DBMS

Powerhouse

NOVEMBER ■ 1986 VOL. 5, NO. 11 ■ $4.00

DEC PROFESSIONAL

SPANNING DIGITAL'S WORLD

- The America's Cup Challenge
- Knowledge-based Systems
- Digital's Newest VAX Family Member

Swifts: Path of Movement + Dynamic Sequences, 1913 by Giacomo Balla

Harmony among languages

EMULEX TALKS DEC 19

HIGH-END VAX SOLUTIONS

Maximize performance of your VAX 11/780/785 thru 8600/8650 computers. Our V-MASTER, supporting both tape and disk controllers, gives system flexibility to meet your most demanding applications.

MAX YOUR VAX 8600/8650

Add our SIDE CAR,™ Model VX100 to your 8600 cabinet. The SIDE CAR provides space for our V-MASTER chassis with power supply, connects directly to your VAX cabinetry preserving FCC compliancy, and occupies less than half the space of a DEC expansion cabinet.

INCREASED PERFORMANCE TOO!

To greatly enhance the performance of the VAX 8600/8650, use our SIDE CAR and V-MASTER chassis with our new SC7003, the only VAX compatible disk controller capable of supporting 3.0 MB transfer rates. Or with the TC 7000 tape controller, connect up to eight 6250 GCR tape drives.

MORE COMMUNICATIONS LINES, LOWER COST

With CS41 UNIBUS multiplexers using T1 technology, only a single continuous cable, using twisted pairs, is needed for a standard CS41 ring network capable of connecting 144 lines. That's 120 more lines per controller than the DEC DMZ32, at about half the cost.

The CS23 communications UNIBUS DHU11 compatible multiplexer offers 32 terminal lines having three times higher throughput than DEC. That's twice as many as DEC's DHU11 at half the cost per line. And it features 33% power savings at maximum configuration.

TOTAL SUPPORT

Emulex maintains a dedicated, well-staffed and equipped repair facility at its headquarters and provides worldwide support through our technical applications group. It is Emulex's commitment that, in the unlikely event our products require service, we will promptly honor all requests for in- or out-of-warranty product repair regardless of purchase source. All Emulex controller products are backed by a one year warranty.

From product selection to product support, we've got you covered. The performance is EMULEX...The choice is yours. Call 1-800-EMULEX3 to find out even more.

EMULEX®

3545 Harbor Blvd., P.O. Box 6725
Costa Mesa, California 92626
Toll-Free (800) EMULEX3 In Calif. (714) 662-5600

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. (61) 02-858-4833; Canada, Mississauga, Ontario (416) 673-1211; Montreal, Quebec (514) 332-0763; France, Montrouge (33) 14735-7070; United Kingdom, Bracknell, Berkshire (44) 344-484234; West Germany, Munich (49) 89304051.

ENTER 22 ON READER CARD

FINALLY, A MICRO-TO-MAINFRAME PIPELINE THAT LETS YOU PLAY WITH A FULL DEC.

INTRODUCING DATABILITY'S *RAF REMOTE ACCESS FACILITY.*™

IT BRINGS DEC MAINFRAMES DOWN TO MICRO SIZE.

What if you could use spread sheet programs, like Lotus 1-2-3, Multiplan or Symphony, on your PC to directly access, retrieve and update worksheet files stored on a VAX or DECSYSTEM-20? Or edit DEC mainframe files direct from your PC.

What if you could extend the reach of your PC so that ANY PC program you use or develop could transparently manipulate data stored on VAX's or DECSYSTEM-20's?

FREEDOM'S JUST ANOTHER WAY OF SAYING RAF

RAF combines the capabilities of your PC with those offered by DEC mainframes setting a new standard for all communications products. The RAF approach: Allow PC users to remain PC users.

FREEDOM TO ACCESS REMOTE DATA

RAF provides you with the freedom to access actual DEC mainframe files directly from the PC programs you use today. Even MS-DOS commands can manipulate remote files. Imagine having the freedom to back up your PC onto the mainframe with a standard COPY command.

THE FREEDOM TO ACCESS REMOTE COMPUTERS

What's more, RAF provides you with other freedoms. Like automatic access to remote computers through a scripting mechanism that allows you to define each step of an automatic login. Or if you prefer, a complete VT100 terminal emulator unlike any other software system. Enjoy the freedom to instantly jump from a PC program to your DEC mainframe as a VT100 terminal and return to your PC exactly as you left it.

THE FREEDOM TO USE MAINFRAME POWER DIRECTLY FROM PC PROGRAMS.

For the first time, programmers can develop PC programs that call remote subroutines or entire programs to solve problems. Imagine accessing mainframe data base software DIRECTLY from the PC, WITHOUT user involvement.

FOR A DETAILED BROCHURE OR MORE INFORMATION WRITE OR CALL:

DATABILITY

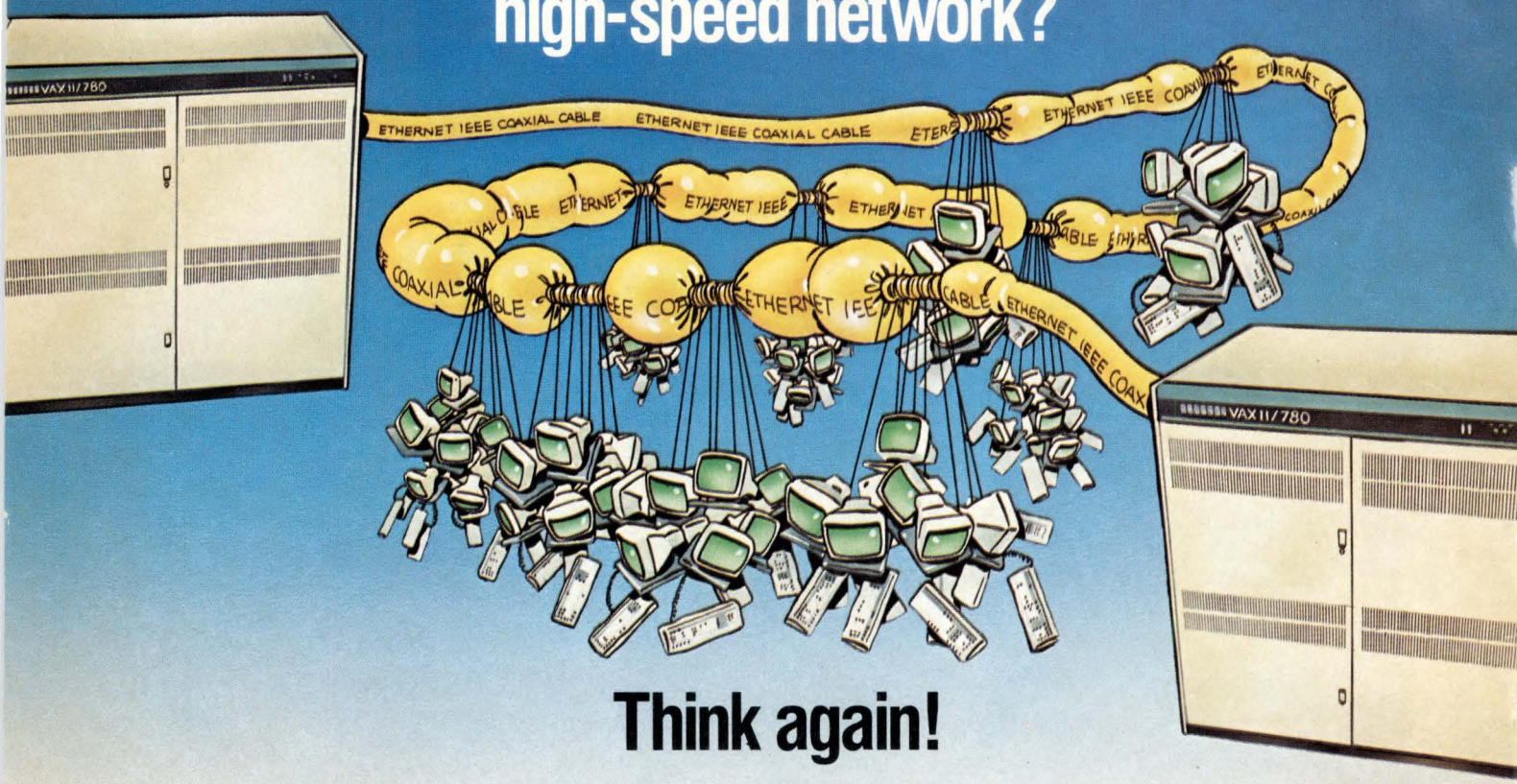
1-800-Dial DSS

In New York, 212 807-7800

Databability Software Systems, Inc.
322 Eighth Avenue, New York, N.Y. 10001

ENTER 217 ON READER CARD

Thinking of tying low-speed terminals onto a high-speed network?



Think again!

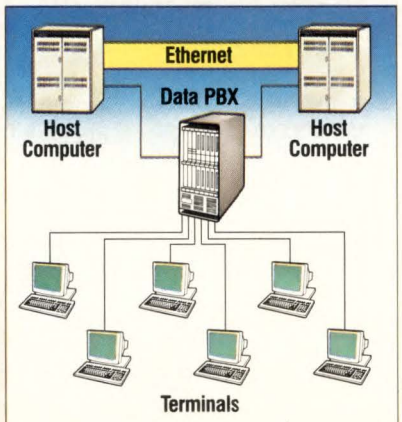
A high-speed LAN is ideal for file transfer, distributed processing and CPU-to-CPU communications. But using it for terminal traffic can cause problems.

You may be tying up bandwidth. Low-speed terminal traffic on a high-speed network can rob bandwidth where it's needed most. That means slow file transfers and sluggish response for all network users. The protocol overhead required for a terminal to send small data packets across an Ethernet® link can mean that only 10% of the 10 Mbps bandwidth is available.

By connecting your terminals through an Equinox® Data PBX and connecting your computers together with Ethernet, your LAN runs at top efficiency. An Equinox Data PBX dedicates a full 12 Mbps to terminal data traffic. More than 1300 devices can run continuous 9600 bps data at the same time, providing the best possible response through the network.

You'll tie up about $500 per terminal. When you consider the cost of Ethernet Terminal Servers, Taps, and Cable, Ethernet can cost between $300 and $800 per terminal. An equivalent solution using an Equinox Data PBX with our 8-channel Terminal Servers and twisted pair wiring is about $100 per terminal.

You could tie up your computer. Some Ethernet LANs handle terminal switching by running special software in your computer. So adding terminal traffic means your computer spends more time running the network and less time running applications. An Equinox Data PBX requires no special software and handles all terminal network processing without disturbing the host. It even allows you to monitor the network load and provides additional security for access control.



We won't tie you down. Putting your terminals on an Equinox Data PBX provides more terminal switching features for less money with greater efficiency, so you can get the most out of your LAN. And because it works with all types of computers and terminals you're not tied to a one-vendor solution.

Don't think twice. Call Equinox.
1-800-DATA-PBX
In Florida Call (305) 255-3500

Equinox Systems Inc.
12041 S.W. 144th Street
Miami, FL 33186-6108

Equinox is a registered trademark of Equinox Systems Inc. Ethernet is a registered trademark of the Xerox Corporation.

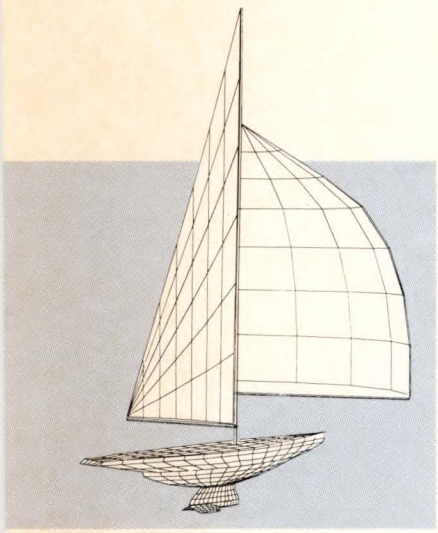
EQUINOX

We Make The Right Connections.

ENTER 25 ON READER CARD

DEC
PROFESSIONAL

CONTENTS



page 66

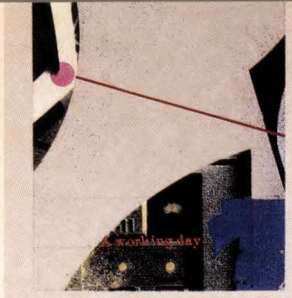
ON THE COVER:
Giacomo Balla. Swifts: Paths of Movement + Dynamic Sequences. *1913. Oil on canvas, 38-1/8 x 47¼". Collection, The Museum of Modern Art, New York. Purchase. Photograph © 1986 The Museum of Modern Art, New York.*

NOVEMBER 1986 VOL. 5, NO. 11

LANGUAGES

FEATURES

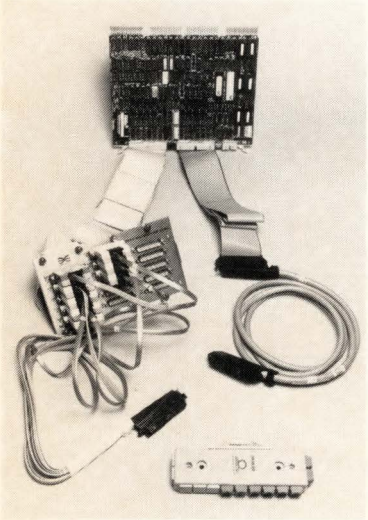
Continued on page 6.



CONTENTS

Continued from page 5

DEPARTMENTS



page 144

The ARIS symbol on an article indicates that the program segments are available electronically on our Automated Reader Information Service. Dial (215) 542-9458.

We will consider for publication all submitted manuscripts and photographs, and welcome your articles, photographs and suggestions. We cannot be responsible for loss or damage. This magazine is not sponsored or approved by or connected in any way with Digital Equipment Corporation. "DEC" is a registered trademark of Digital Equipment Corporation. Digital Equipment Corporation is the owner of the trademark "DEC" and is the source of all "DEC" products. All materials presented are believed accurate, but we cannot assume responsibility for their accuracy or application. DEC PROFESSIONAL Magazine ISSN 0744-9216 is published monthly, except twice in January, March, May, July, September, and November, by Professional Press, Inc., 921 Bethlehem Pike, Spring House, PA 19477. Printing and binding by R. R. Donnelley & Sons Company. Subscriptions are complimentary for qualifed U.S. and Canadian sites. Single copy price, including postage, $4. One year subscription rate $30 in the U.S. and Canada; and $50 foreign. All orders must be prepaid. Second Class postage paid at North Wales, PA, and additional mailing offices. POSTMASTER: Send all correspondence and address changes to: DEC PROFESSIONAL, P.O. Box 503, Spring House, PA 19477-0503.

BPA

smarterm®

The Communications Software That Knows You Can't Ignore Evolution

The world of computing has much in common with nature: Those who adapt to their environment flourish. Those who can't—go the way of the dinosaur.

If your computing environment includes mini computers, you can access them using standard terminals. But the smarter alternative is an IBM* compatible PC* and SmarTerm terminal emulation software—an advanced species of communications software.

Persoft began where most terminal emulation software companies strive to end—with exact, feature-for-feature emulation. Then Persoft took SmarTerm software to the next stage of evolution: superiority.

SmarTerm 240, the latest in the SmarTerm series, not only provides the ReGIS* and Tektronix* graphics capabilities of a DEC* VT240* terminal, but adds capabilities that are only possible through the power of a PC.

Features like error-free data transfer (using Kermit or XMODEM protocols), on-line help screens, remappable keyboard layouts, and programmable softkeys.

SmarTerm 240 is just one example of the most advanced line-up of DEC, Data General and Tektronix terminal emulation software in the industry.

Make the "natural selection." Ask your local dealer about SmarTerm terminal emulation software. Or contact:

Persoft, Inc.
465 Science Drive
Madison, WI U.S.A. 53711
(608) 273-6000
Telex 759491

ENTER 160 ON READER CARD

persoft

Visit Booth #8624
Hilton Pavillion West
COMDEX/Las Vegas

SmarTerm Terminal Emulation Software
. . . The Natural Selection

DEC PROFESSIONAL

Publisher: Carl B. Marbach
Editorial Director: R. D. Mallery

Editorial

MANAGING EDITOR Linda DiBiasio
SPECIAL PUBLICATIONS EDITOR Lonni Wright
ASSOCIATE EDITOR Bruce Feldman
SENIOR TECHNICAL EDITOR Al Cini
WEST COAST EDITOR Philip Naecker
DCL EDITOR Kevin G. Barkes
MICROVAX EDITOR David Bynon
SPECIAL EDITOR Victor J. Chorney
NETWORKING EDITOR Bill Hancock
C EDITOR Rex Jaeschke
UNIX EDITOR Lori A. Snyder
RSX EDITOR Ralph Stamerjohn
COPY EDITOR Pamela F. Fullerton
EDITORIAL ASSISTANT Anne Schrauger
CONTRIBUTORS Philip G. Anthony, Stephen Dourson, Mason Killebrew, Elizer May, Philip A. Naecker, Gary W. Neidhardt

Design

DESIGN/PRODUCTION DIRECTOR Leslie A. Caruso
DESIGN/PRODUCTION ASSOC. Ruth Ann Leiby
ART/PRODUCTION ASSOC. Timothy M. Kraft
PRODUCTION ARTIST Darwin Au
SENIOR TYPESETTER Joseph E. Hohenwarter
TYPESETTING/PRODUCTION MaryEllen Springer

Circulation & Administration

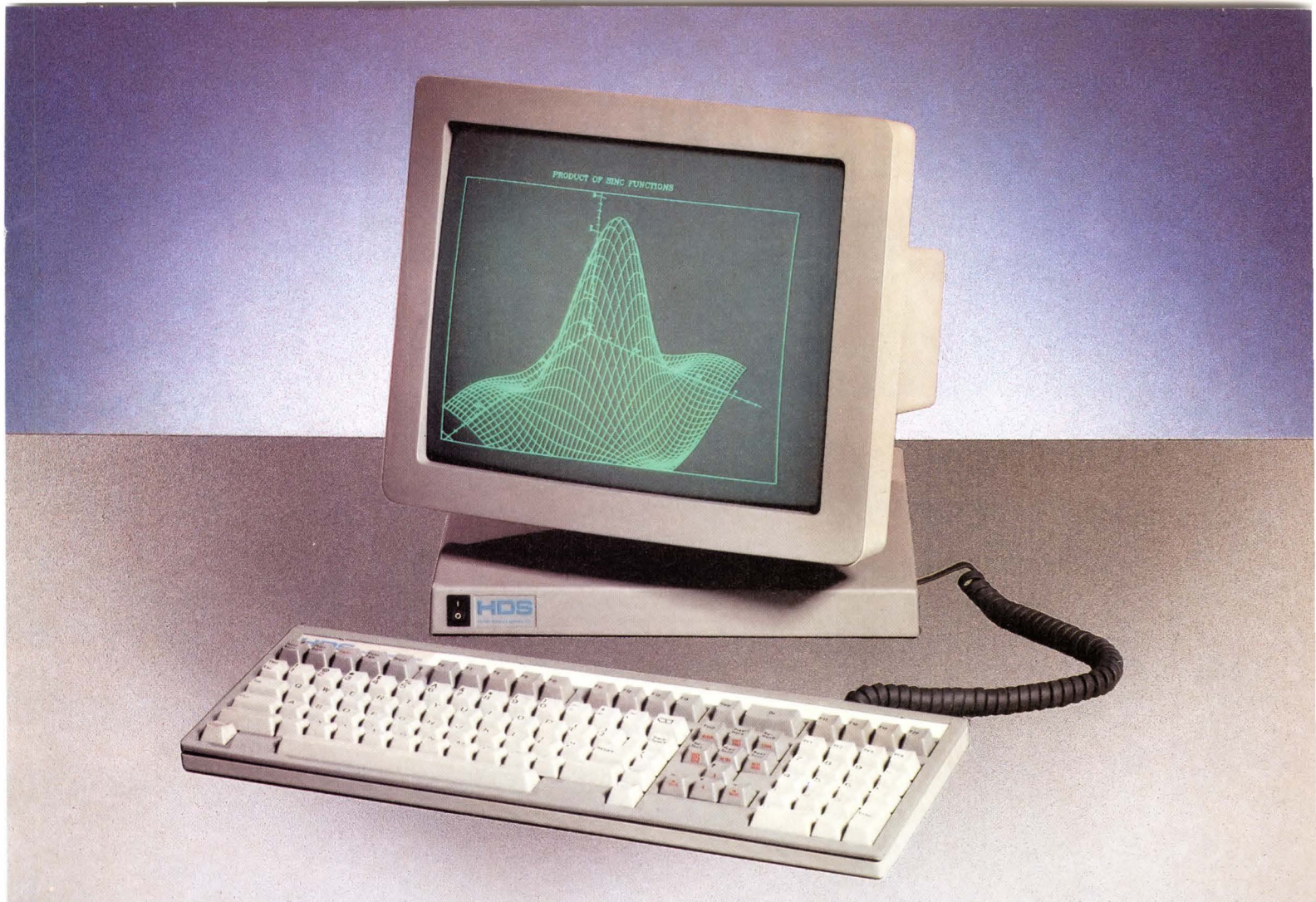
VICE PRESIDENT Peg Leiby
CIRCULATION DIRECTOR Mary Wardlaw
ADMINISTRATIVE ASSISTANT Margie F. Pitrone
CIRCULATION FULFILLMENT Douglas Benoit, Ruth Henderson, Claire Hollister, Joann Ness, Donna Schmidt
ACCOUNTING Andrea Beneke, Lori Goodson
COMPUTER SYSTEMS Kevin Kennelly, Ruth Mermelstein
ARIS MANAGER Bonnie Auclair

Advertising

VICE PRESIDENT Helen B. Marbach
NATIONAL SALES MANAGER Jeffrey Berman
ADVERTISING MANAGER Connie Mahon
REGIONAL SALES MANAGERS
NEW ENGLAND Cynthia Davis
MID-ATLANTIC Connie Mahon
INTERNATIONAL Helen B. Marbach
MIDWEST, SOUTHEAST Peter Senft
NORTHERN CALIFORNIA, WASHINGTON, OREGON A. G. Germano
SPECIAL EDITIONS Richard Weiss
THE BUCKLEY COMPANIES:
SOUTHERN CALIFORNIA (SAN DIEGO AREA) Kathy Buckley
SOUTHERN CALIFORNIA, SOUTHWEST Terry Buckley, Greg Cruse
MARKETING SERVICES (215) 542-7008 Mary Ann Browarek, Jan Krusen, Lori Kutchi,
ASSISTANT TO THE PUBLISHER Cathy Dodies

PROFESSIONAL PRESS, INC.

