.S. Citizen _____ Permanent Resident _____ Student Visa _____

6. Foreign Language

Read _____ Write _____ Speak _____

7. Please indicate current salary _____

*Please Sign Here

Date

*Your signature will authorize us to forward the above information on to the company of your choice, in the strictest confidence. Your current employer will not be contacted.

8-85

CLASSIFIED ADS

Copy Deadline:

Space reservations and advertising copy must be received by the 10th of the month preceding the issue date. Camera-ready mechanicals must be received by the 15th of the month preceding the issue date. For example, to appear in the February issue, copy must be received by January 10; mechanicals by January 15.

new literature

TECHNOLOGY TRANSFER

New! Giant Reference Book of Govt. sponsored Computer & Electronics Research: Thousands of patents for license to industry, tech reports, literature searches, F.O.I. procedures, lab sources. \$65 + \$3.95 P&H. Check, Visa, MC. 10 day money back guarantee. AITA, Box 730B, Concord, MA 01742.

CIRCLE NO. 225 ON INQUIRY CARD

inventions wanted

INVENTIONS, IDEAS, NEW PRODUCTS WANTED!

Presentation to industry. National Exposition.

Call: 1-800-528-6050, X831
ISC-MMS, 903 Liberty,
Pittsburgh, PA 15222

CIRCLE NO. 226 ON INQUIRY CARD

software

D-M-DRIVER Disk in Memory

for Micro/RSX, 11M, 11M+

Call 415-420-9579

Proto Systems

1238 Josephine St, Berkeley, CA

*TM of Digital Equip Corp 94703

CIRCLE NO. 227 ON INQUIRY CARD

services

ATTENTION

Canon PC Copier and Laser Printer (HP LaserJet, Apple LaserWriter, etc.) Owners.

Don't throw away your used cartridges. Get them recharged!!

Copiers/Printers - \$30/\$40

Toner Distributors -
(619) 438-2811

CIRCLE NO. 228 ON INQUIRY CARD

market research

MARKET RESEARCH TOOL:

Complete, Fast, Up-to-Date

The CIA is the source for published market information on computers, related equipment, and software. Information on forecasts, sales, shipments, market share, and more is delivered quarterly in a form useful for planning and analysis. A useful reference that you'll turn to frequently, not only for specific information but to stay informed of overall market trends. Computer Industry Abstracts is available in hard copy and Lotus 1-2-3 versions.

Information: (619) 464-6888
DATA ANALYSIS GROUP

CIRCLE NO. 229 ON INQUIRY CARD

Small ads do
attract attention.

Contact: (617) 964-3030

CLASSIFIED ADVERTISING ORDER FORM

Mini-Micro Systems classifieds reach more mini-micro people

Rates: \$90.00 per column inch (non-commissionable)

6x program earns 5% discount; 12x program earns 10% discount.

There is no charge for typesetting classified listings. Plan approximately 50 average words to a column inch, 8 lines of approximately 38 characters per line (3 inch maximum). Please send clean typewritten (double-spaced) copy.

Category: The following categories are available; be sure to specify the category you wish to be listed under: Business Opportunities, New Literature, Selling, Buying, Trading, Seminars, Services, Software, Supplies & Accessories. (Other categories may be employed at our discretion.)

Run this ad in _____ (number issues) Reader Inquiry No. YES NO
Ad size 1 col. wide by _____ inches deep Under _____ (category)
Check enclosed for \$ _____ (Pre-paid orders only)

Signature _____

Name _____ Title _____

Company _____ Telephone No. _____

Address _____

City _____ State _____ Zip _____

MAIL TO: Linda L. Lovett, Classified Advertising, Mini-Micro Systems,
275 Washington St., Newton, MA 02158

SYSTEM INTEGRATORS' NOTEBOOK

Tips that make dollars and sense

SYSTEM TOOLS EASE DATA SEARCH

Carl Warren, Western Editor

Finding information buried somewhere in a file on a system's storage device(s) can be difficult. Locating a specific file is relatively easy. You simply look at a directory. Locating specific information is more involved, but system tools make the job easier.

For example, with the MS-DOS/PC-DOS machines' FIND filter you can specify information you would like to locate within a given file. A filter is a software utility that allows a user to extract certain information.

As with many of the utilities found in DOS, the FIND filter provides a great deal of flexibility. For one thing, it allows you to define paths (levels of directories) where various files might be located.

Because FIND uses the syntax: FIND "locate this string" \path names and file names, you can build a tool in BASIC (or Pascal) to search at various levels. You can direct all the file names to a particular file by typing DIR > filename, and then use this information to furnish the file names to FIND. Additionally, the verb PATH,

when executed, displays the current directory paths set up in DOS. These paths can be piped into a separate file and used as variables in a program.

Notice that you only use the piping function of DOS to create files about what's contained in the system. Now the PATH represents only those directory paths established by the AUTO-EXEC file on bootup, or later by you by entering PATH and specific subdirectories. You may discover that the information you are looking for extends to many volumes (different disk drives) and that the current path won't deliver the desired data. Therefore, you may have to create separate files of all directories on all volumes, or keep a special file that defines the paths to all files and records anywhere on the system. You can do this by using an autobatch file, which invokes the system shell and saves new subdirectories as they are created.

Once you have defined where your files are, you can proceed to locate specific information. Ideally, you would have carefully segmented files as to type. Text files, for instance, should always exist in one specific area

under one grouping of subdirectories. The same goes for spreadsheet and other data files. This is simply part of system management, but it can save a great deal of time.

Although the FIND function locates almost any data, its real power comes from its ability to locate string data. For example, if you have a database of all the articles appearing in *Mini-Micro Systems* and *EDN* since 1978, you could find everything written by a particular writer by making one entry. Your front-end program should only ask for the information you want—the rest of the parameters are built by the system automatically.

Locating a string of data does assume that the data is stored in text format and can be converted to displayable ASCII. In most cases, this is possible. But, for some files—such as Ashton-Tate's dBase II, Lotus Development Corp.'s WKS and MicroPro International Corp.'s Wordstar—the format is different enough to require conversion. Even though the data isn't stored in text format, FIND will locate it in most cases. What it displays, however, may not be readable—often requiring the resetting of the eighth bit. This can also be handled by the Pascal or BASIC operating program.

Because FIND is a filter, unreadable data can be piped into a file for further processing. At that point, you can check for text type (e.g. Wordstar) and do any necessary conversions. In addition, you can set up a display program to present the data in a useful way. Therefore, you can have an automated system for locating specific information.

LOOKING AHEAD IN MMS

Be sure to watch for these editorial highlights in coming issues of Mini-Micro Systems.

- The October issue will cover mass storage memories and add-in/add-on boards.
- Power supplies and terminals will be featured in the November issue.

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

ADVERTISERS INDEX

Advanced Matrix Technology Inc. . . . .	.88	MCG Electronics Inc.	158
Alcatel Thomson Gigadisc. . . . .	.25	Megatek Corp. . . . .	.44
Alloy	101, 158	Method Systems Inc.	112
AMF Logic Sciences.	102	Microdesign International . . . . .	.47
Ampro . . . . .	.16	Microplot Systems . . . . .	.72
Cahners Exposition Group. . . . .	.73	Microware . . . . .	.80
Carroll Touch Technology . . . . .	.61	Mostek Corp.	70, C3
Charles River Data Systems . . . . .	.69	Multi-Tech. . . . .	.78
CIE Terminals . . . . .	.22	NCR Corp.	74-75
Compaq Computer Corp.	123	NEC America	72A-D
Computer Museum . . . . .	.72	NEC Information Systems Inc. . . . .	.52
Concept Technologies. . . . .	.40	NEC Peripherals	8-9
Concord Data Systems	135	Newbury Data	113
Control Data Corp.	116	Novell Data Systems.	138-139
Craig Data Cable . . . . .	.90	Oracle	E2
CTS Corp.	154	Output Technology . . . . .	.48
CXI . . . . .	.10	Pioneer Research . . . . .	.57
Dataproducts . . . . .	.97	Plessey Microsystems . . . . .	.55
Dataram . . . . .	.83	Preston Scientific . . . . .	.63
Delta Airlines	128	Quantum	126-127
Digital Sound Corp.	120	RDS-Relational Database Systems.	124
Dual Systems . . . . .	.4	Seiko Instruments USA	146
Elgar	144	Sequent Computer Systems	20-21
Emulex Corp.	6-7	Shape Magnetronics Inc.	153
Equinox Systems . . . . .	.62	Simpact Assoc. Inc. . . . .	.5
Excelan	155	Software Express	119
Facit.	136	Spectra Logic	143
Fujitsu America Inc.-Data Products Division	132	Speech Plus Inc.	166
Fujitsu America Inc.-Storage Division . . . . .	.58, 150-151	SyQuest Technology . . . . .	.43
Fujitsu America Inc.-Printer Div.	110	Systech	C2
General Power Systems	131	TEAC Corp.	E1
Giltronix	140	Technology Forum . . . . .	.32
Heurikon Corp. . . . .	.94	Telebyte Technology . . . . .	.90
Hewlett-Packard Co.	64-65, 163, 165	TeleVideo Terminals	148
Hitachi America Ltd.	14-15, 162	Texas Instruments Inc.	84, 109
Human Designed Systems Inc. (HDS) . . . . .	.39	Unify Corp.	76-77
IBM Corp.	17, 91-93	Universal Data Systems Inc.	C4
IDEAssociates	114-115	Viking Acoustical	167
Illbruck/USA	167	Viking Software Services	169
Infotron Systems Corp. . . . .	.1	Western Telematic Inc. . . . .	.26
Interface Group	104-105	Wyse Technology	28-29
Interphase Corp.	12-13		
Invitational Computer Conferences.	160		
Irwin Magnetics . . . . .	.51		
ITT Information Systems . . . . .	.98		
Keytronics . . . . .	.66		
Lear Siegler Inc.	156		
Lockheed Getex	159		
Mannesmann Tally	18-19		
Matrox Electronic Systems Ltd. . . . .	.87		
Maxtor Corp.	30-31		