For information on how to contact your sales representative, see page 176. ■ Editorial, Advertising Sales, and Executive Offices at 921 Bethlehem Pike, Spring House, PA 19477. ■ (215) 542-7008
TWX 910 333 9522 ■ Easylink 62805174
ARIS (Automated Reader Information Service) (215) 542-9458



More graphics terminal for your money

HDS2000 Terminals. $795 to $1595.

The new HDS2000 alphanumeric and graphics terminals give you higher resolution, better emulation and more innovative features for your graphics dollar. Offering uncompromising performance and the industry's best value has made Human Designed Systems the largest independent supplier of graphics terminals.

The HDS2200 alpha, HDS2200G medium-resolution, and HDS2200GX high-resolution graphics terminals start with full emulation of the DEC VT220, Tektronix 4010/4014, and Retrographics terminals, then add powerful enhancements designed to increase your productivity. Pages of alpha and graphics memory, multiple host communications, mouse and digitizer support, an extra large fifteen inch screen, razor-sharp video, a one year warranty—we've included all of the features that have made Human Designed Systems famous.

Unique in the industry, the new HDS2000 Series offers a full range of terminals for all your applications. You can upgrade from one terminal to another if your requirements change. From VT220 alphanumerics to 1024 × 390 or 1024 × 780 resolution graphics, only Human Designed Systems produces such a wide range of terminals, at such affordable prices, with the emulations and features you need.

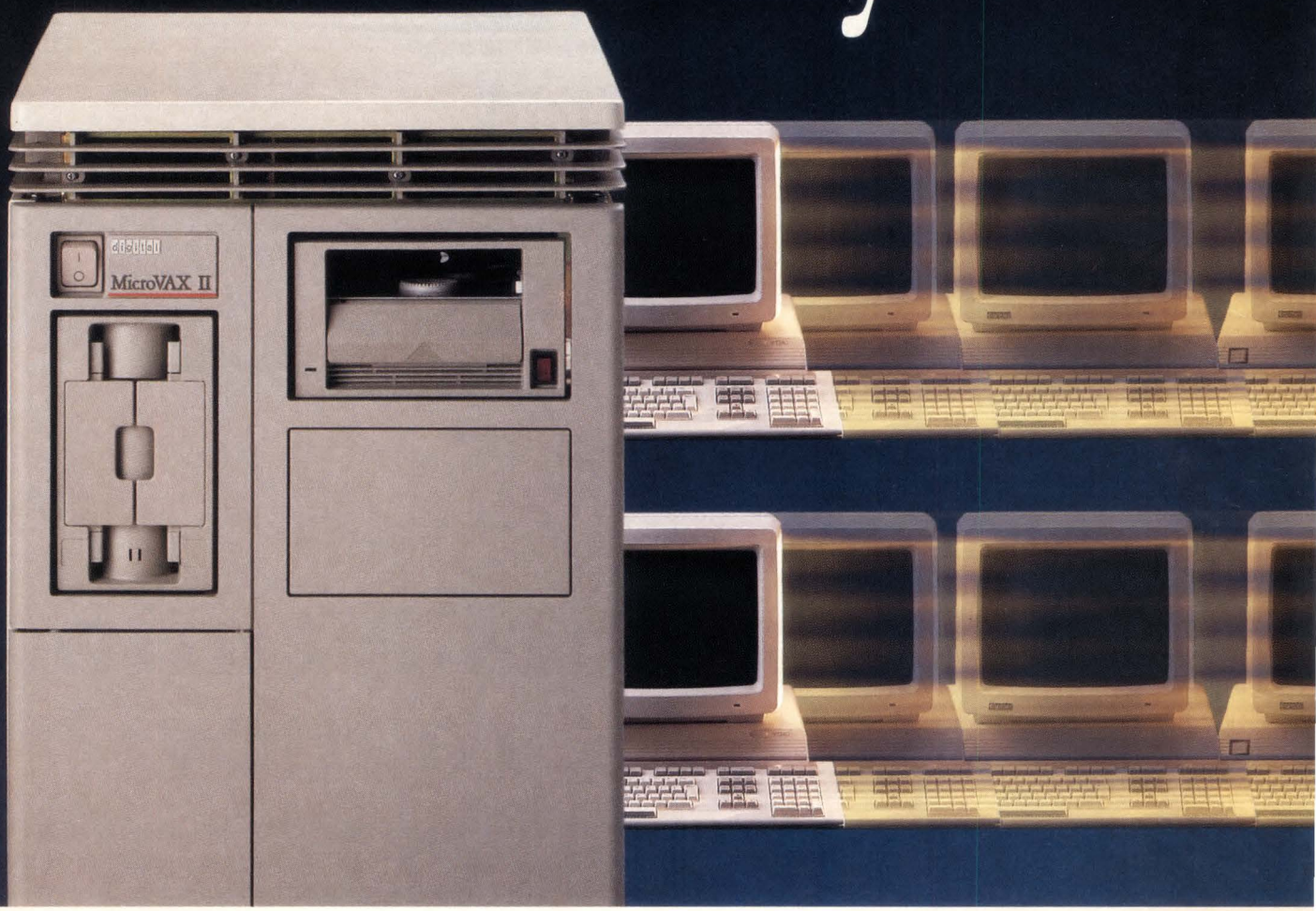
Human Designed Systems leads the graphics terminal industry by giving you higher resolution and more performance for less money. See the quality, flexibility, and value our display products offer. Call toll free today for a free trial.

Call 1-800-HDS-1551 × 377

HDS
human designed systems

ENTER 82 ON READER CARD

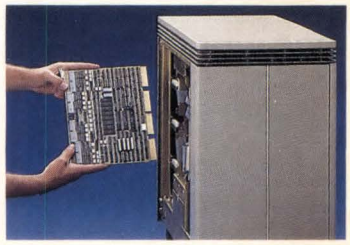
Camintonn, No
Family of M



Now, add up to 16 users to your MicroVAX™ II and Q-bus™ systems with Camintonn's full line of communications products.

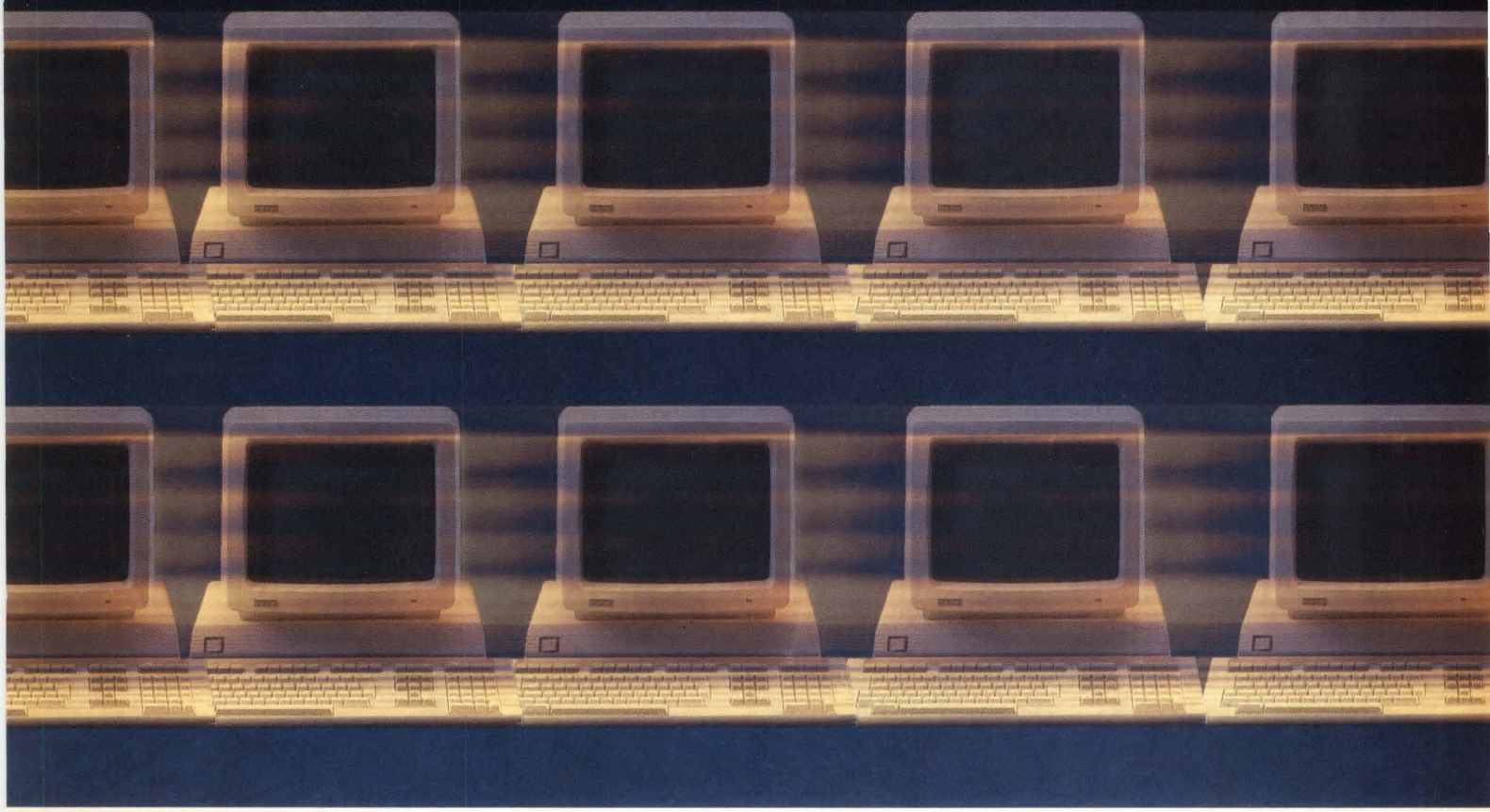
Camintonn delivers the communications solution that's right for your needs. Choose from our 4-, 8- and 16-channel boards. Each offers outstanding performance at low, competitive prices.

16-Channel Solutions. Add up to 16 users to your DEC™ computer with either Camintonn's CM-DHV16 quad board or CM-DHV16-D dual board. With a fast, 38.4K-bits-per-second data transmission rate for all 16 lines, these boards set the standard for 16-channel, full-duplex performance.



CM-DHV16—Leading The Way. With full, local and remote interface to

w A Complete ultiplexers.



RS-232, RS-423 and RS-422 connections, our CM-DHV16 offers complete configuration flexibility. Standard features include full DEC DHV11 emulation, an extra console port, modem control on all lines, Direct Memory Access (DMA) or Single Character Program I/O on transmit and more.

CM-DHV16-D (data only)—Lowest Cost Per Channel. Advanced design and technical superiority give our dual-height CM-DHV16-D a price advantage the competition can't match. This means you get the lowest cost per channel of any 16-channel solution.

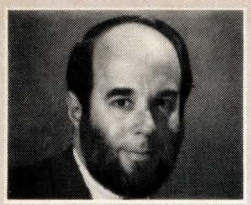
8-Channel Multiplexer. Featuring the same speed, value and quality of our 16-channel multiplexers, the CM-DHV11 offers 8 full-duplex lines on a dual-height board. And it's fully compatible with DEC's DHV11 and DHQ11.

4-Channel Interface. Our lowest cost communications solution, the Camintonn CM-DLV11-J provides 4 asynchronous serial channels. This easy-to-configure board is compatible with all LSI-11™ systems.

Rely on Camintonn Quality. Featuring a full line of memory and communications products, Camintonn makes DEC expansion cost-effective and easy. For more information on these products or any of Camintonn's other fine solutions, including memory, for DEC computers, call **1-800-843-8336,** in California **(714) 553-0247.** Or write: Camintonn, An AST Research Company, 2121 Alton Avenue, Irvine, CA 92714-4992. **ENTER 9 ON READER CARD**

CAMINTONN

An AST Research Company



PUBLISHER

Carl Marbach

Confined

I recently helped configure a VAX system for a long-time friend's business and was surprised to learn just how much Digital has locked up its hardware. I knew that the new BI bus was going to make it difficult for third-party suppliers, but the reality has arrived: The VAX 8200 proposed by DEC has to be all DEC; there are no third-party hardware items available for this BI-only machine!

There was very little flexibility in configuring this computer because of the lack of available BI slots (only four). For communications, the only BI-based controller supports eight lines. The corresponding UNIBUS board from third parties can control 32 or more with outboard logic extensions. DEC's answer is a Terminal Server with DECnet and Ethernet, with all the corresponding overhead and software licenses. Strike one for the user.

Memory can be supplied only by DEC. Memory is memory, but the Digital price is outrageous. Many third parties are giving lifetime warranties on their memories, packaging them more densely (taking up less slots and allowing more total memory per system), and charging competitive prices. Strike two.

Disk subsystems are limited to the four-year-old RA-81s. At 456 MB, they are behind current technology. The rumored RA-82 or RA-81 Plus has been delayed with problems similar to the RA-81's original headaches. Ask someone who has a multiple RA-81 subsystem and he'll tell you about the failures. Today, DEC is behind the times in size, speed, reliability and price; but with the 8200 BI system, you have no choice — buy a product that isn't competitive. Strike three!

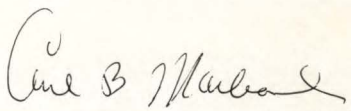
The basic 8200 and VMS can't be beat in the market today, but the peripherals are dragging it down to just ordinary status. Instead of being the clear computer of choice, it is a foot race with at least two other major vendors.

With an open bus architecture, this computer could have been configured with a reasonable communications multiplexer supporting 32 or more users per board. It could have had a front end communications processor to offload the VAX or that overhead. Space and power within the computer could have been saved. More memory could have fit into the cabinet at lower cost, allowing more flexibility in the budget for another printer or more terminals. Disks could have been bigger, more reliable, and could have transferred data at a faster speed AT LESS COST PER MEGABYTE!

Who is being hurt by this? Is it DEC? The end user? The third-party supplier? Clearly the third-party supplier has lost a potential sale, so he is hurting. DEC takes it on the chin because it may lose this sale (and many others). But the big loser is the ultimate buyer of the system: He is getting less and paying more.

Digital should concentrate on building and selling *computers* and leave the peripheral market to the user to decide what to buy. Let DEC *compete* in that market with a better disk, then we'll buy it; but if someone else builds it better, shouldn't his be the one on our computers? Ultimately, Digital would be more successful concentrating on getting its computers into places it hasn't reached yet. DEC should spend its time and money on that, not on TELLING us what we HAVE to buy.

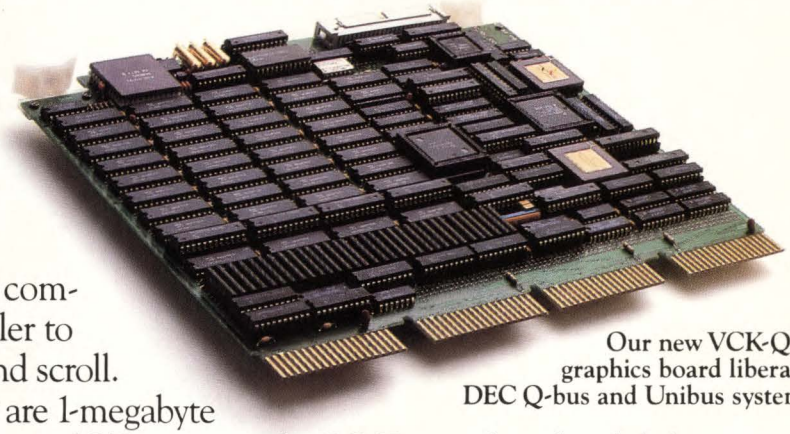
It's up to you — the user community — to voice your opinions loud and clear to DEC. Let them know that you support freedom of choice in your computer systems.



Publisher

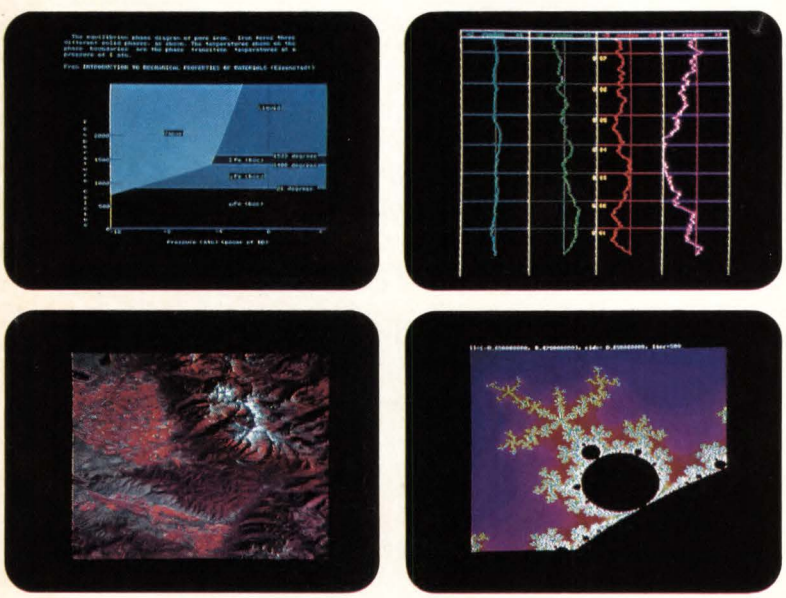
Call it the computergraphics freedom machine

Take the load off your host CPU in both Q-bus and Unibus DEC computers with our new VCK-Q/U tightly coupled combined graphics controller and single board computer. Our new quad height board gives you a stand-alone 68010-based computer and an advanced CRT controller to do graphics primitives, zoom, pan and scroll. On board to lend power to the 68010 are 1-megabyte of system RAM, fast DMA circuitry, serial I/O ports and a SCSI port for a hard disk.



Our new VCK-Q/U graphics board liberates DEC Q-bus and Unibus systems.

Use your new VCK-Q/U to do the work of two or three ordinary boards at a substantial saving and improvement in both graphics and computer power. Choose either a factory configured Q-bus or Unibus format. The primary color display of 1024 × 1024 × 8 bits/pixel shows 256 colors from a palette of either 4096 or 16 million colors. We've added a high speed alphanumeric overlay and a single-color graphics overlay to superimpose grid lines, arrows, boxes and the like.