See P. 174 for Classified Advertisers

See P. 170-173 for Career Opportunity Advertisers

See P. 179-180 for Mini-Micro Marketplace

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

MARKET TRACK

Sharon Hassell, Assistant Editor

Shipment boost expected for voice/data add-ons

Shipments of personal computer add-on devices for integrated voice and data will reach 330,000 units in 1989, up from the 5,000 units shipped in 1984, according to a recent market study by Advanced Resources Development (ARD). Moreover, by 1989, the add-on devices will be a standard option for personal computers and will support the growth of fully integrated voice/data terminals (IVDTs), which are expected to have shipments totaling 375,000 units by 1989, the study says.

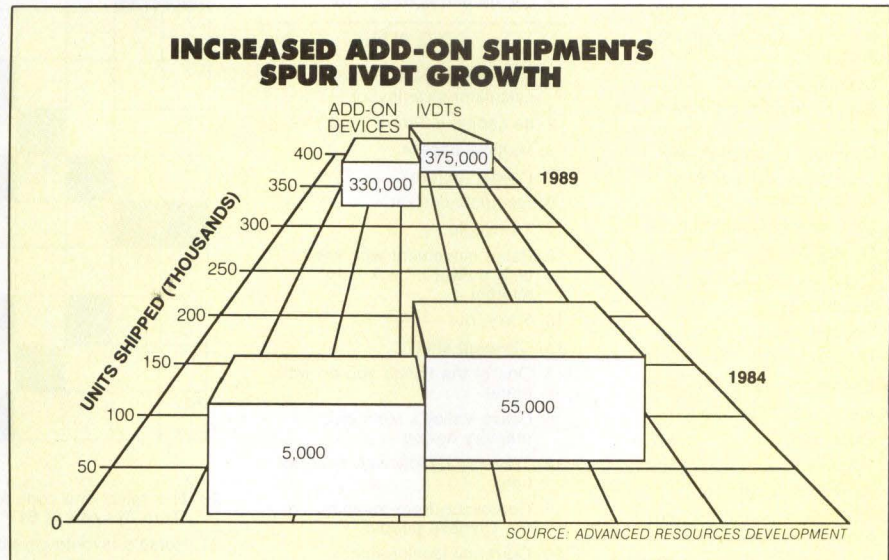
According to ARD, there are over 3 million IBM Corp. PCs and compatibles installed in the United States and millions more are expected to be sold over the next few years. A large number of these PCs are enhanced with modems, reflecting users' strong interest in data communications.

Add-on devices typically add integrated voice features for telephone-management applications, simultaneous voice/data communications, electronic messaging and voice mail. The study says PC users are interested in these combined capabilities and are attracted by the relatively low cost.

Add-on devices consist of a variety of technologies. Some are external "black boxes" with computer and telephone interfaces, intelligent modems and telephone-management software. Others are components configured on internal, plug-in boards. The devices allow communication between PCs and access to databases and telephone-management functions, such as directories and auto-dial. These are the basic applications offered on fully integrated IVDTs.

The price of the study is \$1,150 and is available through **Advanced Resources Development**, 28A Park Street Station, Medfield, Mass. 02052.

Circle 350



Shipments of personal computer integrated voice and data add-ons are expected to reach 330,000 units in 1989, prompting an estimated 375,000-unit shipment of integrated voice/data terminals (IVDTs).

Fourfold revenue jump for color-hard-copy market

Revenues from the sale of color-hard-copy products will increase from \$1.27 billion in 1984 to \$5.96 billion in 1989, according to research figures compiled by C.A. Pesko Associates Inc. The consulting company also expects shipments of color-hard-copy products to reach 2.2 million units in 1989, an almost threefold increase over the 1985 figure of 614,000 units.

According to Pesko, color-hard-copy products include those that employ both impact—dot-matrix and pen plotter—technologies and non-impact—ink-jet, electrostatic, photographic, thermal-transfer and electrophotographic—technologies.

The company's research indicates two factors that affect color-hard-copy

products: the operating environment, or physical location of the product, and the major application for which the product is used. Pesko forecasts revenues for various operating environments, including production, shared resources and workstations.

A yearly subscription to Pesko's research service, including further information on the color-hard-copy market, a monthly newsletter, a yearly technology forecast and a once-a-year company consultation, is \$12,000. **C.A. Pesko Associates Inc.**, 1 Snow Road, Marshfield, Mass. 02050. Circle 351

Interest Quotient (Circle One)
High 495 Medium 496 Low 497

ARTFUL INTELLIGENCE

By John K. Young

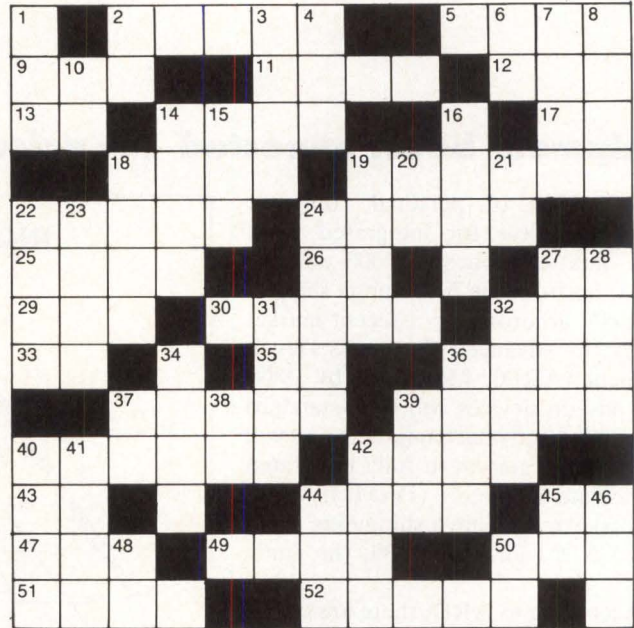
ACROSS

- 2 To remember information
- 5 Time needed to accelerate to operating speed
- 9 Gate type
- 11 Impulse to do certain things
- 12 Piece of clear, prepunched acetate
- 13 Special function
- 14 Section restricted for particular use
- 17 Chinese one-third of mile
- 18 Concessions derived by appeasement
- 19 What graphics must be
- 22 Disney center
- 24 Optimum exposure test
- 25 Small drink
- 26 Denotes singularity
- 27 Musical note
- 29 Engine for space vehicles
- 30 Heroine in "The Works"
- 32 Statement
- 33 Page in front of book (Abb.)
- 35 Aluminum (Chem.)
- 36 Color background for photographing action
- 37 Black silhouette image preventing exposure in specific area of film
- 39 Beauty queen's coronet
- 40 Used to call up colors at bottom of TV screen
- 42 Produced by optical printer
- 43 Tantalum (Chem.)

- 44 Gamble
- 45 Give approval
- 47 Apparatus (Abb.)
- 49 Movie whose graphic feats "awoke" TV networks
- 50 100 square meters
- 51 Type of projection
- 52 Locate and correct error

DOWN

- 1 Group of keys in numeric calculator-style layout
- 2 Its capital is Pierre (Abb.)
- 3 Multiple passes
- 4 Poetic "before"
- 6 Electrical current
- 7 To mingle
- 8 Ballet movement with knees bent outward, back held straight
- 10 Sorry, but _____
- 14 Close-up shot
- 15 One of the things you do with menu
- 16 Grass Valley's electronic memory device
- 18 Traverse rapidly with beam of light
- 19 Combining form meaning "of the Chinese people"
- 20 Currently fashionable
- 21 General store at army camp
- 22 Prepare for presentation
- 23 Movable article used on stage
- 24 Weak sister of broadcast TV
- 27 Number of years behing U.S. and Japan, Europe is in computer graphics



- 28 This telephone code for Mini-Micro Systems is 617
- 31 Horse's favorite cereal grass
- 32 Image to which reflection adds interest and depth
- 34 Glow surrounding image
- 36 Get away without paying
- 37 Belonging to me
- 38 "Et _____, Brute?"
- 39 Contraction of "it is-"
- 40 Product dominant in fast-growing market
- 41 To record animation
- 42 Fork prong
- 44 Image distortion
- 45 Logical operation
- 46 Card punch
- 48 Keystone State (Abb.)
- 50 Silver (Abb.)



Solution will be printed next month.

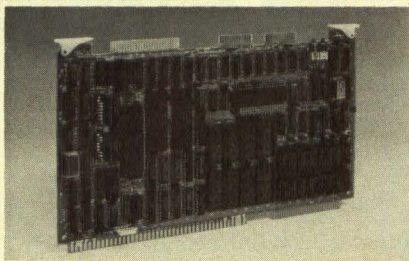
Answers to August's puzzles can be found on Page 164.