Use the SCSI/DMA link to quickly input and output images, display lists, commands, and programs. The DMA controller lets you rapidly move data between the SCSI port, CRT controller, computer bus, and all on-board memory.

Our microcomputer has a 9.8 MHz 68010 CPU and a 68881 FPU with access to all other on-board devices including 1 MB each of system and video RAM, two video overlay memories, and 64 KB of EPROM or RAM.

For the rest of the story, detailed specifications, price schedules, delivery, phone us now, (415) 531-6500. TWX: 910-366-2029. Or if more convenient, address Peritek Corporation, 5550 Redwood Road, Oakland, CA 94619.

Peritek

DEC, Q-bus, Unibus are trademarks of Digital Equipment Corporation.

ENTER 48 ON READER CARD

Few companies in any industry can offer a full spectrum of products, from the most sophisticated to the most basic. At Dataram, we've created our full line of DEC memory products with one aim in mind: To help you make the most of your system, and your system investment.

We're uniquely qualified for the job.

It's a matter of experience. We've been building DEC-compatible memory products for 20 years. That's a continuity and dedication unparalleled in memory.

It's a matter of depth. We know DEC systems inside and out, in all their considerable strengths. More important, we've come to know their vulnerabilities, and how to overcome them.

It's a matter of quality. We put every DRAM type through 2.2 million device-hours at 55°C.—and pay a premium to buy only pretested IC's. So every Dataram product meets the demands of real-world applications problems.

We speed advanced radar and ultrasound imaging through our 200 MB/sec Wide Word™ system. We power flight simulators and robotic warehousing systems with our BS-207 solid-state disc. We boost the performance of every application with our board-level products. Our top-to-bottom approach means that every Dataram product benefits from our high-level research and engineering.

A good example is our new DR-286 for the VAX 8600/8650. Distinguished by innovative design, the DR-286 fits up to 16 MB of memory onto each single-slot board and gives you twice the potential capacity of DEC's MS86-CA memory. By providing up to 128 MB of main memory, the DR-286 can keep your VAX 8600/8650 growing cost-effectively for years.

What's more, with fewer solder joints and components, the DR-286 is inherently more reliable. It exceeds DEC's own stringent quality-control guidelines.

At the other end of the VAX spectrum is our DR-224. The DR-224 can double the memory capacity of your MicroVAX II to 16 MB and prolong its life by years. And improve performance fast, thanks to 100% DEC compatibility.

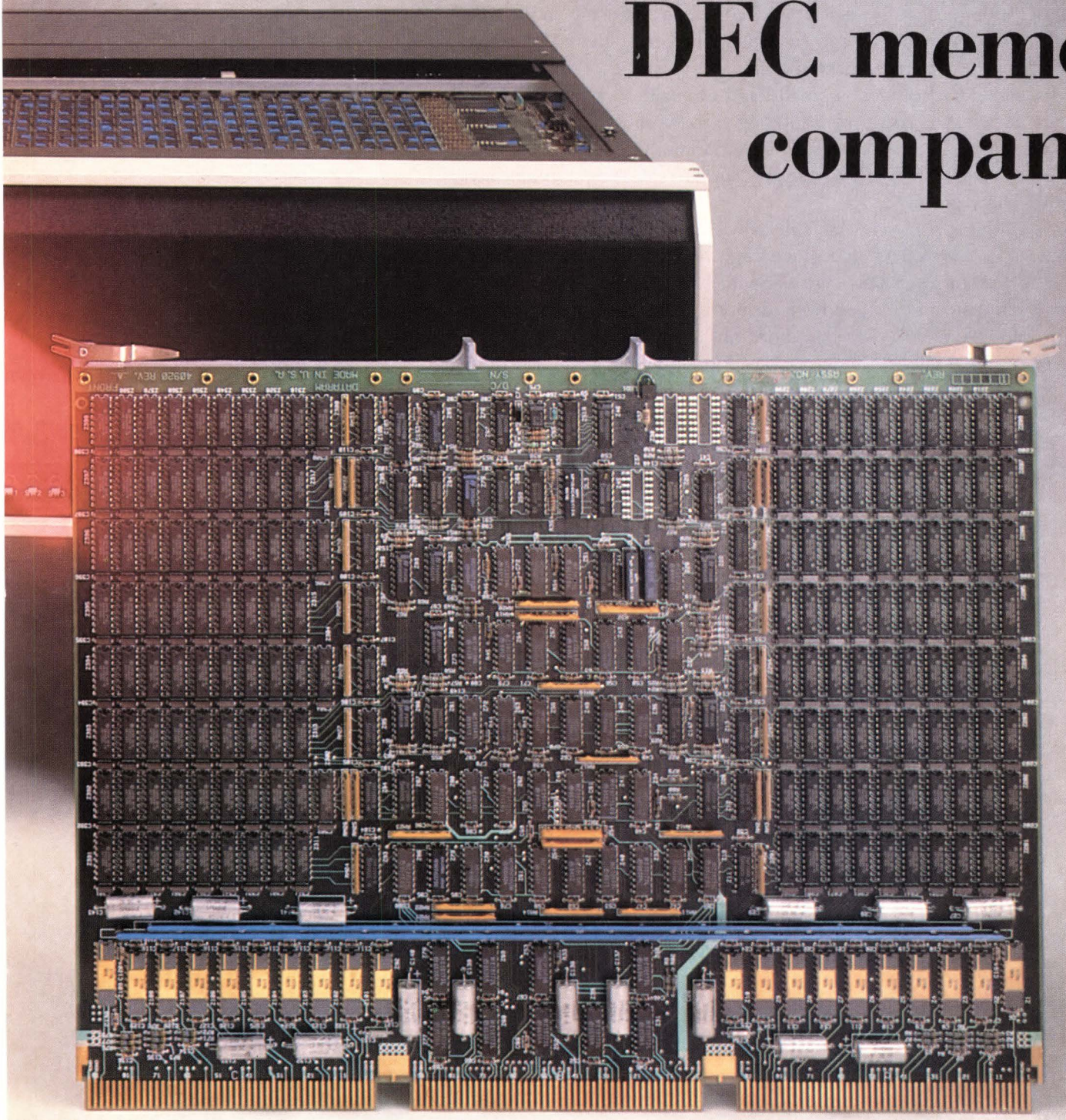
In fact, all Dataram memory products are 100% compatible with DEC hardware and software. It's just one of the full spectrum of long-term and immediate advantages you get with Dataram. We offer a *lifetime* memory-board warranty...competitive prices... and prompt delivery.

Call us today at 1-800-822-0071—because wherever your memory needs are on the spectrum, Dataram is there.

DATARAM

Dataram Corporation
P.O. Box 7528, Princeton, NJ 08543-7528
(609) 799-0071 1-800-822-0071
TWX: 510-685-2542

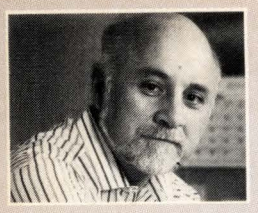
Dataram: The only full-spectrum DEC memory company.



EUROPEAN HEADQUARTERS—United Kingdom: Dolly's Cottage, Dedmere Road, Marlow, Bucks SL7 1PD, Tel: (06284) 74815; TLX: 846272

See us at DEXPO East '86—Booth 1002.

ENTER 14 ON READER CARD



EDITORIAL

Dave Mallery

Thoughts, On The Eve Of DEXPO

I am bemused by a trend in our industry. In the "old" days (when real men spoke octal), there was a two-tiered market in the DEC world: DEC and the third parties. The third parties were a small band of small companies that over a few years became big companies and began to exhibit some DEC-like attributes (i.e., high prices and sluggish development).

I now see a small band of fourth-party suppliers starting to nibble away at the third-party players.

This is good for everyone. After all, why should we have to put up with quad-high tape controllers and quad-high eight-port muxes? This is 1986 . . . the year of the 80386. Why should I have to buy a box with an eight-slot backplane and huge power supply if I can build the VAX of my dreams in a four-slot box that sits under my terminal?

I have noticed the classic third-party vendors taking notice of these young upstarts and being driven back to the lab. Good, for all of us. Ultimately, this engineering pressure comes to bear on DEC, and that's where the real benefits are.

A free market is one in which demand drives innovation. When demand is "dictated" by the supply of current technology, the results are history. When the innovators are denied access to the market, the market rapidly will resemble the classic Apple commercial with its grey-clad legions marching over the cliff of conformity.

Editorial Director

VMS™ TeX™ Users

"Take a Good Look at What You're Doing."

"Up until now there was no way to preview on your VAX® You had to use a lot of imagination to go from TeX and graphics files to printed documents. You were never sure what you were printing until it was printed.

"Talaris has changed all that with our exciting new terminal, the Talaris 7800. You can see everything on the screen – before it's printed.

"With PréTeXt,™ our TeX previewing software, you can see your formatted TeX page on the screen. With fonts that match your laser printing fonts, with line and page breaks, tables, and equations. More than that: you can see Tektronix™ graphics integrated on your TeX page.

"Introducing the first Preview Terminal for Laser Printers."

"PréTeXt can do all that because it utilizes powerful features built into the T7800 terminal. Like 30 TeX Computer Modern fonts in ROM, half a megabyte of memory for speed, and pan and zoom for graphics editing. Plus Tektronix emulation and optional ReGIS™ emulation.

"And the Talaris 7800 acts like popular alphanumeric terminals such as the VT52, VT100, VT220, and VT240. So you can talk to your VAX with just one terminal.

"Couple the T7800 with one of our Talaris Laser Printers, and you have the Talaris Preview Printing System, the most advanced and affordable printing system ever.

"And the Preview Printing System is geared for growth. That's why Barry Ferris, our V.P. of Software Development is busy working on new software extensions. And if Barry's working on it, you know you can depend on versatility far into the future.

"Get a good look at what our Preview Terminal can do for you, write for a complete information package to P.O. Box 261580, San Diego, CA 92121, or call **619-587-0787.**"

Sonny Burkett
VP Marketing
Talaris Systems Inc.

FOR INFORMATION, ENTER 136 ON READER CARD **FOR DEMONSTRATION, ENTER 293 ON READER CARD**

Regional Sales Offices: **California** (714) 540-7977, **Georgia** (404) 587-3511, **Illinois** (312) 303-0044, **New Hampshire** (603) 893-1976, **New Jersey** (201) 548-0821, **Texas** (214) 423-6311. ™ and ® subject to trademark claims.

TALARIS SYSTEMS INC.®

LETTERS

NO REMORSE

It was with great amusement that I read the August "Back End" and I must admit to a profound feeling of comradship with the author.

UNIX is indeed one of the computer world's most infamous and arcane anachronisms rather than its new apotheosis and I will not mourn its inevitable descent into the appropriate netherworld hereto reserved for such wonders of the computer software world as the heirachical database model.

What's that I hear in the background?

"IMS is the strategic database product for high-volume, high-performance mainframe transaction processing systems."

Oh no, the postulate of historical inevitability falls to the ground under remorseless crashing blue waves on the white plains of insanity.

Oh well, perhaps the experience of the dinosaur is illustrative, but can we survive another 50 million years?

Philip J. Lewis
Denmark

ELIMINATE THE COMPETITION?

After reading your August editorial about DEC closing the architecture on its BI-based products, I have a few comments about DEC and the new closed architecture approach. I am the data processing manager for a small agricultural manufacturing company. I work with the lower end of the computer scale (PCs and PDP-11s) but my opinions are still relevant to the high-end systems in general.

In this day and age of increasing price/performance ratios, I would strongly resist buying anything from a company that would close its architecture. I do not feel that protecting your profit margin by eliminating the competition is a fair business practice. This is not only unfair to the smaller, more competitive businesses that would produce the third-party support, so important for a new product's acceptance and success, but it forces all buyers of their system to pay top-dollar for something less than top-notch products.

This new marketing strategy from DEC only could be rationalized by thinking that DEC knows that it can't compete with other vendors based on price or performance, so it will eliminate the competition entirely giving itself a marketing advantage (oh no another blunder). Texas Instruments and Radio Shack have tried this strategy and failed miserably. Open architecture keeps the pressure on a company to keep improving its products instead of taking it easy, knowing that you are stuck with them no matter what they produce (or don't produce). Given this situation, I would turn to someone else for my computer solutions.

Open systems have made other computers, such as Apple and IBM PCs, the big shots they are today. IBM feels it has been hurt by "clones" and third-party software but where would IBM be without these people? Maybe IBM would have abruptly left the personal computer market the way Texas Instruments did?

As a person who decides what computer hardware, software, and peripherals are purchased by our company, I try to purchase the best products at the best prices. If my choice is between two comparable products at comparable prices, and one is from DEC, I would buy the DEC product every time.

Miles E. Crawford
Spokane, Washington

Address letters to the editor to the *DEC PROFESSIONAL* magazine, P. O. Box 503, Spring House, PA 19477-0503. Letters should include the writer's full name, address and daytime telephone number. Letters may be edited for purposes of clarity or space.

NEW READER SERVICE

Now that *DEC PROFESSIONAL* comes in a plastic wrapper, it arrives in good physical condition. As the best publication in its field, *DEC PROFESSIONAL* deserves the improved packaging.

Alan L. Cowles, M.D.
Overland Park, Kansas

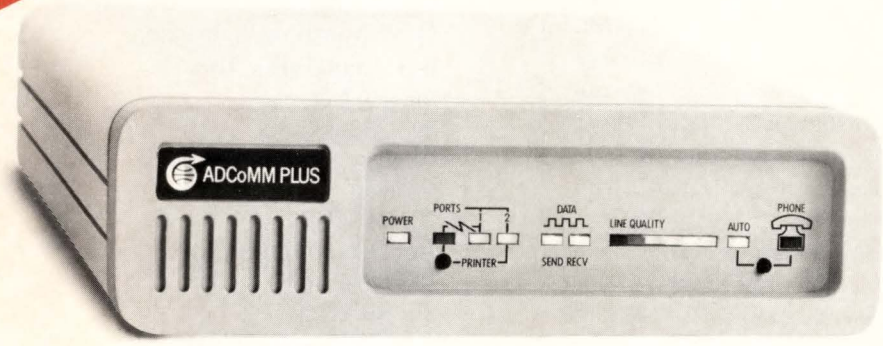
Thanks for the kind words. We're pleased to be able to bring you this new service. Because most of our readers save each issue of DEC PROFESSIONAL *for future reference, we want to make sure it arrives in top condition.*

Please remember, however, that the mailing label, which you will want for returning reader service cards or dialing into ARIS, may now be located on the mailing bag rather than on your magazine.

$400 TRADE-IN/REBATE ON YOUR OLD MODEM

DEC USERS

Interactive Applications
Dial-Up to 19.2 Kbps



ADCoMM PLUS
Advanced Communications
Modem/Multiplexer

Now, with ADCoMM PLUS, your remote terminals can respond as if they were locally attached, even over poor quality unconditioned Dial-Up lines.

- Auto Answer/Auto Dial
- Full Duplex
- 100% Error Protection
- Data/Character Compression
- Voice Grade/Satellite Operation
- Local/Long Haul Connectivity
- High Speed Fallback Mode
- Bell 103/212A Compatibility
- Hayes "AT" Command Set
- Network Diagnostics/Test Generator
- Optional Printer Mux Channel

CABLE & WIRELESS
Carterfone

Information Systems | Communication Systems
Maintenance Service | Facilities Management

1341 West Mockingbird Lane, West Tower, Dallas, Texas 75247
(214) 630-9700 • FAX (214) 630-9025

Ask about Carterfone's $400 rebate.

1-800-527-1169

ENTER 266 ON READER CARD

BUILDING ZIMBABWE TECHNOLOGY

Despite the stimulating prospects that arise from being DEC's official distributor for Central Africa, my company, Realtime Zimbabwe, is constantly frustrated by the constraints suffered by almost every developing nation. The two most critical of these are the shortage of skilled people and severe foreign exchange allocations that force us to operate in an ad hoc way and to rely heavily on various aid programs.

But they also force us to operate in an innovative and energetic style, and we have built up an organization of over 60 computer professionals in just five years. We currently support several VAXclusters, large VAX networks and numerous PDPs.

From time to time, we seek guidance and outright assistance from the DEC family world wide in order to optimize our opportunities and further enhance the proud name of DEC.

In that light, we seek a sympathetic ear from the academic fraternity throughout the world to take advantage of the one and only VAX recently installed on campus at the University of Zimbabwe in Harare. The 750, together with six terminals and four Rainbows, is installed in the Department of Electrical Engineering.

The VAX has created quite a stir! Head of department Professor Richard Harlen has been inundated with requests by students from other faculties to use the system . . . not surprising when one considers there are 4,000 students (expanding to 6,000 soon) on campus and the VAX is the only significant system available.

Alas, our University has no software for this VAX showpiece, a situation we cannot allow to continue. Therefore, we would be most grateful if any of your readers, colleges or educational institutions could consider making available any software or hardware (even obsolete) that could boost our University's VAX.

We also are working very closely with various technical colleges in Zimbabwe, including the largest center in Bulawayo, which has been granted USAID under the BEST (Basic Education and Skills Training) program.

We need to help them, too, and show them the power of DEC and VAX. Therefore, any advice or assistance would be highly appreciated. If we can create a VAX showpiece in Zimbabwe, the path for the future sales in Zimbabwe and north in the rest of Africa could be opened.

We look forward to hearing from the academic fraternity. Contact:

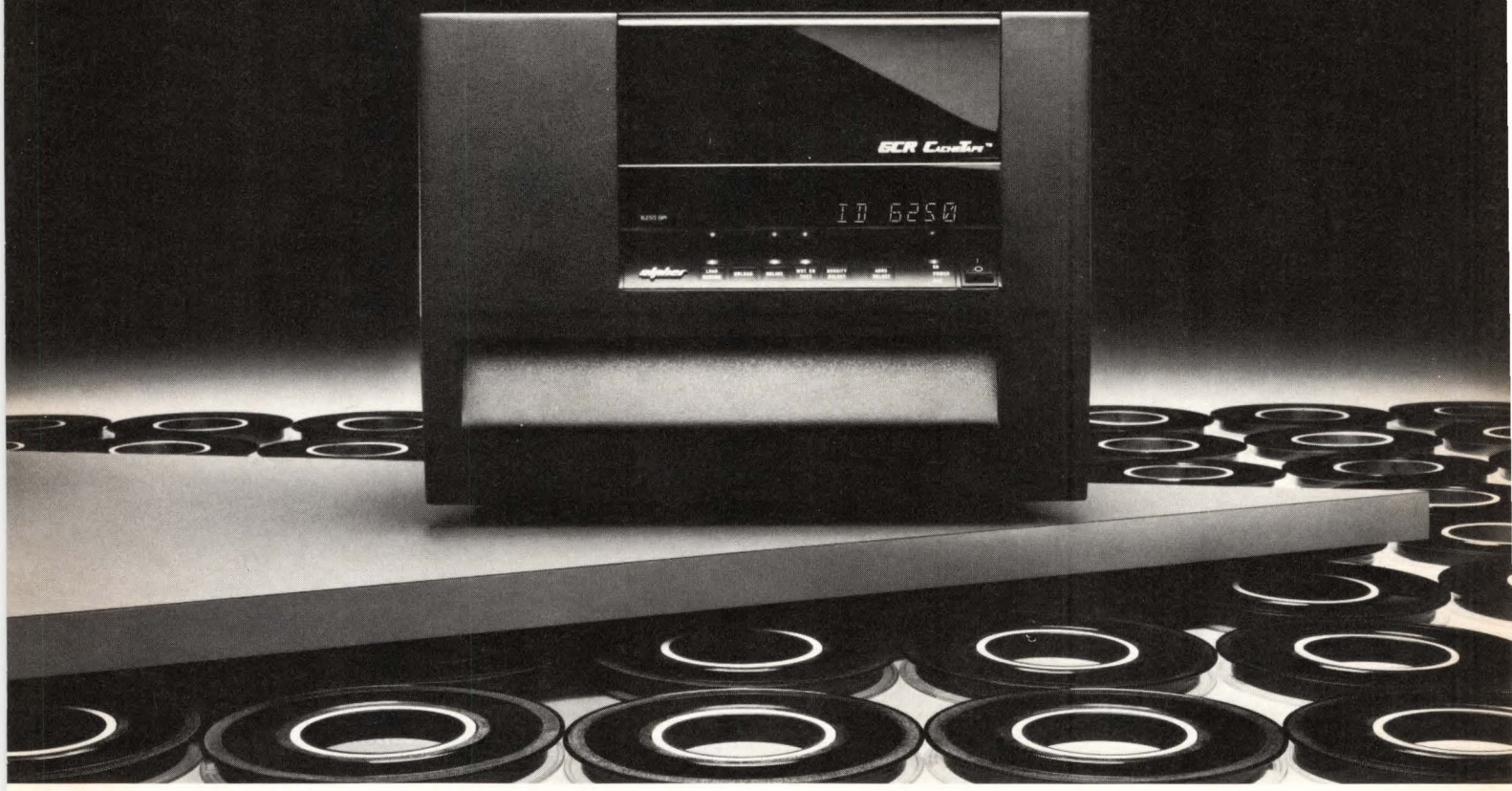
Ron Hyslop
Marketing Director
Realtime Zimbabwe
P.O. Box 4567
Harare
ZIMBABWE
Telephone: Harare 739655
Telex: 2037

Ron Hyslop
Harare, Zimbabwe ■

Editor's Note:

Due to a printing error in last month's issue, Ron Hyslop's letter inadvertently was cut off in the middle.
We present it here in full with our apologies to Mr. Hyslop and to our readers.