Interest Quotient
(Circle One)
High 498 Medium 499 Low 500

MINI-MICRO MARKETPLACE

A special section for advertisers of hardware, software and services.

Please circle reader service numbers for additional information.



CP/M-8000™ MULTIBUS™ SYSTEM

The CP/M-8000 operating system is now available for our 10 MHz Z8000™ Single Board Computer. This high-performance system has all the familiar CP/M commands. File compatibility with CP/M-80 and CP/M-86 makes it easy to transport files to CP/M-8000. A 'C' compiler and MACRO assembler are included. Call for further information. CP/M™ Digital Research, Multibus™ Intel, Z8000™ Zilog. SINGLE BOARD SOLUTIONS, 7669 Rainbow Drive, Cupertino, CA 95014. (408) 253-0181

CIRCLE NO. 200 ON INQUIRY CARD

IBM PC TAPE BACKUP



- Cipher 5210 Subsystem
- 25MB (formatted) capacity
- Menu Driven Software
- No Additional Card
- \$1025⁰⁰ with 6 mos. warranty

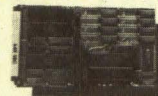
Available From:

Microware Inc.

41711 Joy Road • Canton, MI 48187
(313) 459-3557

CIRCLE NO. 201 ON INQUIRY CARD

New 64K SBC



Only
\$375.
4" x 6"

- Requires no terminal. Includes Video Controller and CP/M® 2.2
 - Runs any size floppy drive
 - Substantial OEM Discounts Available
- Other models include Hard Disk Controller, CP/M® 3.0, 128K or 256K RAM, Time of Day Clock, EPROM, Peripheral Expansion & RGB Color Video Display

64K SBC includes:

- 6 MHz Z80B
- Video Controller
- 2 Serial Ports
- 4 Parallel Ports

- I/O Expansion
- Source Code and Drivers included
- CP/M® 2.2

CP/M is a registered trademark of Digital Research Inc. Z80B is a registered trademark of Zilog Inc.

Megatec Computer Technologies
Head Office and Technical Support Center
150 Turbine Drive, Weston, Ontario M9L 2S2
Telephone: (416) 745-7214 Telex: 065-27453 MEGATEL TOR.
U.S. Sales and Service Office
2311 South Anthony, Fort Wayne IN 46805
Telephone: (219) 745-0310

megatec

CIRCLE NO. 202 ON INQUIRY CARD



THE RSX/11M PLUS SPECIALISTS

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

CM-300/Q22 computer systems are configured with DEC's LSI-11/73 CPU, giving these systems 11/70 PERFORMANCE AT LSI-11 PRICES. CM-300/Q22 systems can be configured with up to 1200MB of fixed Winchester disk, up to 4MB of main memory and up to 64 terminals. System back-up is provided by an industry standard 9 track 1/2" 1600 BPI tape drive. Optional software packages include Automatic Date/Time for RSX, Memory Assisted Disk, Cached Pseudo Disk, Memory Dump, Mail List RSX, accounting software, FORTRAN 77, FMS-11, BASIC + 2 and DATATRIEVE. An LSI-11/73 based 300MB system including RSX-11M + license, media and documentation may be purchased for \$21,461.

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

ADVANCED
COMPUTER
SYSTEMS, Inc.

250 Prospect Street
Waltham, Massachusetts 02154
617-894-3278

CIRCLE NO. 203 ON INQUIRY CARD

for Serious Software Developers

TARGET MICROPROCESSORS

80286, 8086/80186, 8096, 8080/8085, 8051, 8048, Z8002, Z80, Z8, NSC 800, 9900, 68000/08/10, 6809, 6800, 01/02, 6805, 6301, 6305, 6500, G65SCXX, G65SC1XX, R65C00, R6500/1, and others.

HOST COMPUTERS

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

SOFTWARE TOOLS

C Compilers, Pascal Compilers, PLM Compiler, Assemblers, Linking Loaders, Librarians, Download, Communications, VT-100 Emulator, CPM/80 Emulator.

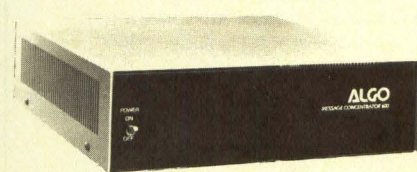
If you are a serious software developer, shopping for software development tools, call or write today for more information. 800-551-5554 in CA call (408) 733-2919



**MICROTEC®
RESEARCH**

3930 Freedom Circle, Suite 101, Santa Clara, CA 95054
Mailing Address: P.O. Box 60337, Sunnyvale, CA 94088
(408) 733-2919 Telex (ITT) 4990808

CIRCLE NO. 204 ON INQUIRY CARD



MESSAGE CONCENTRATOR 600

A six RS-232 port system using statistical multiplex techniques to network micro-computers and share peripherals.

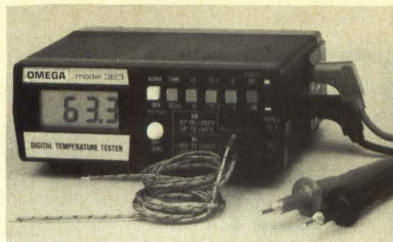
Design your own network using the MC 600 as a building block.

Networkable to over 500 ports.

\$866.00 for a six port system.

ALGO, INC.
9198-C Red Branch Road
Columbia, Maryland 21045
301-730-7442

CIRCLE NO. 205 ON INQUIRY CARD



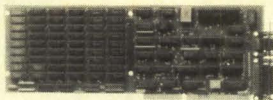
**NEW DIGITAL TEMPERATURE TESTER
MODEL 383**

Complete temperature tester in one compact hand-held instrument. Features include 3" display, dual type J thermocouple inputs, differential/normal temperature mode, DC millivolt range, analog output. All these features and more in this unique instrument. Unit is supplied with 2 type J glass-braided thermocouples, test lead kit, 9v battery, and operator's manual.

For more information, call 203/359-7613 or write Omega Engineering, One Omega Drive, Box 4047, Stamford, CT 06907.

CIRCLE NO. 206 ON INQUIRY CARD

**IBM AT 3Mb
COMBO CARD
WITH LIFETIME WARRANTY***

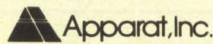


The AT Multifunction Card that can give you up to 3Mb of added memory plus added I/O features.

Expandable from 128K to 3Mb. Add memory as you need it. • IBM AT Compatible • Parallel Port • Serial Port • Spooler • Supports IBM VDISK • User Upgradable • Parity Checking Standard • Split Memory Addressing.

Complete with 128K RAM, Serial and Parallel Port \$299
AT RAM Expansion Card (08K) \$109

Additional RAM available at our low prices. **OTHER ADD ONS** 384K RAM/ Clock, 512K RAM Card, Spoolers, RAM Cards for PPCs and more.



ADD ON AND ON AND ON AND ON AND ON AND ON

4401 So. Tamarac Parkway / Denver, CO 80237 / 303/741-1778

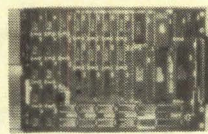
ORDERING AND DEALER INFORMATION

800/525-7674

Stores in Denver & Chicago / *On all cards sold after June 1, 1984

CIRCLE NO. 207 ON INQUIRY CARD

**Q-BUS DISK DILEMMA?
TRY THE SCSI SOLUTION!
THE TDL-12 FROM TD SYSTEMS**



- Emulates DEC* RL01/RL02's with 22-bit addressing.
- 100% compatible with all DEC Q-Bus processors and operating systems.
- Supports all popular SCS/SASI controllers and disk drives in any combination up to a maximum of 41.6 MBytes.
- High performance - 5 MBit/sec maximum throughput.
- On-board bootstrap, comprehensive utilities, and diagnostics.
- Configuration and drive characteristics stored in non-volatile EEPROM.
- \$595 each in small quantities with manual and cable. Attractive OEM discounts available.



24 PAYTON STREET, LOWELL, MA 01853
(617) 937-9465

*DEC is a registered trademark of the Digital Equipment Corp.
CIRCLE NO. 208 ON INQUIRY CARD

**T-310
Telephone
Access Unit**



Connect the unlimited capabilities of your computer to the telephone system

- A complete telephone line controller
- FCC-approved for direct connection
- RS-232 compatible
- Provides call following
- Couples audio sources (speech synthesizers, tape players) onto the phone line
- Permits remote data entry from any Touch-Tone phone anywhere
- Offers incoming call security—up to 15 digits
- Priced at less than \$375, including power supply and phone cord

Use the T-310 and your computer to dial and control outgoing calls or receive incoming calls—automatically! For more information, call Teltone today:

(206) 827-9626, ext. 437



Teltone Corporation, P.O. Box 657
Kirkland, WA 98033

In Canada contact Teltone Ltd., 183 Amber St., Markham,
Ontario L3R 3B4, (416) 475-0837

CIRCLE NO. 211 ON INQUIRY CARD

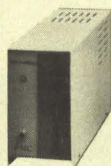
**Promote
New Literature
at a LOW
COST**

If you've got catalogs or literature, distribute them at a low cost in the MINI-MICRO MARKETPLACE.