HIGH CAPACITY DISKS NEED HIGH PERFORMANCE BACKUP.



The GCR CacheTape® from Cipher, when enough is not enough.

To respond to the needs of today's business world, powerful computers are being equipped with more and more storage capacity.

But, storage capacity alone is not enough.

Archival capabilities, data interchange and backup support are also essential for today's business computers.

The newest disk drives are also demanding the higher performance a GCR tape drive can provide.

Like storage capacity, though, performance alone is not enough.

In selecting the right GCR tape drive to enhance your system, you should also consider how easy it is to implement, its interchange capability, form factor, and, last but not least, price.

"Enough," you say. "I'll never find all that in *one* product line." Yes you will; in the M990 GCR CacheTape from Cipher Data Products, Inc.

We offer selectable interface speeds. Working with our customers, we match the interface of the tape drive to the system and not vice versa.

The operator interface with its direct english responses greatly simplifies system use.

If all that is not enough, the tape written by Cipher's GCR is probably more interchangeable than the same tape created by any other tape drive on the market today. Our GCR tape management system, a continuous monitoring of some 200 GCR user tape system tapes, assures that we will maintain a high level of interchangeability.

And, Cipher commitment to total quality has resulted in a product filter mechanism so efficient that only the finest products are shipped to customers.

Still not enough? Then, remember that all this comes from a company considered to be the industry trend setter, the leader in removable data storage devices and subsystems. You can find out much more by contacting your nearest Cipher authorized distributor or by calling Cipher direct at 1-800-4-CIPHER.

See us at COMDEX
Booth #1370

cipher data products, inc.®

PREMIUM PRODUCTS FROM PREMIUM PEOPLE

ENTER 311 ON READER CARD

DATELINE DEC

DEC Announces New Color AI VAXstations

Memory Upgrades Available

Two new high-end members of the AI VAXstation family are now available from DEC. The new AI VAXstation/GPX (Graphics Extension) color workstations use ULTRIX and VMS operating systems, enabling users to develop and deliver applications combining Artificial Intelligence and conventional programs.

Concurrently, DEC announced the availability of memory upgrades to the AI VAXstation system, introduced last year, which increases capacity to 16 MB of memory, and an enhanced version of the expert system language VAX OPS5.

The new AI VAXstation/GPX workstation with high-resolution eight-plane color graphics and VAX LISP offers users a complete Common LISP environment with VAX performance and either DEC's proprietary MICROVMS or ULTRIX-32 operating systems. The ULTRIX-32 operating system is DEC's native mode UNIX operating system and is compatible with AT&T's UNIX System V Release 2.0.

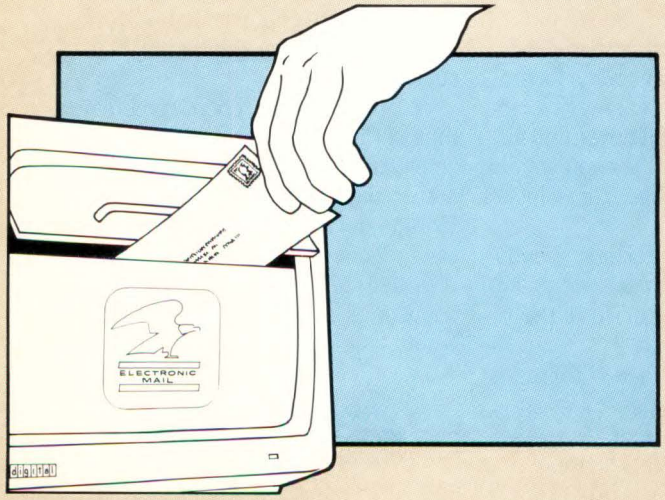
Because the AI VAXstation is based on the general-purpose MICROVAX II computer, users are able to integrate Artificial Intelligence with conventional programs. VAX LISP running on the AI VAXstation/GPX gives the AI applications the ability to use a variety of layered languages and databases through the VAX Calling Standard and provides access to all system services.

VAX MAILGATE Introduced For MCI Mail

ALL-IN-1 Users To Access MCI Mail

MCI Communications Corporation and DEC recently announced a new software product that combines the strengths of DEC's ALL-IN-1 Integrated Office and Information System electronic mail system with MCI's worldwide public electronic mail service.

VAX MAILGATE For MCI Mail is specifically designed to allow ALL-IN-1 electronic mail users to access MCI Mail delivery options, including telex delivery to more than 1.6 million telex subscribers worldwide. To the user, both systems appear as a single, integrated mail system, so information can be quickly and easily exchanged and accessed.



In addition to worldwide telex delivery, ALL-IN-1 electronic mail system users can send messages to any MCI Mail subscriber, to users of electronic message systems registered with MCI Mail, or to any address, nationwide or worldwide, for postal or courier delivery. MCI Mail and telex subscribers can, in turn, send messages to ALL-IN-1 electronic mail system users.

VAX MAILGATE For MCI Mail is available from both MCI and DEC and is priced at $7,500.

Admiral Grace Hopper Joins Digital

Begins New Career At Age 79

Dr. Grace Murray Hopper, the Rear Admiral who in August retired as the U.S. Navy's oldest officer on active duty, began a new career with DEC on September 2 at age 79.

Harvey Weiss, vice president of U.S. Operations for Digital, announced that Admiral Hopper accepted a position as a Senior Consultant working out of DEC's Washington National Place office at 13th and Pennsylvania Avenue.

Admiral Hopper's

duties will include representing DEC at industry forums and symposia, making speeches that focus on government issues and ADP environments, serving as a representative on computer industry committees and engineering forums, writing and publishing computer systems/engineering papers on selected subjects, and participating in DEC's liaison programs with educational institutions.

Since 1952, Admiral Hopper has published more than 50 papers and articles on computer software and programming languages. She was a leader in the development of the COBOL computer language and served on the ANSI X3.4 Committee on the standardization of computer languages. She is a member of the CODASYL (Conference on Data Systems Languages) Executive Committee.

At her retirement ceremony aboard the U.S.S. Constitution in Boston, Navy Secretary John F. Lehmann Jr. presented Admiral Hopper with the Distinguished Service Medal. More than 40 colleges and universities have conferred honorary degrees on Admiral Hopper, and she has been honored by her peers on several occasions. She was the recipient of the first Computer Sciences "Man of the Year" award given by the Data Processing Management Association. Her entry in "Who's Who" takes 34 lines to thumbnail her accomplishments, appointments and honors.

AI Training, Consulting Programs Announced At AAAI-86

New Brochure Highlights AI Software Services, Education Services

At the Fifth National Conference on Artificial Intelligence (AAAI-86) in August, DEC introduced two new AI consulting and training programs designed to help customers building knowledge-based expert systems. DEC's new Expert System development services, called IMPACT, are built on a three-tiered approach: Methods, Tools and Integration. Creation of an AI system requires flexibility, yet there must be project controls. IMPACT draws on a set of project methods that DEC has found effective in the development of its own internal expert systems.

The SELECT program is an added dimension to the IMPACT program in that customers become participants in developing their own AI applications. The goal of SELECT is to help the customer grow his own AI development capabilities. This is accomplished through project development participation plus a combination of classroom training, briefings and consulting. SELECT also incorporates business and organizational variables that surround industrial-scale expert systems development.

Also in the area of AI, the "Artificial Intelligence: Training and Consulting" brochure is now available free from DEC. The brochure describes DEC's Software Services and Education Services offerings in the Artificial Intelligence environment.

The brochure describes DEC's experience with AI, what is feasible, how the technologies work, and how customers can benefit from other users' developmental experience when getting started in Artificial Intelligence. Also, there is a summary of how DEC evaluates individual AI situations and trains customers to recognize, develop and integrate AI applications into their businesses.

To obtain a copy of the brochure, contact a DEC sales representative.

VAX COBOL Achieves Validation Milestone

Rated High-Level COBOL Against FIPS PUB 21-1, ANSI-74

VAX COBOL has been validated by the U.S. Government as a High-Level COBOL Language. VAX COBOL is DEC's implementation of the COBOL language that runs on its VAX computer family.

VAX COBOL passed the 1986 validation testing and has been rated as a High-Level COBOL against Federal Information Processing Standard (FIPS) PUB 21-1 and ANSI-74.

Validation at this level will make it easier for DEC and its prime contractors to compete in the marketplace because many government and commercial contracts stipulate this requirement.

In addition to it meeting ANSI-74 High-Level Standards, VAX COBOL already has been upgraded in Version 3 to meet many of the new standards set forth under ANSI-85 guidelines.

DEC's new VAXmate networked personal computer features Microsoft Windows as its user interface of choice.

DEC Selects Microsoft For VAXmate

'Windows' Chosen As User Interface

Microsoft Corporation recently announced that DEC selected Microsoft systems and application software for use in its new Personal Computing System Architecture, featuring the new VAXmate personal computer.

Microsoft Networks, MS-DOS 3.1 operating system, and Microsoft Windows, along with DEC's DECnet/Ethernet networking products, provide the foundation for DEC's new personal computing products. VAXmate, which comes standard with a one-piece monitor/system unit, keyboard and mouse, features Microsoft Windows as its user interface of choice.

Additionally, DEC signed a license agreement to make Microsoft Word, Microsoft Multiplan, Microsoft Project, and Microsoft Chart available on VAX, MICROVAX and VAXmate servers.

VAX/VMS Rated 'C2 Secure'

Meets Evaluation Criteria For 'Trusted' Computer Systems

The VAX/VMS operating system has been evaluated by the National Computer Security Center (NCSC) and meets Controlled Access Protection (C2) security requirements.

The announcement puts VAX/VMS in company with a small number of operating systems to have successfully met the evaluation criteria for "trusted" computer systems.

The NCSC recommends a C2 level operating system as a minimum criterion for government users who process sensitive or classified information. A C2 level system is acceptable in environments that operate in a System High Mode, which means all users must have clearances to the highest level of information in the system.

In a letter to DEC, the NCSC evaluation team stated it completed its evaluation of VAX/VMS V4.3 and found it to meet C2 requirements of the DOD Trusted Computer Systems Evaluation Criteria of August 15, 1983.

DEC provides the C2 level access control protection as a standard component of VAX/VMS at no additional charge. The C2 classification covers all announced VAX/VMS computers as of July 1986, from the VAX 11/725 to the VAX 8800, as well as Norden Systems' Mil-VAX I and Mil-VAX II.

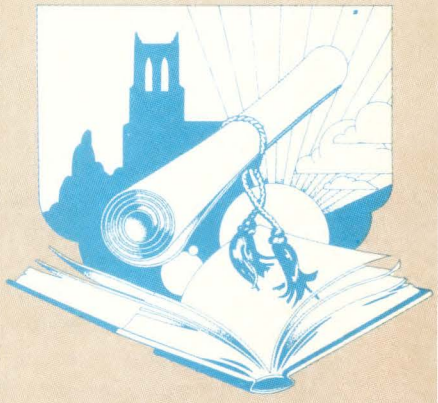
Contributions Program Exceeds $13 Million

Viewed As 'Investment In The Future'

DEC's Corporate Contribution Program exceeded $13 million in cash and equipment donations for its fiscal year ending June 30, 1986.

The company's Contributions Program concentrates its support in four areas: education, culture, health/handicapped, and civic/social affairs. It also includes DEC's employee-related Matching Gift, United Way and Scholarship programs.

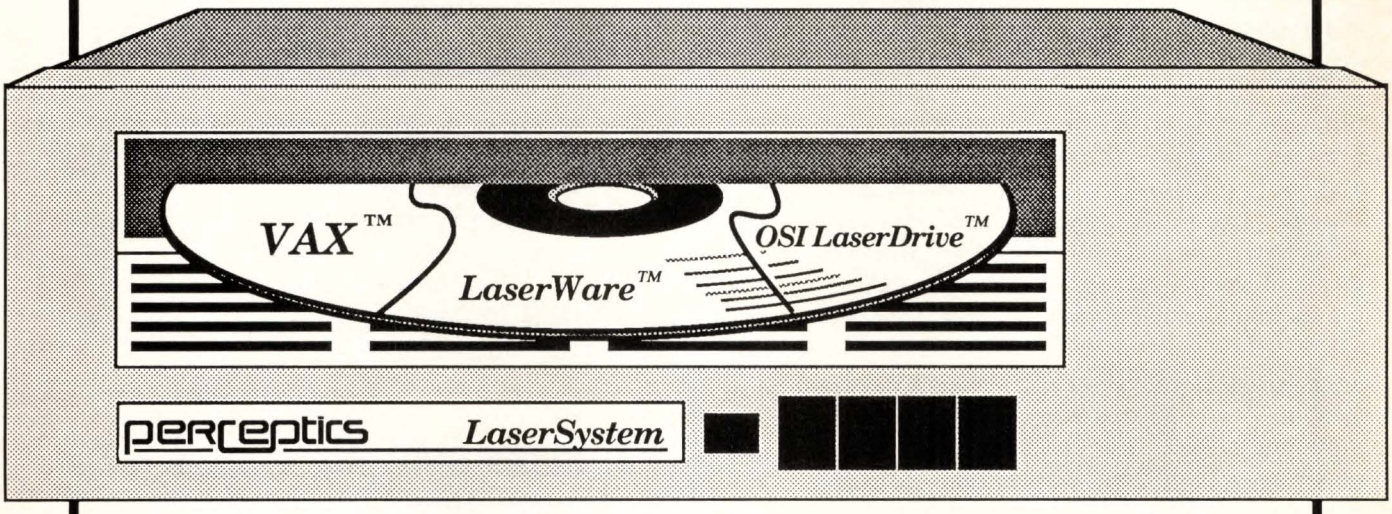
According to Nancy A. Dube, manager, Corporate Community Relations, "Digital views its contributions as not only a corporate responsibility, but also an investment in the future of both the company and the community-at-large."



Education and training are an integral part of the program, with grant recipients ranging from local high schools, vocational/technical schools, and colleges and universities throughout the

perceptics®

Now Perceptics puts all the optical disk pieces together ...



LaserSystem™

Laser-disk subsystem for VAX/VMS™

Perceptics introduces the solution: *LaserSystem* – an integrated, ready-to-use optical disk storage subsystem providing transparent access to high capacity optical disk storage on VAX/VMS systems. *LaserSystem* includes an OSI LaserDrive optical disk drive, Emulex host adapter, Perceptics *LaserWare* optical disk software, installation, and support.

LaserDrive Features

- 1 GByte per side write-once (WORM) removable media
- Direct Read During Write (DRDW)
- Automatic reallocation of bad blocks
- Built-in self-diagnostics
- On-site maintenance by Control Data Corporation

***LaserWare* Software Features**

- Full on-disk VMS-compatible directories using WORMS-11™ disk format
- File deletion, renaming, and modification
- Compatible with VMS utilities, e.g., BACKUP, and DCL commands
- No changes to existing software

Complete DEC computer systems also available

Perceptics Corporation

Pellissippi Center • Knoxville, Tennessee 37932 • (615)966-9200

ENTER 80 ON READER CARD

country, to associations such as the American Association of University Women in Washington, D.C. The company also focuses on minority education and women's development, through programs annually providing scholarships to over 100 students pursuing degrees in engineering and computer science.

DEC supports the performing and visual arts in their many forms — from symphony orchestras and museum exhibitions to public television programming and children's theatre groups. Contributions in the area of health care primarily are directed toward making high-quality, affordable health care services available to its employees, their families, and the community-at-large. In the civic program area, DEC supports a number of organizations serving a broad spectrum of social needs, including the homeless, the environment, substance abuse, and child abduction.

The company addresses the interests of its employees through the Matching Gift Program and the annual United Way campaign.

VAX OPS5 Enhanced

V2.1 Includes Debugging, Program Statistic Display Features

DEC announced enhancements to VAX OPS5, its fully supported version of the OPS5 expert-system building language.

VAX OPS5 is a native mode VAX compiler designed for efficient development of high-performance, rule-based expert systems. Programs written on VAX OPS5 can call and be called by routines in other VAX languages. VAX OPS5 Version 2.1 includes several features for program debugging and displaying program statistics.

Documentation for VAX OPS5 includes a *Reference Manual* and *Users Guide*. DEC's Educational Services also offers VAX OPS5 training in seminar or self-paced instruction form.

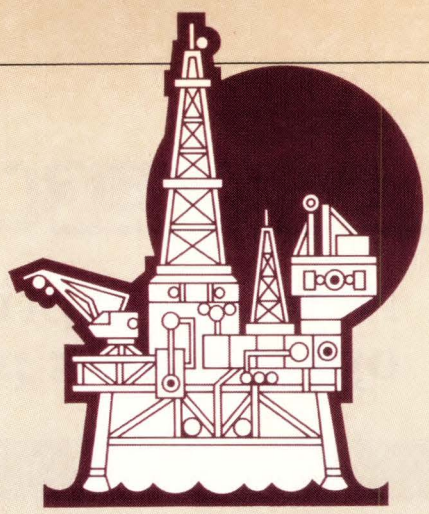
VAX OPS5 Version 2.1 is licensed from $3,000 for the MICROVAX II computer to $15,000 for the VAX 8800 computer, with immediate availability.

DEC, Radian To Market CPS

Software For Petroleum Industry

DEC announced a cooperative marketing agreement with Radian, Inc. to market Radian's CPS family of software products for petroleum industry applications.

Radian's CPS software provides the petroleum industry and government agencies with software application products that allow geotechnical professionals to model surface and subsurface



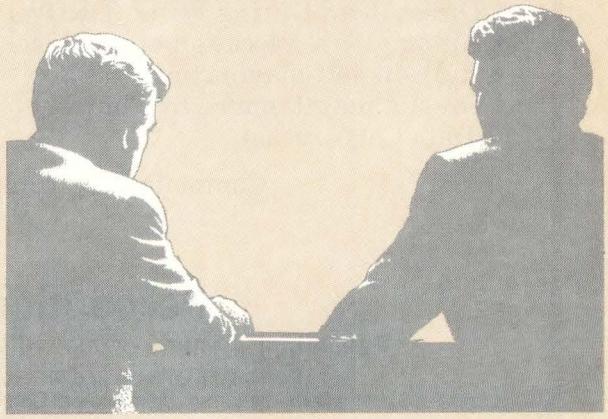
features of the earth. The software, which runs on all VAX processors from the MICROVAX to the VAX 8800, can represent and quantify the subsurface near oil and gas reservoirs, as well as create three-dimensional models of the earth's surface for terrain modeling. Radian's interactive software also can set up, edit, quantify and display multilayer models and cross sections.

DEC Signs CMP Agreement With Computer Aided Decisions, Inc.

To Market Systems For Investment Management

Computer Aided Decisions, Inc. and DEC signed a Cooperative Marketing Program (CMP) agreement, under which the two companies will work closely together to market systems for the investment management industry.

With this agreement, DEC and Computer Aided Decisions have established a cooperative mode of operation which actively promotes the sale of both companies' products. Currently, Computer Aided Decisions has five software modules designed to meet the needs of the investment and brokerage community — from the portfolio manager to the trading desk.



How do you answer those tough questions about VAX* resource usage? Quantum RS.

When you need software for VAX* resource management, system accounting, and capacity planning, you need Quantum RS. It gives you maximum system information with minimum effort so you can account for current VAX resource usage, anticipate future requirements and plan wisely for timely investment in additional hardware. Quantum RS accounts for computer usage by individual users, projects, user name/projects, departments, accounts and any other accounting entities you define.

Quantum RS tracks all available VMS* resources to give you answers on:

- Capacity planning
- Resource accounting
- Internal cost allocation
- Project accounting
- Chargeback
- Performance analysis

* VAX and VMS are trademarks of Digital Equipment Corporation

ENTER 287 ON READER CARD

For more information call or return the coupon today.

YES! I need answers to those tough questions about VAX resource usage.

☐ Send me product information today.
☐ Have a product representative call me.
☐ Keep me informed of additional offerings.

Name _____

Title _____

Company _____

ATTACH BUSINESS CARD HERE

Street _____

City _____ State _____ Zip _____

Telephone ( ) _____

Send to: CIS, 165 Bay State Drive, Braintree, MA 02184-5203
Telephone: (617) 848-7515 TELEX: 4996932
Outside Massachusetts, call toll free 1-800-232-5215.

DCPRO8611

cis

165 Bay State Drive, Braintree, MA 02184-5203
Telephone: (617) 848-7515 TELEX: 4996932

The Logical Choice

YOU'VE BOUGHT THE RIGHT COMPUTER.

DON'T MAKE A TERMINAL MISTAKE.

NEW! 4200 SERIES NOW AVAILABLE

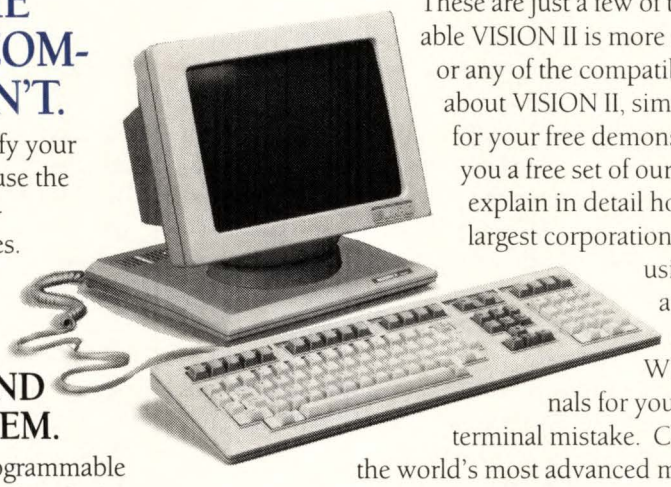
After comparing and evaluating specifications, you settled on a DEC™ VAX™ computer as your best choice. Simply speaking, the VAX is the most technically advanced supermini on the market today.

The logical next step, then, would be to choose DEC VT™ 220 terminals. Logical, but not necessarily right. Because the VT220 may not take full advantage of the potential of the VAX and its applications.

To really get the most out of your VAX, you need the most functional terminal you can get. The new VISION II 4200 Series terminal, from Lanpar.

HERE'S WHAT THE NEW VISION II 4200 SERIES HAS THAT THE VT220 AND COMPATIBLES DON'T.

You'll never need to modify your host software in order to use the VISION II 4200 Series terminal's impressive features.



THE INDUSTRY'S BEST ALL-AROUND FUNCTION SYSTEM.

VISION II has 96 user-programmable functions that can be routed to the host, the terminal, or both. In addition to 256 bytes of VT220-compatible volatile function memory, VISION II has 1530 bytes of non-volatile function memory. Use this memory to store onscreen function-key labels displayed on the 25th status line, to store commonly used commands, or even to call up reference text, all with the touch of a function key. Ideal for multi-level, multi-tasking operating systems such as VMS™ and UNIX®, VISION II is extremely versatile and easy-to-use, eliminating hours of repetitive keystroking.

ReGIS GRAPHICS.

Simply by inserting Lanpar's proprietary 68000-based, Tektronix™ 4010/4014-compatible graphics board, you can turn a VISION II into a high-performance graphics terminal that can pan and zoom on the fly. This fall, an improved 4200 Series graphics board will be available that's upgradable to run ReGIS graphics!

ENTER 96 ON READER CARD

SHARPER SCREEN.

The new 4200 Series now has a higher-resolution, 375 x 800-pixel screen that increases text clarity and will significantly improve graphics resolution.

OTHER FEATURES.

Unlike the VT220 and all other compatibles, VISION II has a multi-page memory system that can store up to 220 lines (eight independent pages) of text locally, and can instantly display any of these pages without disturbing the host.

VISION II also has dual bi-directional host ports and set-up tables that let you connect to two different hosts in different operating modes, and switch back and forth between them instantly without altering the set-up.

These are just a few of the reasons why the affordable VISION II is more functional than the VT220 or any of the compatibles. To find out more about VISION II, simply call 1-800-387-4205 for your free demonstration. We'll also send you a free set of our application notes that explain in detail how some of America's largest corporations and institutions are using VISION II to simplify and speed-up their everyday computing tasks. When you're choosing terminals for your VAX, don't make a terminal mistake. Choose VISION II. Because the world's most advanced minicomputer deserves the world's most functional terminal.

CALL 1-800-387-4205 TODAY FOR YOUR FREE DEMONSTRATION.

Head Office: 747 Main Street, Concord, MA 01742 (617) 371-0915. Other Offices: Rockville, MD (301) 424-0588; Schaumburg, IL (312) 885-4170; Los Angeles, CA (818) 358-9794; Canada (416) 475-9123; Europe 44-04215-61424.

LANPAR

VISION II

SIMPLY BETTER ENGINEERING™

LANGUAGES

JET SET SOFTWARE

A Multilingual, Multinational Approach To Business Software.

By Gary W. Neidhardt

How can system integrity be kept, while being locally friendly as well? When a Fortune 250 company asked us to modify our financial application software, *IBMS*, to become multilingual and multinational, and for installation on DEC's range of VAX/VMS computers, we learned quite a bit about this question. The lessons learned are intended as a guide, to both nontechnical managers and application software designers, toward creating, improving, or acquiring international financial software.

Most of today's financial applications software is limited by rather large constraints: It is written for Americans by Americans, and speaks only American English. This is a major reason why so much installed software must be replaced and why international software designs will continue to emerge as a growth opportunity.

An ideal software package is one that is as friendly as if you wrote it yourself. It speaks your language and adapts when circumstances change. It also provides a common design for automated interchanges of information, and is "language independent."

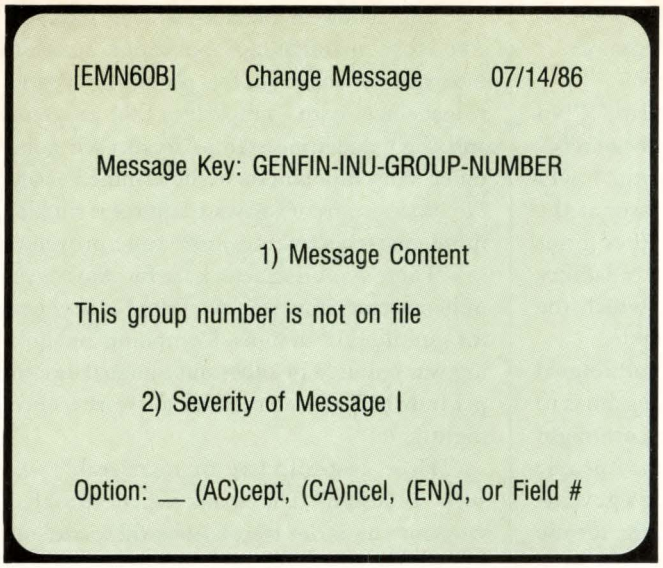
A worldwide multicomputer application system should behave with the logical characteristics of a single site computer system, for a large corporation to employ it with confidence.

These requirements are as true for foreigners as for Americans, particularly in an era when U.S. corporations derive significant benefit from business overseas.

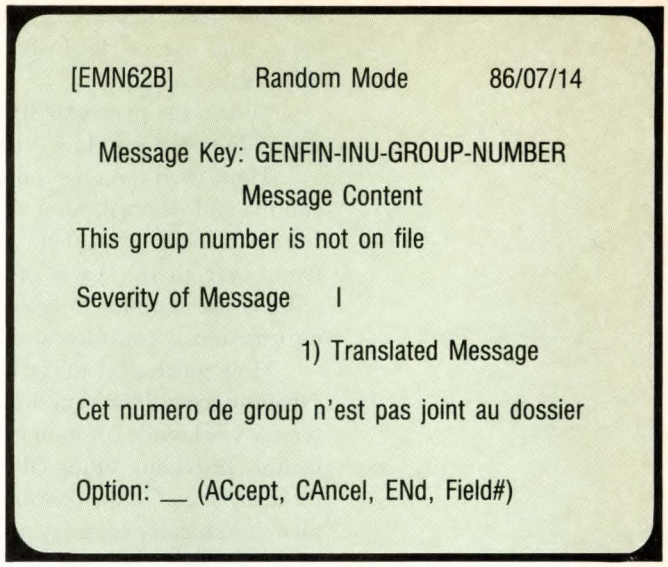
Why install a multilingual software application? In the past, the price of an American installation of common application systems overseas most often required the end user to speak American. Maintaining multiple versions of software per country and/or language was either cost prohibitive or too cumbersome to administer effectively.

Friendliness, an aspect of adaptability (see "Layered Architecture," *DEC PROFESSIONAL*, Vol. 4, No. 11, November, 1985, p. 14), has been overlooked in most American designs. Often, the overseas subsidiaries had to write or buy their own software (or remain manual), because Corporate's was unfriendly, unaffordable, unavailable, or inappropriate. Thus, quite often, today's technique of consolidating international financial statements results in a smorgasbord of computer and manual systems developed at different times by different people; systems never designed to interchange information.

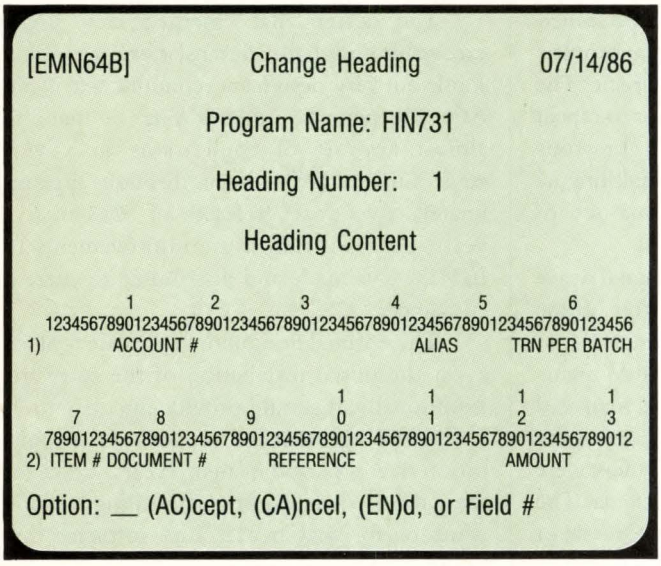
These antiquated systems must be replaced, but replaced by what? I suggest using everywhere, one version of application software smart enough to change languages without programmer dependency. It should provide users the capability to translate the application appropriately at installation time, and allow the same people to change the translation and local definitions as they see fit. It also should achieve decentralized



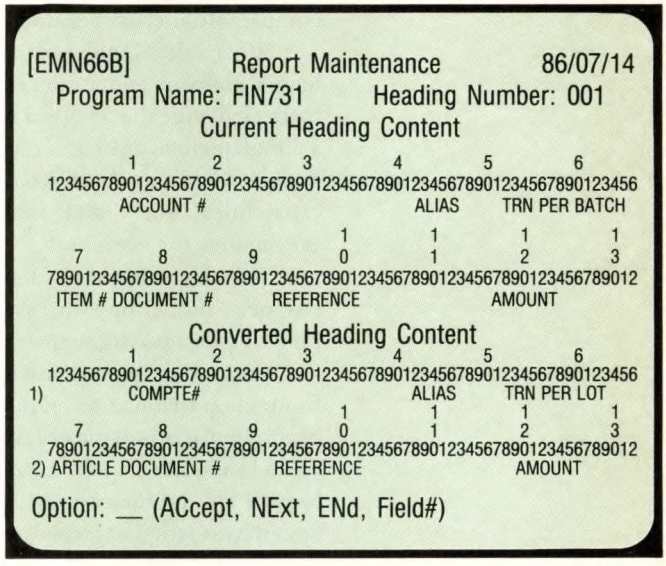
Screen 1.



Screen 2.



Screen 3.



Screen 4.

friendliness and retain centralized system objectives and control.

We Americans, so I've been told, speak "American," not English. We American project members were corrected during the project by the British members, anytime we implied otherwise. Australians, New Zealanders, and Canadians also would have corrected us. Thus, we have significant language differences even before the first non-English-based translation is considered. (How do you spell cheque?)

Most multilingual data requirements should be obvious. Everything shown to a user on a terminal or report should be translatable. All software prompts, error messages, and operating commands used by the average user to communicate with the system, should be translatable. All descriptive information used to understand the system's data contents, should be under local control as well.

However, multilingual requirements contain additional characteristics often overlooked. If we Americans say that today is 07/10/86, that is a matter of opinion. Today is also 86.10.07

and 10-07-86, depending on your point of view. The use of decimals and commas is disputable as well:

"I paid the man 10,000.00 dollars." "No you didn't; you paid him 10.000,00 pounds."

Thus, even the positioning of the lowly comma and decimal point are at issue if the system doesn't print them "like they print them over there." Lack of such capability reduces the number of arenas in which the information is considered presentable.

How much does the lack of multilingual capability cost? If one application system is to serve a worldwide community, the cost might include providing bilingually trained people for many sites. Or, the cost might be a government bureaucracy someday prohibiting the use of any application software that doesn't use the local language! A multilingual software application ultimately provides more stability than comparable alternatives, and also is friendlier.

What's the single most important multilingual software application characteristic? The main challenge that evolved was not to repeat a fundamental mistake made in previous designs: Other approaches *claimed* multilingual capabilities, but didn't supply one set of executables for everyone.

This flaw seemed so fundamental that we stopped modeling ourselves after these previous designs right then and there.

I once was associated with an IBM mainframe shop that had seven IBM 360s managed centrally. All programmers were located at the Ohio headquarters, while the computers were located around the country and Canada. The system was strictly batch-oriented. One set of American executables ran on all systems.

The online multilingual software problem seemed to us to have design criteria identical to that of the IBM shop: Allow all programmers to be in one place, but allow the one set of executables they produced to service everyone. That criteria was not new in itself; to design the system to operate regardless of domestic boundaries *was* new. We felt this choice represented the most effective long-term software management strategy.

MANAGEMENT OF THE MULTILINGUAL application software, therefore, is performed at the program-executable level. A linkage editor (the system software that creates an "executable" file that the computer "runs") can place a date/time stamp on the executable file it creates. Therefore, maintaining application software integrity is achieved by providing central management with a simple list of the programs and their date/time stamps from each computer. Any differences are determined easily. No other means of software control is simpler, more cost-effective, or more time proven.

There's nothing new here for American-only systems; however, we found it was new for multilingual designs. Compiling and linking was required by other multilingual designs per translation — a potential software control nightmare!

How cost-effective or manageable was such a design? The management problem worsens the more translations there are, not to mention recurring implementation costs or the number of programs in the system. Please, Murphy's Law *has* to apply!

The design that emerged is a single executable design for all translations; a possibly subtle but very significant economic statement. After all, periodic updates must be made to almost any set of applications in a VAX environment. We've been through approximately two dozen releases of VMS in five years, not to mention the improvements to *IBMS* we've made and distributed to current customers.

The optimal design must provide tools to assist the initial installation of the software. Additionally, it should provide integrity tools for the management and support of the application over a period of many years. Look for these tools when acquiring multilingual software, or for that matter, any software that needs to grow and change along with you.

There's one additional concern that a seasoned software support manager will have: How do you take an American auditor overseas and expect him to audit a German or French application system? Does the desire to be multilingual require multilingual personnel? No! In a single command, an American user can go to the overseas location and the translated system is told to speak to him in American. In addition, there's no limit to the number of translations that can exist per site.

The Fear Of Decentralization

Almost any corporate controller will be concerned about the decentralization of a com-

A main benefit of the collection umbrella becomes the low cost of performing financial consolidations.

pany's financial database. He'll want controls to assure integrity, and his ability to monitor the organization cannot be jeopardized. Besides the cost of long distance (which in the U.S. still seems to favor centralization more than elsewhere), the fear of losing control often provides the most substantial obstacle to decentralization. The desire to ensure financial control, as well as software application control over multiple software sites, became essential to the success of the project.

The concept of "baseline management" emerged to solve this requirement. This is the procedure for providing various data files to each location, created and controlled centrally. By providing these baseline files, a "corporate data collection umbrella" exists at each installation. This always will be in common everywhere, but the data provided underneath the umbrella can be tailored to the specific local requirements as needed. Tools were designed to provide for the centrally controlled update of the collection umbrella. Additional tools were designed to prove that each installation updated its collection umbrella correctly as instructed.

A main benefit of the collection umbrella becomes the low cost of performing financial consolidations. The collection umbrella is created by centralized management by naming the rows and columns of each financial report it wants, from each installation. Each site must run only the reports supplied to it. The technique of providing these definitions is quite similar to defining a spreadsheet, a procedure commonly done today by accountants on microcomputers.

Because the rows and columns of the financial reports are present in the design, all that need be transmitted by the subsidiaries to Corporate are the totals kept by the rows and columns; i.e., at a reporting chart of accounts level rather than at a much more detailed financial chart of accounts level. This concept significantly reduces what otherwise might defeat or postpone a decentralized design: the cost of transmitting data over long distances.

At corporate headquarters, the transmission files can be consolidated into one corporate database. In addition to the rows and columns of each report, which define part of the reporting chart of accounts, a unique designation per site is included within the reporting chart of accounts. The following is a possible reporting chart of accounts:

1. Report Number
2. Company Number
3. Office Number (optional)
4. Row Number
5. Column Number
6. Sort Criteria no. 1 (optional)
7. Sort Criteria no. 2 (optional)
8. Sort Criteria no. 3 (up to seven more permitted).

With each reporting chart of accounts entry, there will be a value which most likely will be in U.S. dollars. This reporting chart of account data can be transmitted quickly to Corporate at month's end. Consolidated reports can be quickly generated from Corporate's database, which is built directly from the contents of the transmission files. Each site can be reported individually, or all sites can be reported together.

A copy of each report generated at each site either can be mailed or transmitted to Corporate as well. The conservative approach would be to insist on a hardcopy of each subsidiary's report that can be compared with the same report generated off the centralized database. This approach is quite suitable dur-

```
[EMN50B]   Screen Name: EMN67A   86/07/14

                Field Type: PROMPT
                Field Length: 51

                     Current Value
[EMN67A]    Headings Report Selection
                   Converted Value
[EMN67A]  Selection du Rapport Des Titres


Option:
```

Screen 5.

```
[EMN50B]   Screen Name: EMN67A   86/07/14

                Field Type: HELP__MESSAGE


                     Current Value
Select an option from the list that appears to the right
                   Converted Value
Choisir une option de la liste a droite


Option:
```

Screen 6.

```
[EMN55A]        Option Translation        86/07/15
American Option: ACcept
  Local Option: ACCEPT
  Preceding Options      Succeeding Options
  ----------------      ------------------
       END
       MORE
       PREVIOUS
       DELETE
       NEXT
       CHANGE
       REJECT
       CANCEL
```

Screen 7.

```
[EMN55A]        Option Translation        86/07/15
American Option: ACcept
  Local Option: ACepter
  Preceding Options      Succeeding Options
  ----------------      ------------------
       FIn
       ENcore
       PRecedent
       BIffer
       SUivant
       CHangement
       REjeter
       OBliterer
```

Screen 8.