Call Norma Lindahl
(617) 964-3030

CIRCLE NO. 209 ON INQUIRY CARD

**MicroMate
CP/M 3.0 COMPUTER**



System or Board Level to suit your application



- Use with RS 232C terminals
- Thousands delivered — in use
- 128KB RAM and autoboot ROM
- Interfaces four 400 KB disks
- 10-20MB hard drive add-on
- Abundant software available
- Excellent price/performance

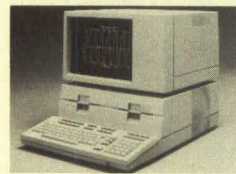
Personal Micro Computers, Inc.



275 Santa Ana Court
Sunnyvale, CA 94086
Phone 408-737-8444

CIRCLE NO. 212 ON INQUIRY CARD

FOR SALE!



Like new
HP 9836A
Desktop
Computer
\$9,450.00

Includes 128K RAM, HP Basic 1.0, and HP-IB interface. Many units are less than one year old. And you can get 256K memory boards at 1/2 price when you buy a system! Subject to prior sale. **30 DAY WARRANTY!** Call (800) 225-1008, in Mass. (617) 938-0900 — or (800) 227-8409, in Calif. (800) 331-3440.

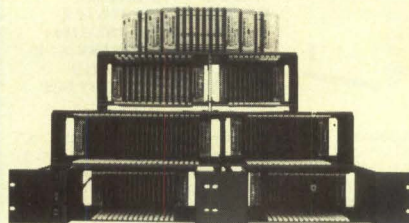


REI Sales Company

6307 De Soto Avenue, Suite J
Woodland Hills, CA 91367

CIRCLE NO. 210 ON INQUIRY CARD

**Matrix STD BUS
Motherboards, Card Cages
and Powered Racks.**

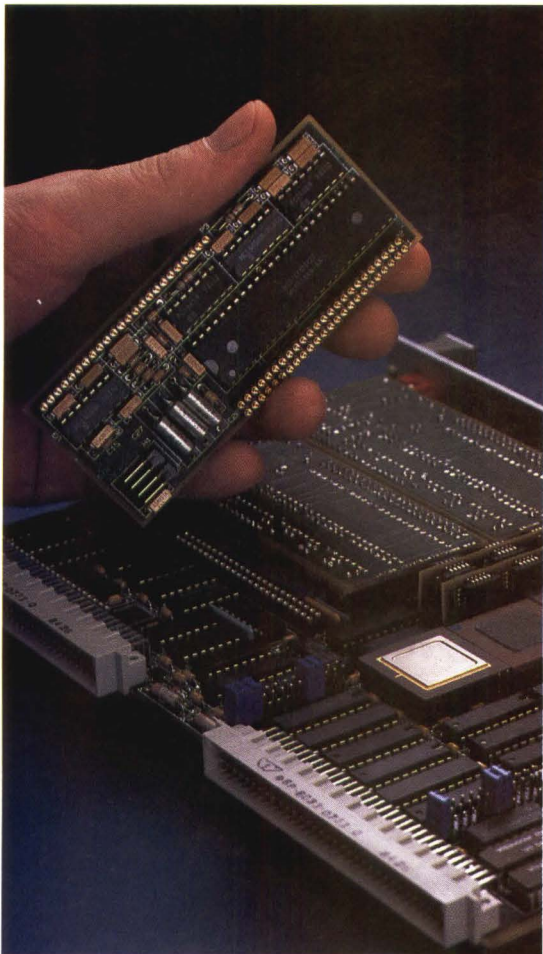


Matrix Corporation
1639 Green Street, Raleigh, N.C.
(919) 833-2837 27603

Matrix: Progress Through Automation

CIRCLE NO. 213 ON INQUIRY CARD

I/O WITH I.Q.



These plug-in modules make the Intelligent VMEbus board completely user-configurable.

The VMEbus Intelligent I/O board from Hamilton Standard Digital Systems.

VMEbus has always been a smart choice for flexible system solutions. And now, we've made it even smarter, by introducing the VMEbus Intelligent I/O board.

Using the I/O board in your system gives you a high-performance communications interface that places minimal demands on system resources. And since we designed the I/O board to accept up to three plug-in modules, it's completely user-configurable.

You can select up to six independent, full-duplex serial channels in pairs, or combinations of serial, parallel or other interfaces. Either RS232 or RS422 for serial I/O, or a Centronics-compatible printer port, or a general-purpose 16-bit parallel port.