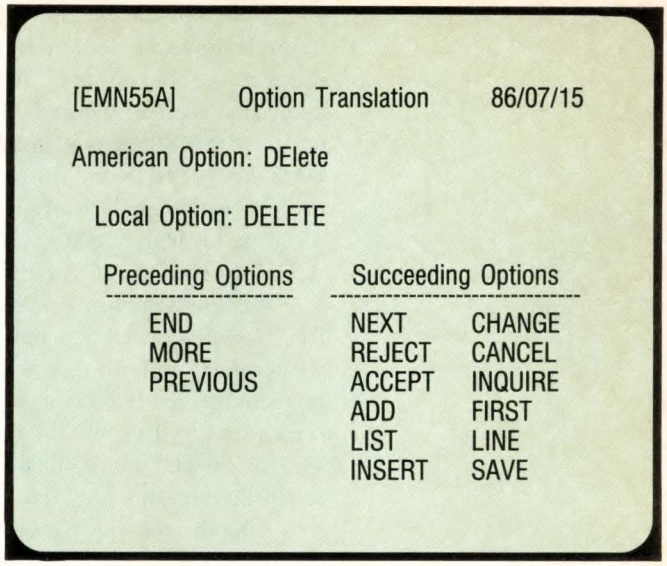
ing parallel testing as a confidence builder, or as a permanent practice for ongoing confidence. A benefit of the procedure is that it provides ironclad monitoring of each location.

While my explanation still may be somewhat new to some, let me approach the concept of a reporting chart of accounts differently.

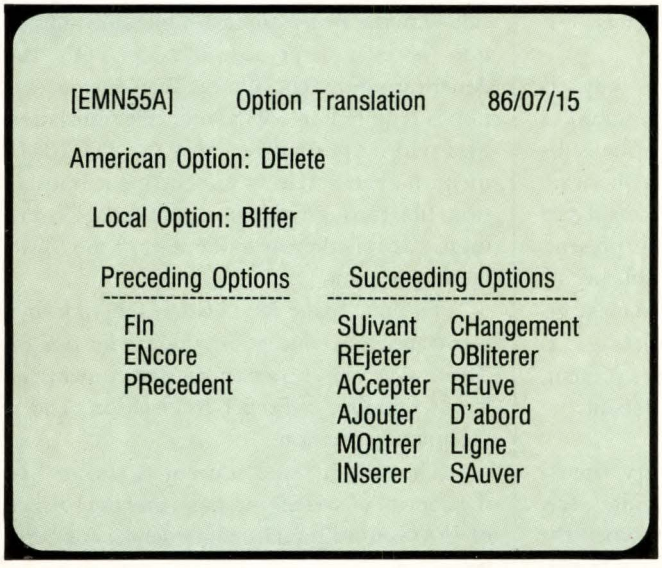
IN ANY LARGE CORPORATION, you can be sure there are corporate financial policy and definition manuals found in the auditing and accounting offices. Within one or more of these corporate bibles, are sections devoted to documenting the source of each row and column on each management report; i.e., the corporate reporting chart of accounts typically exists in any organization of any size. All that's been missing is a means for the accountants to codify it, and then spread these definitions throughout the corporation in an automated manner.

The codification of the reporting chart of accounts now has become an integral part of the financial application. The financial application software system has gained enough

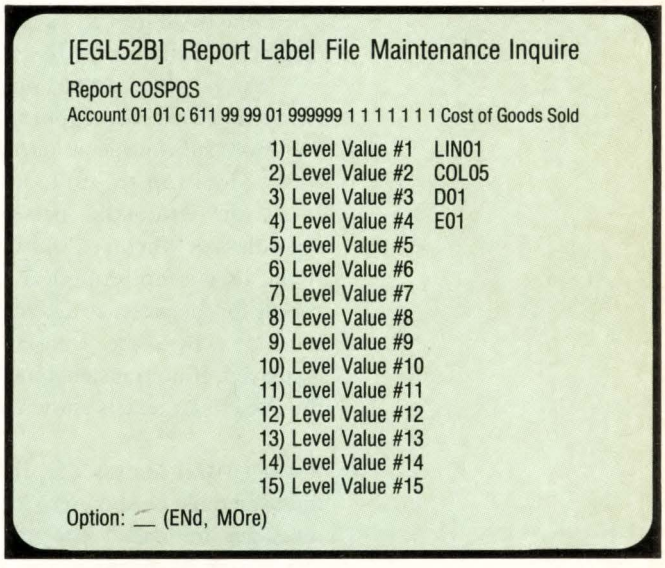
Message Maintenance represents a set of programs that control the contents user messages.



Screen 9.



Screen 10.



Screen 11.

maturity to automate a large part of the corporate bible.

How many large corporations have completely automated financial reporting systems? Very few. Manual collection and refinement still is required often for higher level management, or as a function of the number of places where a company does business. The concept of a reporting chart of accounts gives the highest levels of management automated access to information suitable to their level of interest and/or responsibility.

Message Maintenance represents a set of programs that control the contents user messages. There are three categories of user messages: error messages, warning messages, and informationals.

Message maintenance programs, as is common for other multilingual maintenance, are of two types: *central* programs and *distributed* programs. Central programs are used only by personnel directly responsible for the generation or modification of *IBMS* source code. Distributed programs are used for translation purposes only and are intended for field site use.

Screen 1 is an example of a central program. It shows the user message "This group number is not on file." This message is associated with an indexed-sequential key of GENFIN-INV-GROUP-NUMBER. Only the ISAM key GENFIN-INV-GROUP-NUMBER is present in the application program. The application loads the ISAM key and displays the American message to American users.

This message has a severity level of "I" for "informational," which means the bell on the terminal will not ring when the message is encountered. If the message was entered with a severity level of "W" for "warning" or "F" for "fatal," the terminal bell would ring when the message appears.

After this message has been entered by the central program, it becomes available to be translated. Screen 2 shows the American message above the translated French message. The same ISAM message key as in Screen 1, is displayed at the top of the screen.

When the ISAM message key is encountered by the application program, a common subroutine is accessed. The subroutine looks to see if the user is American. If so, the American message is displayed regardless of whether a translation is present. If the user is not American, the subroutine checks for the presence of a translated message. If one exists, the translated message is displayed. If no translated message is present, the American text is shown as a default.

RATHER THAN ACCESS the disk every time a message must be shown to a user, quite a few messages are loaded into memory when the program starts. A coding sequence was implemented as part of the design in order to instruct a load-message subroutine of appropriate message data to be stored in memory. Only informational and warning messages are selected. If a fatal message ever is encountered, the cost of going to the disk to retrieve it is not significant.

Actually, the translation of fatal messages is not considered necessary or desirable. Fatal messages, in theory, should not be encountered. The number of such messages that cause a program to terminate prematurely is quite substantial. Translating fatal messages increases the time required to perform a translation, complicates documentation and gives very little pay-back.

Screen 2 executes in two modes: sequential and random. When a user begins the translation, it is much easier to run this screen in sequential mode. Each non-fatal American text message is displayed sequentially. After each message is translated, the program marks that a translation has taken place. The sequential mode does not attempt to retranslate the message the next time the program is run.

Message maintenance can operate randomly as well. If a user wants to change the contents of a previously translated message, he runs message maintenance in random mode. The message key can be determined by accessing reports that show the contents of all messages and their message keys.

Each translated message is stored side-by-side with the American text. Only one translation is ever kept side-by-side with the American equivalent. If more than one translation is required on a VAX, multiple translation files will be present on the VAX. The *IBMS* menu umbrella selects the pertinent translation file through the use of a VAX system logical assigned prior to the start of the *IBMS* menu program.

Figure 1 (page 39) illustrates the side-by-side translation concept provided in the design. Three files are shown: a master control file kept centrally, a French translation, and a German translation.

The side-by-side concept is essential to the control of system messages and the balance of *IBMS* multilingual maintenance. Any difference between the contents of two message files always can be determined by examining the contents of the American text versus the master control file. There never should be any differences in the contents of the American text. Utility programs were written to provide this comparison capability, and function like the DIFFERENCE utility of VAX/VMS.

Thus, central management can maintain the integrity of all *IBMS* message files regardless of their location or translation. All that becomes necessary is to have the message files available on a VAX, to be compared with a master copy. New messages created within *IBMS* can be sent to the field and inserted into a current translation as well. Upon receiving the new messages in the field, the field site runs

And now for our next revolution...

LIBERTY*, to free you from the tyranny of multiple board requirements. It's the only board you'll ever need!

Basic freedoms, not to be denied:

FREEDOM to transfer data up to 12 Megabytes/sec. But in the interest of law and order, we've slowed it to 5.25 to stay within the QBUS speed limit.

FREEDOM to support virtually all peripherals; winchesters, floppies, tape and serial lines using only one board.

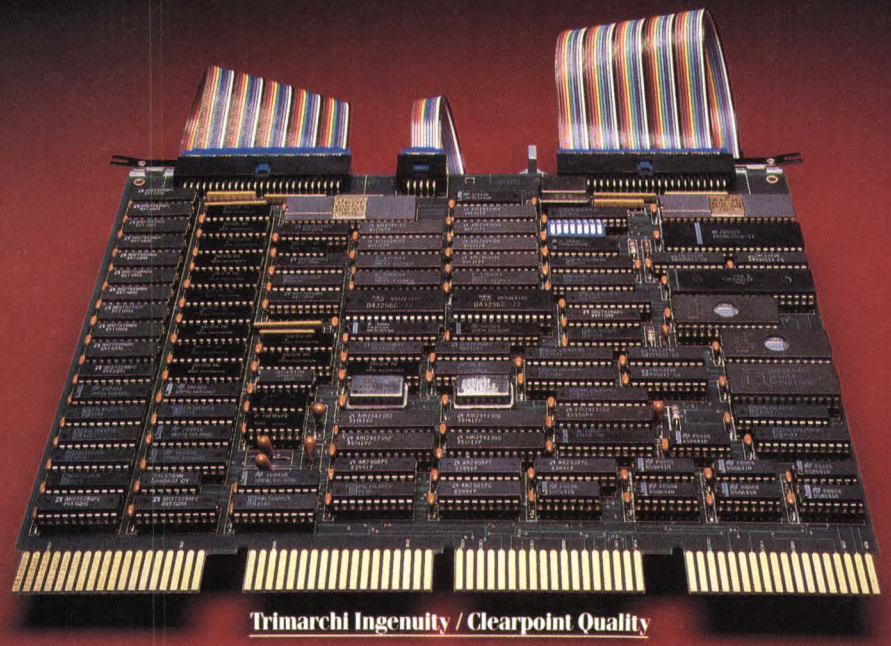
FREEDOM to simultaneously emulate all devices; DU, MU, DLV, DHV, . . .

FREEDOM to expand serial lines indefinitely, but 57 for now.

FREEDOM to outrun any disk. Well, almost any disk. Watch for our next revolution — HYPERCACHE.

FREEDOM to choose:

Give me Liberty or give me DEC!**



Trimarchi Ingenuity / Clearpoint Quality

Trimarchi and Associates, Inc.
P.O. Box 560, State College, PA 16804
(814) 234-5659
Telex: 271462

*Trademark of Trimarchi & Assoc., Inc. Made in USA. **DEC is a registered trademark of Digital Equipment Corporation

ENTER 62 ON READER CARD

Central control over the *IBMS* package can be achieved, as is the consistent philosophy of the design.

message maintenance in sequential mode, and only the new messages appear in order to be translated.

Report Heading File Maintenance

This part of the multilingual maintenance system controls the contents of all fixed reports within *IBMS*. It is very similar in nature to Message Maintenance. The essential differences are that Report Maintenance becomes very specific to certain programs, and no less than 132 characters must be shown on each screen, rather than only 80. Otherwise, the two maintenance systems essentially are identical.

Screen 3 shows an entry of American text into the centrally controlled Report Maintenance file for a specific program, which in this case is FIN731. Because multiple report headings will exist for FIN731, the user assigns a unique heading number for each entry. The 132 text string is shown on two lines of 66 characters each. A number grid assists the user in aligning the text properly.

Screen 4 shows the French translation of the American text entry of Screen 3. Four lines show in all: two for the American text and two for the French text. Two sets of number grids are provided for alignment assistance. As with Message Maintenance, American text will be shown to Americans and French shown to the French. When the user logs into *IBMS*, his username and password instructs *IBMS* how it is to respond.

SCOPE Screen Maintenance

IBMS uses a screen formatting package called *SCOPE*, which has been developed by our parent company, Interactive Systems Inc. All user prompts (the fields that describe data shown on a screen) and masks (the fields where data is entered) are presented to the user under the control of *SCOPE*. Thus, user prompts must be translatable.

SCOPE has an online editor that is used to create and modify screen displays. This editor is more than capable of translating a screen, but does not contain the side-by-side display features useful during a translation.

The *SCOPE* editor also provides more power over changing screens than is appropriate for a translation. The format of the screen should not be allowed to change during the translation procedure. If a prompt happens to be a particular number of characters in length starting on line X in column Y, performing a screen translation should not jeopardize this information. Otherwise, the control over the software package could be lost, and entry fields could partially or completely disappear.

Thus, a *SCOPE* screen translator evolved as a standard part of the *IBMS* multilingual design. The screen translator asks questions that only are pertinent to performing a successful translation. Central control over the *IBMS* package can be achieved, as is the consistent philosophy of the design.

Screen 5 is an example of translating a user prompt. The prompt actually represents a heading message, which will show on the top of a screen named EMN67A. The American text is "Headings Report Selection," and the French translation is shown below it. The original field length of the prompt takes 51 characters. The *SCOPE* screen translator doesn't allow the length of the prompt to grow as a result of the translation process. Thus, the format of the original screen is guaranteed to be retained in the translated counterpart.

ONE OF THE MAIN stumbling blocks performing a translation has been solved: American tends to be one of the more concise languages;

translations tend to grow. *IBMS* requires the translator to fit his language into the same number of characters provided by the American prompt. An identical translated screen format is assured.

Screen 6 shows a help message being translated. The help message is a feature of *SCOPE*, and is provided for every field a user enters. Since a help message is allowed to be up to 80 characters in length, and all of terminal-line 24 is dedicated to *SCOPE* help messages, the number of characters used for the text is not important, as long as not more than 80 are used. Consequently, no character length as in Screen 5 shows in Screen 6. The American help message "Select an option from the list that appears to the right" is shown above the French translation.

As with other multilingual maintenance capabilities of *IBMS*, there are sequential and random access methods of using the *SCOPE* screen translator.

Option Translation

Option Translation became the most difficult part of the project to develop. Options are defined as the set of commands entered by a user to tell *IBMS* what to do (Options show in the lower left-hand corner of Screens 2, 3, and 4, among others).

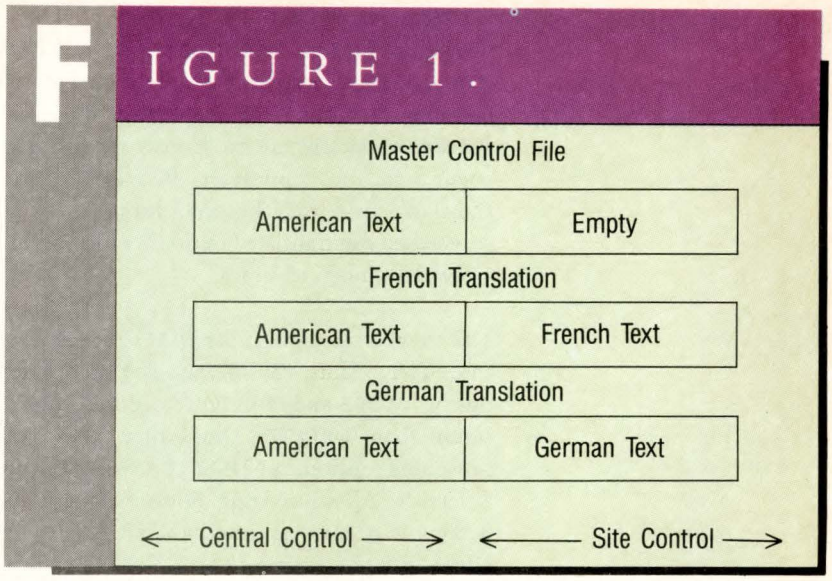
Our design requires the user to type one character, followed by the return key, in order to instruct the system. This standard allows *IBMS* to function on most keyboards regardless of the terminal manufacturer.

This approach provided substantial challenges. Before we even could begin to consider translations, we had to determine all of the options used per *IBMS* program, then provide the means to replace the hardcoded American responses with table-driven equivalents suitable for translation. Failure to design this part of *IBMS* would jeopardize achieving a successful translation. If the translated equivalent of ADD and CHANGE ever started with the same letter on the same screen, only one of the two options could ever be executed.

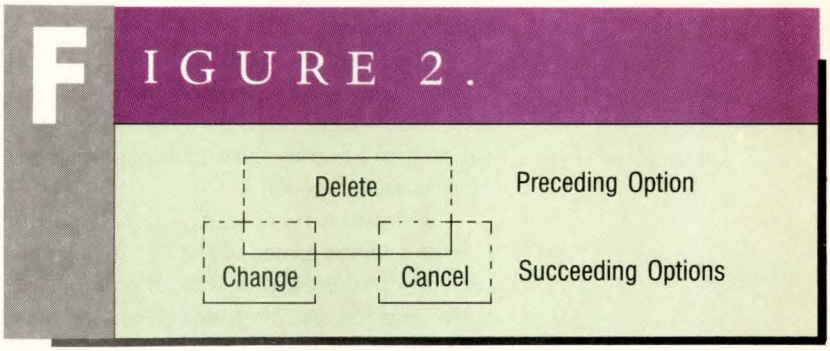
About 130 options in 150 sets evolved from our examination. Within one set, no option would be allowed to start with the same first character. This standard would always assure that there were no American or translated duplicates that otherwise might make parts of programs impossible to execute. The use of additional characters to provide friendliness, by displaying full words to the user for clarity, was considered irrelevant to the one-character standard that we needed to achieve.

Screen 7 shows a set of American options associated with the command ACCEPT. Within this set, a unique first character per option is shown. Screen 8 is the identical option set translated into French. The same one-character standard is present.

Screens 7 and 8 were created by operating Option Maintenance in sequential mode. However, similar to the rest of *IBMS* multilingual maintenance, Option Maintenance also can operate in random mode.



Message Translation Files.



Option Sets.

Screens 9 and 10 were created by operating Option Maintenance in random mode. Both examples have the concept of *preceding* options and *succeeding* options. Preceding options are those instructions that occur in the most option sets. Because they are translated first, they become dominant over succeeding nontranslated options, which occur a fewer number of times.

THE MOST USED option for *IBMS* turned out to be END. Thus, END always is a preceding option. MORE and PREVIOUS occurred more often than DELETE; thus, they also are preceding options to DELETE, as shown in Screen 9. All succeeding options shown in Screen 9 occur less often than DELETE in *IBMS*. When operating Option Maintenance in random mode, if DELETE is to be translated to some other word, the one-character standard is required for all preceding and succeeding options shown.

Note that in Screen 9, CHANGE and CANCEL are shown as succeeding options. ADD and ACCEPT are shown too. This observation looks like an apparent violation of the one-character standard.

However, it is not. CHANGE and CANCEL appear related to DELETE, but as succeeding options only. Succeeding options for a given option are not necessarily in the same individual set. CHANGE shares at least one set with DELETE; CANCEL shares at least one set with DELETE. But CHANGE and CANCEL never will appear within the same set. The same is true of ADD and ACCEPT when compared with DELETE.

Figure 2 shows the relationship for DELETE, CHANGE and CANCEL. Screen 10 shows the French translation equivalent to Screen 9. The set rules are identical.

Report Label File Maintenance

Our client defined all of its high-level financial reports and consolidations using Report Label File Maintenance.

Any financial report consists of a certain number of rows, columns, and summary level totals. The values entered into Report Label File Maintenance; i.e., which "label" the rows, columns and summary level totals, become Corporate's reporting chart of accounts.

Suppose we needed to create the report named COSPOS using Report Label File Maintenance:

This report has nine rows of detail, four rows of totals by company, and two rows of totals by country. It has five columns of numbers. Figure 3 shows how the fifth column of the first row has been labeled. A financial account number "points" to the "data cell" defined by the report labels. Any number of financial accounts can point to the same data cell. The report also requires the sum of a set of NNN.NN values to equal YYY.YY, and the sum of a set of YYY.YY values to equal XXX.XX.

This report format is intended for high-level management. These high-level reports quite often summarize a great deal of information on only one or two pages. Such reports become so highly summarized that automating them tends to go beyond the summary capability of most financial chart-of-accounts structures and related report generators.

The most common solution to high-level reporting requirements has been to hire application programmers and pay them to "hard-code" programs in order to force desired results. (Why else are there so many financial application programmers in those IBM shops?) Since this solution violated the concept of a financial application software package, we had to find another solution. Report Label File Maintenance became that solution.

Screen 11 shows an example of Report Label File Maintenance. A cost-of-goods-sold account has had four report labels associated with it, for a report named COSPOS. A report label contains from one to 15 "level values," each of which is from one to five characters in length:

1. LIN01 belongs on the first line of report COSPOS. This is level value no. 1.
2. COL05 belongs in the fifth column of report COSPOS. This is level value no. 2.
3. D01 is associated with D01 company totals. This is level value no. 3.
4. E01 is associated with E01 country totals. This is level value no. 4.

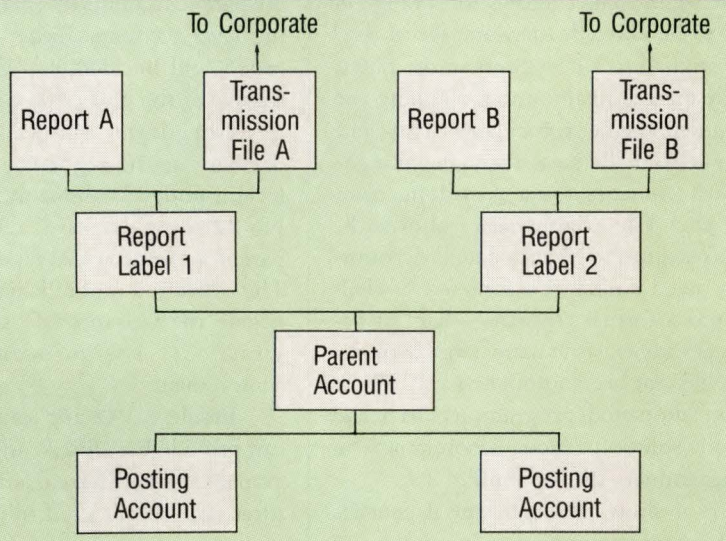
The values chosen as level values are arbitrary. There's nothing sacred about LIN01; it could have been named any combination of

FIGURE 3.

Report COSPOS	Sales	Returns	Freight	Taxes	Costs
Division Name	NNN.NN	NNN.NN	NNN.NN	NNN.NN	NNN.NN <--
.	NNN.NN	NNN.NN	NNN.NN	NNN.NN	NNN.NN
.	NNN.NN	NNN.NN	NNN.NN	NNN.NN	NNN.NN
Total Company 1	YYY.YY	YYY.YY	YYY.YY	YYY.YY	YYY.YY
Division Name	NNN.NN	NNN.NN	NNN.NN	NNN.NN	NNN.NN
.	NNN.NN	NNN.NN	NNN.NN	NNN.NN	NNN.NN
.	NNN.NN	NNN.NN	NNN.NN	NNN.NN	NNN.NN
Total Company 2	YYY.YY	YYY.YY	YYY.YY	YYY.YY	YYY.YY
Total Country 1	XXX.XX	XXX.XX	XXX.XX	XXX.XX	XXX.XX
Division Name	NNN.NN	NNN.NN	NNN.NN	NNN.NN	NNN.NN
.	NNN.NN	NNN.NN	NNN.NN	NNN.NN	NNN.NN
Total Company 3	YYY.YY	YYY.YY	YYY.YY	YYY.YY	YYY.YY
Division Name	NNN.NN	NNN.NN	NNN.NN	NNN.NN	NNN.NN
Total Company 4	YYY.YY	YYY.YY	YYY.YY	YYY.YY	YYY.YY
Total Country 2	XXX.XX	XXX.XX	XXX.XX	XXX.XX	XXX.XX

Sample Report.

FIGURE 4.



1. Parent Accounts are entered that will collect Posting Level Accounts. Defined centrally.
2. Report Labels are built to define the reporting chart of accounts. Defined centrally. Reports built using REPGEN. Transmission capability built next.
3. Posting Level Accounts are defined locally at field site.

The Collection Umbrella.

Where it has been automated, programmers have had to hardcode solutions. Now, accountants can have programmers do something else.

up to five characters. The actual level value consistently must describe the sorting and location where account values and summary totals should appear. After all level values are entered, they become the legitimate account parts of the reporting chart of accounts.

Our report writer, REPGEN, uses the values contained in the reporting chart of accounts. REPGEN is instructed to sort report data using the report labels. When one of the label values changes, or a new level value is encountered, REPGEN is instructed to print appropriate text and totals.

For example, when level value no. 3 changes from D01, the line commencing with "Total Company 1" will print. When level value no. 4 changes from E01, the line commencing with "Total Country 1" will print.

TO ASSIST IN reducing the time it takes to build report labels for appropriate accounts, Report Label File Maintenance allows for a range of accounts to be entered, then one set of level values is applied to all accounts in the range.

While there is an amount of planning and effort required to enter report labels, corporate accountants manually have documented high-level report contents for a very long time. Report Label File Maintenance allows the manual procedures to be automated. Accountants only need codify the contents of their reports into a formal reporting chart of accounts. It already exists in many large corporations but has not been automated yet. Where it has been automated, programmers have had to hardcode solutions. Now, accountants can have programmers do something else.

Figure 4 shows the substantial benefits gained after completing the reporting chart of accounts. This structure describes the collection umbrella described earlier. It also describes the order in which the collection umbrella is built.

First, a set of parent accounts is built by Corporate. These accounts collect all financial data pertinent in a field location. Field sites are instructed in the use of these parent accounts, and they have a limited ability to change them; they can't delete them.

Second, the reports are built using Report Label File Maintenance and the REPGEN report writer. Each parent account is tied to one or more reports as required. When the reports are completed, transmission instructions can be built using REPGEN and the same report labels. Upon installation in the field, these transmission files can be sent directly to Corporate by long-distance lines. Because the transmission files already are summarized, the cost of long distance is minimized.

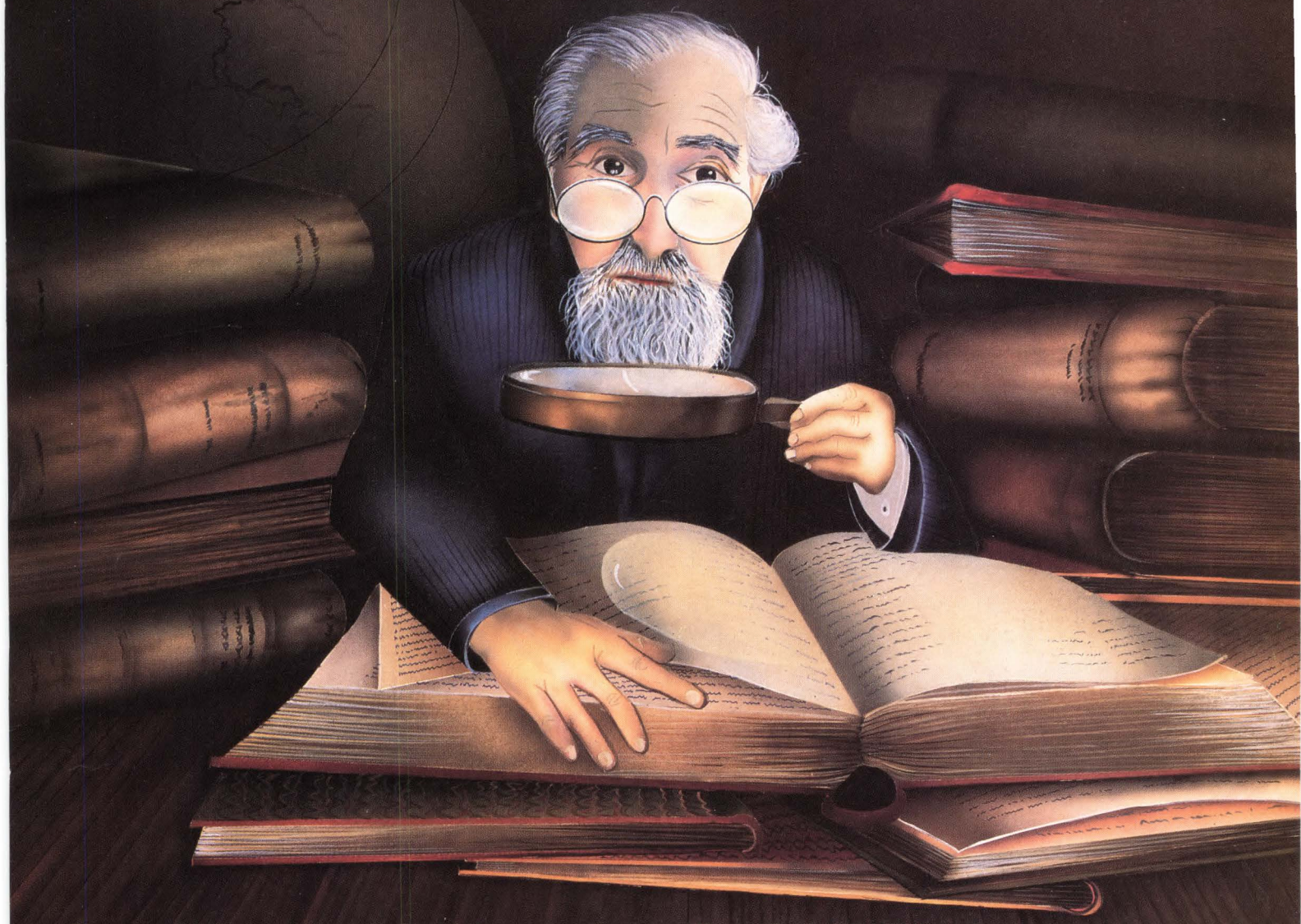
Corporate's collection umbrella is now complete. Upon installation in the field, each site can build posting level accounts underneath the parent accounts, or post directly to the parent accounts by changing them to posting level accounts. Either way, the data collected will be identical. Either way, the integrity of the collection umbrella is ensured.

Corporate maintains a centralized database at the reporting chart of accounts level, two levels above the posting accounts. No "shadow database" reflecting posting or parent account activity is required centrally. The collection umbrella has been designed to negate the nuisance of "shadow databases," which is a significant consolidation achievement.

Result: A VAX application software design can provide benefits far in excess of software available on hardware from a certain manufacturer that colors itself blue.

Gary W. Neidhardt is product development director of The FASBE Group, Lowell, Massachusetts.

Would You Read The Whole Dictionary To Find The Definition Of One Word?



You wouldn't read the whole dictionary to find the definition of one word . . . So why waste countless man hours going through page after page of large documents and other text format files searching for specific references? STATUS, the world's most advanced text storage and retrieval system from CP International allows you to search, cite, and display references, no matter how specific, in seconds.

STATUS provides you with immediate access to any information in your files, both structured and unstructured. Contracts, product reports, catalogs, service manuals, large volumes of legislation, government regulations and patent summaries can be searched and referenced in almost any way imaginable . . . right down to specific words or phrases. It's little wonder that STATUS software has received rave reviews from so many of the world's largest oil companies, banks, pharmaceutical companies, power companies, federal agencies, and state and local governments.

Best of all, STATUS is backed and supported by CP, a leader in data processing technology for nearly 20 years. Our staff of text-based systems experts are specially trained to conduct complete analysis, installation and support, whenever required.

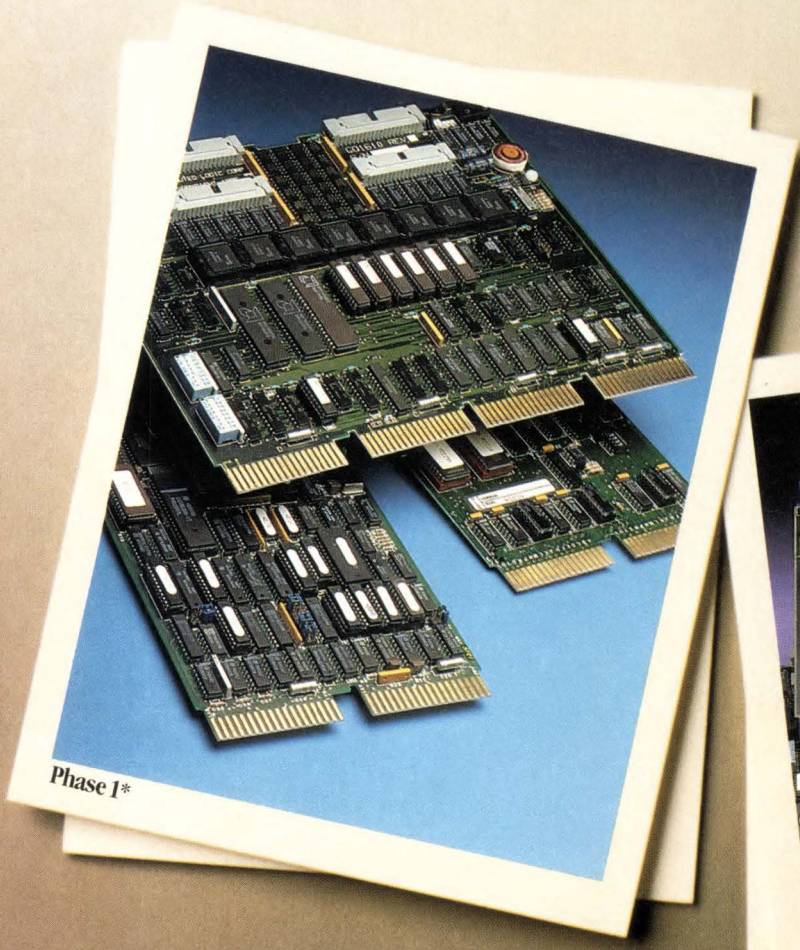
For more information and a free product brochure, call or write CP International at 210 South Street, New York, NY 10002. (212) 815-8691.

ENTER 281 ON READER CARD

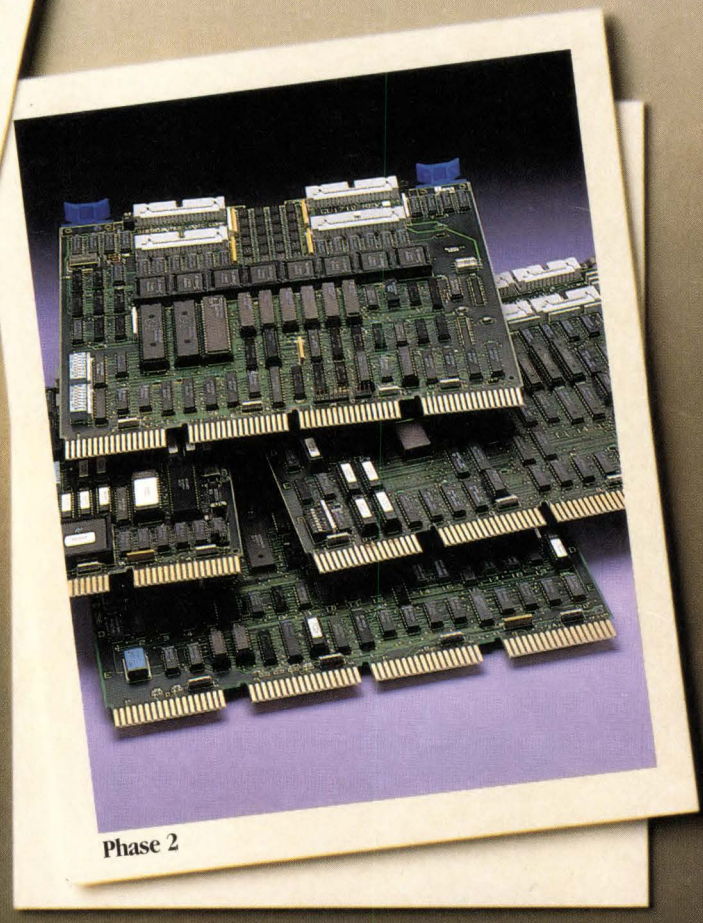
CP International, inc.

STATUS

You Have It Or You Don't



Phase 1*



Phase 2

***Introduced in Phase 1...**

- CQ1610 QBUS/MicroVAX 16-channel asynchronous communications controller with DHV11 emulation
- DQ302 QBUS/MicroVAX tape controller with QIC-02 interface and TSV05 emulation
- MQ100 QBUS multipurpose board with support for console, bootstrap & diagnostics

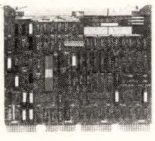
New Advances From The Leading Supplier Of QBUS Compatible Controllers. Phase 2.

Here's the latest in a series of new disk, tape, and communications controllers that DILOG is introducing over the next few months. It's the kind of leadership you'd expect from the number one supplier of QBUS compatibles.

Fact is, we support the entire DEC QBUS family from LSI-11/2 to MicroVAX II with complete software compatibility over a broad range of device interfaces. And yes, we're solidly supporting your UNIBUS systems, too.

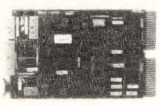
The proof is in our newest emulations, designed to increase the functionality and power of DEC systems. One outstanding highlight is a big boost in the number and type of peripherals you can interface, plus expanded operating system coverage to broaden your choices even more.

Equally impressive are enhanced performance levels, resulting from refinements in controller architecture. Details follow on our four newest controllers.



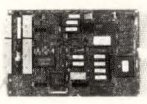
QBUS/MICROVAX 20MHz SMD I/O Disk Controller

New DQ236 with DU driver emulation • 1:1 interleave • 48K byte buffer • Elevator & overlap seek • Bad block replacement • On-board format diagnostics & multiple device bootstrap • 48-bit ECC • 1-4 drives



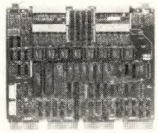
QBUS/MICROVAX 15MHz ESDI Disk Controller

New DQ696 with DU driver emulation • 1:1 interleave • 16K byte buffer • Elevator & overlap seek • Bad block replacement • On-board format diagnostics & multiple device bootstrap • 32-bit ECC • LSI-11, Micro PDP-11 & MicroVAX



QBUS/MICROVAX Multifunction SA450 & ST506 Disk Controller

New MQ606 with DU driver emulation • RX50 media compatible • 1:1 interleave • Elevator & overlap seek • 8K byte buffer • On-board format & diagnostics • 32-bit ECC • LSI-11, Micro PDP-11 & MicroVAX.



UNIBUS/VAX Communications Controller

New CU1710 with DHU driver emulation • 16-channel, full-duplex asynchronous controller • DEC-standard quad height • Data rates to 38.4K baud • Modem control on all channels • Signal-level flow control of transmitted data • PDP-11 & VAX.

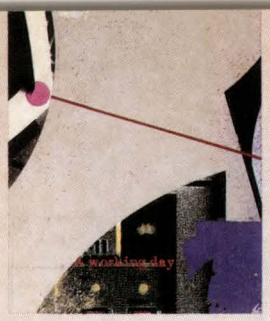
Call for facts — and see why DILOG has shipped over 60,000 controllers to some of DEC's best OEMs.

See us at DEXPO East '86
Booth #733

DILOG
DISTRIBUTED LOGIC CORPORATION

ENTER 149 ON READER CARD

Corporate Headquarters 1555 South Sinclair Street, Anaheim, CA 92806 (714) 937-5700 Telex: 6836051 FAX: (714) 978-2420
Eastern Regional Sales Office 64-A White Street, Red Bank, NJ 07701 (201) 530-0044 FAX: (201) 530-0568
International Sales & Manufacturing Route de Boudry 14, 2016 Cortaillod, Switzerland (4138) 424454 Telex: 952751 FAX: (4138) 312372
U.K. Sales Office Chester House, Chertsey Road, Woking, Surrey GU21 5BJ (4862) 70262 Telex: 859231 FAX: (4862) 62666



LANGUAGES

KNOWLEDGE SYSTEMS

By Stephen Dourson

Applications And A Close-Up Look At A Practical Language For The VAX.

Knowledge-based systems, sometimes called knowledge systems or expert systems, apply the symbolic programming, search and inference techniques developed in artificial intelligence research to represent and solve difficult reasoning problems that do not respond well to traditional computer programming techniques.

Early knowledge systems were written entirely in "artificial intelligence languages" such as PROLOG or LISP. Limitations of this approach included the need for scarce, highly trained programmers, and the fact that much of the effort of building a system went into designing, reinventing, and writing software and English language interfaces, rather than setting up and structuring the problem the system was intended to solve.