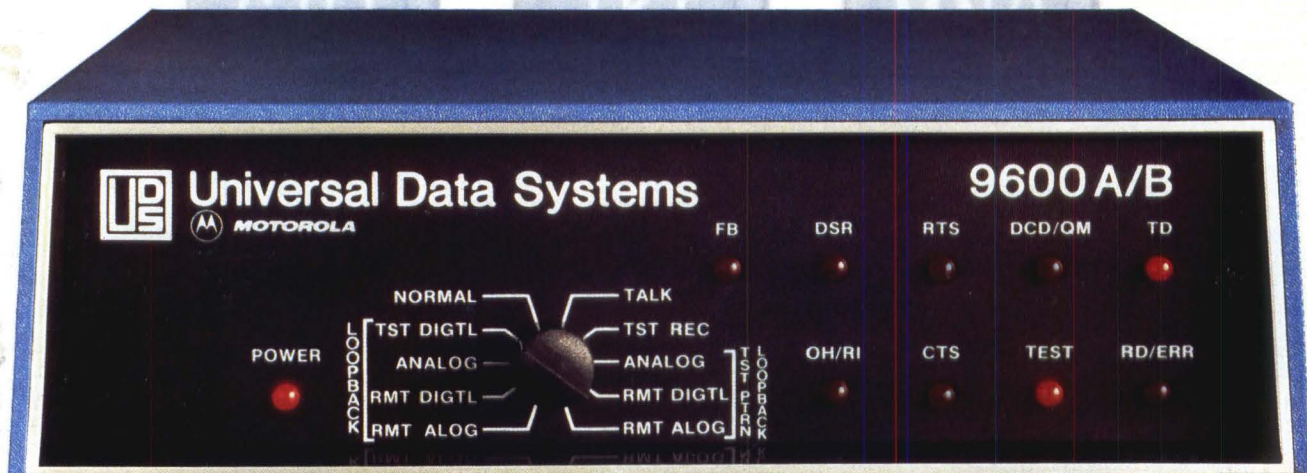
The choice is yours. And because the I/O board incorporates a 68000 processor and 128K to 512K of DRAM, it's not just smarter. It's faster. In fact, it's capable of a transfer rate in excess of 1 Mb/s when used with its optional DMA controller.

What's more, we built in a firmware monitor, an optional power-up ROM that provides download, debug and diagnostic functions.

When you add it all up, our Intelligent I/O board is easily the most flexible hardware solution available for VMEbus applications. Which is just one of the ways in which our continuing commitment to VMEbus shows.

For more information contact Hamilton Standard Digital Systems, Inc., 1419 Dunn Drive, Carrollton, Texas 75011, or call 214/446-2664. In the Northeast, call 203/531-1146 or 609/586-9200. In Central areas, 214/466-7921 or 312/577-9870. In the West, 714/205-0455 or 408/287-5080.





Dial Now, Dedicate Later at 9600 bps

Take your datacomm system to 9600 bps *now*. You can do it with UDS 9600A/B modems! Buy them today and instantly speed up your system *on the dial-up network*. Later, when traffic growth demands an upgrade, three simple strap changes will adapt your modems to dedicated lines.

The UDS 9600A/B provides optional data rates of 7200 and 4800 bps. Communication may be half-duplex (two-wire) or full-duplex (four-wire, V.29). A wide range of integral test capabilities simplifies system diagnostics.

Don't wait to accelerate your datacomm system throughput. Dial-up or dedicated, you can move

to 9600 bps now. For complete details, contact Universal Data Systems, 5000 Bradford Drive, Huntsville, AL 35805. Phone 205/837-8100. Telex 752602 UDS HTV.

QUANTITY ONE PRICE \$1,995



Universal Data Systems

MOTOROLA INC.
Information Systems Group

Inquiry Hotline: 800/633-2252, ext. 373

UDS modems are offered nationally by leading distributors. Call the nearest UDS office for distributor listings in your area.
DISTRICT OFFICES: Atlanta, GA, 404/998-2715 • Aurora, CO, 303/368-9000 • Blue Bell, PA, 215/643-2336 • Boston, MA, 617/875-8868 • Columbus, OH, 614/895-3025 • East Brunswick, NJ, 201/238-1515 • Glenview, IL, 312/998-8180 • Houston, TX, 713/988-5506 • Huntsville, AL, 205/837-8100 • Issaquah, WA, 206/392-9600 • Mesa, AZ, 602/820-6611 • Milwaukee, WI, 414/273-8743 • Minnetonka, MN, 612/938-9230 • Mountain View, CA, 415/969-3323 • Richardson, TX, 214/680-0002 • St. Louis, MO, 314/434-4919 • Silver Spring, MD, 301/942-8558 • Tampa, FL, 813/684-0615 • Thousand Oaks, CA, 805/496-3777 • Tustin, CA, 714/669-8001 • Willowdale, Ont, Can, 416/495-0008 • Ypsilanti, MI, 313/483-2682

CIRCLE NO. 103 ON INQUIRY CARD

Created by Dayner/Hall, Inc., Winter Park, Florida