High-level rule-based knowledge system languages recently have been developed to the point where they now are commercially available. These languages are practical for programming solutions to a wide range of problems, and for delivering this specialized knowledge on-line in a more current, secure, and usable form than books, manuals, or technical notes. Advantages to using a commercial system are that the format of rules and other knowledge is established, the inference engine is built in, and an English language interface is provided for simple and natural interaction with a human user. Other capabilities of commercial systems include consistency checking to alert the programmer to rules that contradict each other, the ability to deal with uncertainty, and the ability of the system to respond to inquiries about why certain information is needed or how a conclusion was made. These features leave the expert system programmers free to concentrate on building their applications.

In this article, we will list examples of successful applications and the characteristics they have in common, look at how a commercial knowledge system language works, and how it can be used to build and run knowledge systems on the VAX.

KNOWLEDGE ENGINEERING TECHNIQUES, properly applied, should augment rather than replace existing computer programming techniques. Projects should be selected with care. Those that are well matched to the technology will have several characteristics in common.

First, the problem domain and task must be well defined and well bounded. A knowledge system that diagnoses "drilling problems" for example, would be too large and too diverse to be effective. What kind of drilling? Oil wells? Water wells? Teeth? Holes in ceramic or high-strength steel? What kind of problems? It's just too big. An example of a properly chosen domain and problem would be "diagnosing drill-sticking problems in oil wells."

Next, the essence of the solution process must be the use of straightforward "if-then" reasoning to choose from among possible values that are known, or that can be calculated or constructed given sufficient information. Examples are the speed of a drill, the temperature of a process, or the dimensions of a mechanical part. Iterative, "cut and try" problems with intermediate or interacting trial

FIGURE 1.

Examples Of Successful Knowledge System Applications

Diagnosis, classification, treatment, and troubleshooting of . . . diseases learning, speech, and behavior disorders software systems communications networks electrical and mechanical equipment malfunctions manufacturing process variations and malfunctions
Checking, verification and interpretation, and qualification of . . . engineering designs and specifications remote sensor data sales leads bank loan applications
Setup and control of . . . manufacturing processes engineering, financial, and statistical analysis programs
Selection of . . . materials and feedstocks products or components from inventory or catalogues procedures, software or instrumentation to solve a problem
Design of . . . mechanical and electronic components

solutions can be solved, but are difficult to program. Sometimes it is possible to study an iterative solution procedure and develop a better, straightforward procedure that lends itself well to knowledge system technology. On the other hand, if the task requires only "number crunching" computation or database search and retrieval, then it is appropriate to use conventional programming techniques.

The application or task should be valuable, recurring, and one where the correct, consistent, timely application of knowledge and judgement means the difference between success and failure, or between excellent performance and marginal performance. It is not cost-effective to use knowledge system technology on infrequent or trivial tasks.

Finally, there should be on-site experts available to help build the system and to provide continuing support. Availability of experts is important because the real power of a knowledge system is realized when it contains the carefully organized results of years of real-world experience in the company, plant, or situation where the system will be used. This kind of experience cannot be obtained from textbooks. Furthermore, it requires an expert to size up the performance of a knowledge system, determine if it is working correctly, and suggest extensions and enhancements that lead to substantial improvements in performance and capability.

Figure 1 shows examples of successful knowledge system applications.

A knowledge system consists of three key parts: a knowledge base, a control procedure,

FIGURE 2.

Example Of A Class

```
DEFINE CLASS tuner
  : :ASSOCIATION                    subsystem.of
  : :NUMBER.INSTANCES               at.most 1
  : :PRINT.ID                       "tuner #"
  : :CLASS.TRANSLATION              "a tuner"
  : :PLURAL.CLASS.TRANSLATION       "the tuners"
  : :BLAND.INSTANCE.TRANSLATION     "the tuner"
  : :FULL.INSTANCE.TRANSLATION      "the tuner"
END.DEFINE
```

FIGURE 3.

Example Of An Attribute

```
DEFINE ATTRIBUTE desired.selectivity
  : :DEFINED.ON              tuner
  : :TYPE                    text
  : :MULTIVALUED             false
  : :LEGAL.VALUES            rating.scale
  : :DEFAULT.VALUES          {average}
  : :LEGAL.MEANS             {try.rules}
  : :DETERMINATION.MEANS     {try.rules}
  : :TRANSLATION             "the desired selectivity for the tuner"
END.DEFINE
```

and an inference engine. The knowledge base contains the "domain knowledge," or rules, facts and data about the problem to be solved. The control procedure is a series of steps that must be followed in order to solve the problem. Information for the knowledge base and control procedure is obtained from experts who know how to solve the problem.

The inference engine interprets the control procedure and applies the rules to information and evidence stored in the system or obtained from a user during a consultation to support or dis prove conclusions about the problem. In commercial systems, the inference engine is provided, along with an English language user interface.

Teknowledge, Inc. (1850 Embarcadero Road, P.O. Box 10119, Palo Alto, California, 94303;, (415) 424-0500) developed its "S.1" language for writing knowledge systems. S.1 runs on DEC VAX systems from MICROVAX-II to the VAX-8600, as well as on special-purpose "LISP machine" computers offered by other manufacturers. S.1 is a rule-based language.

THE DOMAIN KNOWLEDGE in S.1 is contained in "classes," "attributes" and "rules." Procedural knowledge is contained in "control blocks." Figures 2 through 5 are taken from the *Stereo Advisor*, a demonstration knowledge system written by Teknowledge, that assists a client in selecting components for a stereo system based on the client's music preferences, desired system capabilities and features, geographic location, listening habits, and budget.

Attributes contain information about classes.

Classes are the existents or things the knowledge system reasons about. Tuners, amplifiers, tape decks, turntables, loudspeakers, and the client are all examples of classes of things that must be considered when choosing a stereo system. Figure 2 shows the "tuner" class in the *Stereo Advisor*. A particular tuner is known as an "instance" of the class. The definitions marked with "::" are called slots, and they contain descriptive information about the tuner. The ASSOCIATION slot, for example, tells the system that the tuner is a subsystem of the stereo system. NUMBER.OF.INSTANCES tells the system that there is, at most, one tuner in a stereo system. Thus, a person might elect not to have a tuner, but would not have two tuners in one system. The PRINT.ID and TRANSLATION slots tell the system's English language interface how the name of the class, "tuner," is to be translated when the system constructs inquire and respond during a consultation.

Attributes contain information about classes. Examples of attributes are the selectivity of the tuner, the speed regulation of the tape deck, the drive system of the turntable, the linearity of

the speakers, and the music preferences of the client. Figure 3 shows the attribute "desired.selectivity". Attributes, like classes, have slots that contain information to be interpreted by the system. DEFINED.ON tells the system that "desired.selectivity" is an attribute of the tuner's class. TYPE tells the system whether an attribute is a real number, an integer, text, or Boolean (true/false). "Desired.selectivity" is a "text" attribute. LEGAL.VALUES refers the system to a hierarchy of permissible values containing the possibilities "excellent," "good," "average," "poor," and "terrible." DEFAULT.VALUES instructs the system to assign the default value "average" if it is unable to conclude a different value from the hierarchy of possibilities. LEGAL.MEANS specifies the methods ("query.user", "try.rules") that can be used to determine the attribute's value. DETERMINATION.MEANS specifies the order in which the legal means will be tried. In this way a programmer can specify, for example, that the system should try to determine the value of an attribute by using rules before asking the user.

Rules contain the reasoning and judgement knowledge in the form of "if-then" logic. Figure 4 shows a rule that makes a judgement about the desired selectivity of the tuner. APPLIED.TO refers to a particular instance of a tuner being considered when the rule is tried. The PREMISE contains a list of conditions that must be true for the CONCLUSION to hold true. In this rule, the desired selectivity of the tuner is concluded to be "excellent" when the client's residence is a small town either between two big cities or in a hilly region. If the value of another attribute mentioned in the premise of a rule is not known, the system will suspend processing of the rule and attempt to determine the premise attribute's value. When all attributes in the premise have been determined, the rule is tried.

PROCEDURAL KNOWLEDGE in a knowledge system is broken down into a series of subgoals. Each subgoal is coded in a control block. Figure 5 shows the control block that contains the procedure for determining the specifications of the stereo system's tuner. The INVOCATION slot tells the system that this control block is called directly by another control block in the system. The ARGUMENTS slot contains the classes considered by the control block. The BODY contains the individual steps, written in plain English, that must be performed. Each step determines the value for an attribute of the tuner. When executing a control block step, the system proceeds according to the attribute's LEGAL.MEANS and DETERMINATION.MEANS slots, trying rules or asking the user until the attribute's value is determined. By means of control blocks, the programmer can modify the knowledge system's overall strategy without modifying individual attributes and rules.

It is possible to construct a working knowledge system in S.1 using only classes, attributes, rules, and control blocks. "Class types" for categorizing

FIGURE 4.

Example Of A Rule

```
DEFINE RULE rule71
 : :APPLIED.TO          t:tuner
 : :PREMISE             exists(c:client |
                          residence[c] is small.town and
                           (residence.between.two.big.cities[c] or
                            residence.in.hilly.region[c]))
 : :CONCLUSION          desired.selectivity[t] = excellent
END.DEFINE
```

FIGURE 5.

Example Of A Control Block

```
DEFINE CONTROL.BLOCK determine.tuner.specifications
 : :INVOCATION      internal
 : :ARGUMENTS       tun:tuner
 : :TRANSLATION     "determine the specifications for" !
                     argument.trans(tun)
 : :BODY            begin
                     determine desired.sensitivity[tun];
                     determine desired.selectivity[tun];
                     determine desired.signal.to.noise.ratio[tun];
                     determine desired.capture.ratio[tun];
                    end
END.DEFINE
```

classes of objects and "value hierarchies" for prioritizing values of attributes are two features that simplify building large knowledge systems. For compute-intensive problem solving steps, it is possible to make calls to internal functions, or to external programs written in other languages.

S.1 originally was written in the Franz LISP language, and the LISP version makes heavy use of VAX system resources. Teknowledge now has ported S.1 to the C language. On VAX, the underlying C language is VAX-11 C. S.1 is available as a development version for writing and testing knowledge systems, and a runtime or "delivery" version designed for speed and low system overhead for running knowledge systems. Advantages to the C version are improved speed, reduced system loading, and plenty of hooks to the VMS operating system and computer programs written in other languages.

The S.1 language is designed to increase the usefulness of, rather than replace, traditional computer programs. It does not make sense simply to recode C or FORTRAN programs in the S.1 language. Traditional programming languages are very efficient for solving compute-intensive problems, while S.1 is a language of solution procedures and rules. The key to successful integration of a knowledge system is structuring it so the reasoning and decisions are handled by the knowledge system, and computation, when required, is performed by programs written in languages like C or FORTRAN. With the C version of S.1, it will be very effective to design a knowledge system that makes calls to traditional computer programs as part of the problem-solving process, in the same way that human experts use computer programs to solve problems.

Author's note: Thanks to Judy Harris and Barry Plotkin of Teknowledge for permission to use examples from the *Stereo Advisor* knowledge system.

Stephen Dourson is a professional engineer in Dayton, Ohio.

DIGITAL from HAMILTON/AVNET

From the start, Hamilton/Avnet and Digital Equipment Corporation have always been the first to bring you the leading edge technology on which new designs and innovations have been built. This commitment to design freedom is founded on the values that our country has held dear from ITS start: courage, diligence, excellence, and a fierce competitive spirit.

While our highest priority is to lead the way with new products and services that answer your latest needs, we never forget our heritage. With each new introduction, such as the CAE workstations and the local area networks that Hamilton/Avnet now configures using DEC microcomputer systems, we strive to maintain our reputation for leadership and quality.

You need the best, the most advanced technology in the industry. But you also need a level of confidence that will sustain your design through production and on to its next generation. That confidence comes from Hamilton/Avnet and Digital Equipment Corporation, leaders for 30 years in the technology that makes freedom ring.

For the latest on our Digital Equipment product line, talk to a Computer Product Specialist at our location near you, or call toll free: 1-800-4-HAMILTON (in Canada, 1-800-387-6979, in Ontario or Quebec, call 1-800-387-6849).

Hamilton Avnet ELECTRONICS AN AVNET COMPANY

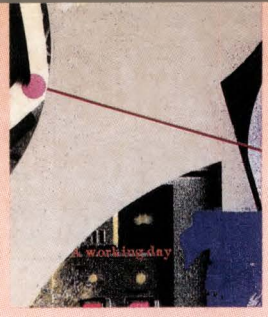
COMPUTER PRODUCTS DISTRIBUTION THROUGH A NATIONWIDE TECHNICAL TEAM

ENTER 331 ON READER CARD

HAMILTON/AVNET AND DIGITAL EQUIPMENT:

FOR 30 YEARS, WE'VE MADE FREEDOM RING

digital™ Authorized Distributor



LANGUAGES

A B TREE In C

By Philip G. Anthony

A Look At Binary Trees For Handling Memory-Resident Lists.

The system resources required for shuffling lists in memory are far different from those needed to handle disk. One result is that programmers who cut their teeth on file structures often use relatively inefficient methods for loading and searching memory-resident lists.

The most common means of handling a list in memory is to put it in an array (Figure 1). If the members of the list are known in advance, this can be a handy, efficient method. A slot is created, of known size for each member, and the members are loaded into their slots by predefinition (in languages that permit this) in a predetermined order.

Retrieving an item at random can be done by binary search of the array. If there are m members in the list, any item can be located by most n = log2(m) comparisons. On the average, a search to find an existing member would try to match half the items, and so n-1 comparisons would be needed. If the member being sought wasn't in the array, the full n comparisons would have to be performed.

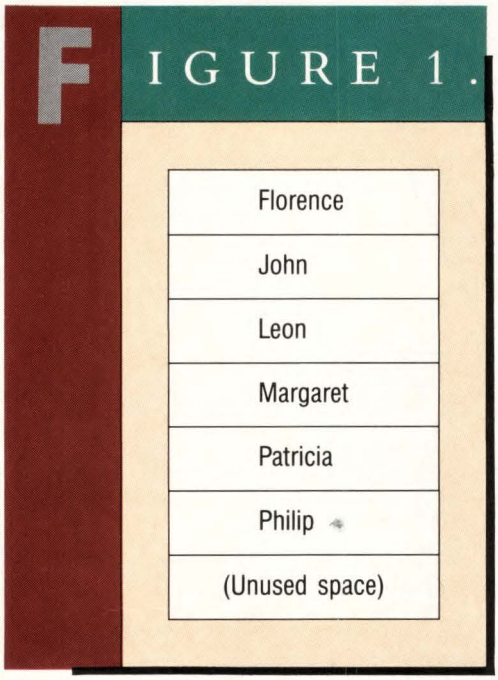
But, efficiency drops drastically when the number of members is not known initially. For one thing, an array must be generated as large as the largest possible number of items. That usually turns out to be 25 more than you need and two less than you need during the Saturday processing, occasioning a telephone call to edit and recompile while you're trying to recuperate from the week's wars. Also, a sort has to be added into the process, either during the array load or once it's complete (Hoare's quicksort is handy for this), unless it can be guaranteed that the members will arrive in the desired order.

The requirement of generating a huge array can be eliminated by use of a linked list or chain (Figure 2). In this method, each member of the list is associated with a pointer to the address of the next member. The final member is given a pointer of zero, to indicate end of list. This can be done, of course, only in languages that permit user-accessible dynamic memory allocation and manipulation of pointers to memory locations. Such languages on DEC machines include MACRO-11 and -32, BLISS, C, PASCAL, and PL/1.

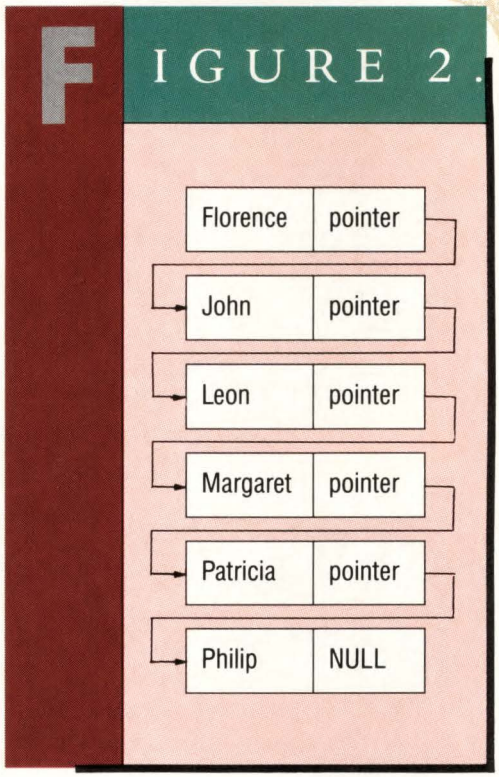
Insertion of a new member, in a desired order, consists of following the chain until a member is found higher in the collating sequence, or the end of the chain is reached. In either case, the address of the new member is copied into the preceding member's pointer area and the new member points at the next one (which will be zero at end of chain). The number of comparisons required to insert a new member, on average, is equal to one-half the number of members currently in the linked list. No sorting needs to be done once the linked list is loaded.

Random retrieval is done by following the links in the chain sequentially until a match occurs. If the sought-for member is not in the list, the search terminates on reaching the first member higher in the collating sequence, or on end of chain. Unfortunately, this method is inefficient for lists of any length, since an average of m/2 comparisons must be made either to find the desired entry or to establish its nonexistence.

Still, this may be the method of choice if the members are to be used sequentially, if the members are likely to change dynamically as



A Typical Array.



A Linked List.

the program runs, or if the number of random retrievals is small compared with the number of items loaded. DEC operating systems make heavy use of memory-resident linked lists, in VMS memory management and RSTS small-buffer queuing, for instance.

Random retrieval from a linked list may be made somewhat more efficient by adding a pointer to the previous member to the linkage. Each link in the list now consists of the member itself (plus any carry-along information about the member) and two pointers — one to the next lower member in the sequence, the other to the next higher. The search now may start at the last retrieved member, or always at the middle member, instead of having to begin at the beginning every time. This can reduce the average number of comparisons from m/2 to m/4.

The advantages of the two algorithms can be combined by creating a linked list of the read-in members and then, when the last item has been added, doing one sequential walk down the chain and loading a fixed array with the member addresses. The array, even though it still must be defined for the maximum possible number of members — plus two, if you're smart — is typically smaller than an array of the members themselves, since each slot contains only one pointer. Loading is done via the linked-list procedure, but binary search can be used to find any given member.

HAS YOUR TERMINAL EMULATOR DONE IT TO YOU AGAIN?

Most terminal emulation software wastes so much time transferring files, you could be arrested for vagrancy. Now the waiting is over. Announcing Background Mode, an exclusive feature of REFLECTION 2.™

PC to VAX file transfer. Without the wait.

No more waiting for long, slow file transfers. Because REFLECTION 2 keeps on working in the background, even after you move on to other tasks.

Use your PC to load and run Lotus, Wordstar, or virtually any DOS application. You can continue transferring files, simultaneously.

REFLECTION'S exclusive new multi-tasking capability is a leap beyond the traditional "hot key," because it doesn't suspend the application when it's not in use. Look up information, send E-mail, even start a file transfer and return to your application, right where you left off.

You can switch between the concurrent host session and your foreground application instantly, with the touch of a key.

PC to VAX file back-up. Without the wait.

With PLUS, an optional feature of REFLECTION 2, you can back-up files to your VAX with a few quick keystrokes. Your entire hard disk, or just recently changed files. And you can program REFLECTION to start the back-up routine any time, without an operator present. A REFLECTION 2 exclusive!

Powerful command language eliminates wait.

REFLECTION 2 also includes a powerful command language to automate tasks like complex log-on procedures and back-up routines. Command language script files even run in the background.

Plus, you get Kermit, X-modem, definable soft keys, foreign keyboard support, and of course, complete VT-220 emulation.

What are you waiting for?

Stop wasting time with long, slow file transfers. Try REFLECTION 2 for just $199, or REFLECTION PLUS for $249. Your satisfaction is guaranteed or your money back.

ENTER 235 ON READER CARD

Order REFLECTION now, or call for information. (206) 324-0350

Or write: Walker, Richer & Quinn, Inc.
2825 Eastlake Avenue
Seattle, Washington 98102

Telex: 298 565 WRQ UR

Quantity discounts begin with your second copy!

REFLECTION™ SERIES SOFTWARE

BEYOND PERFECT EMULATION 2

Raster Operators.

Opening a new window of opportunity.

At GraphOn, we want you to be able to take advantage of every opportunity. So we make terminals that meet all of your graphics and alphanumeric requirements today—and prepare you for tomorrow's most advanced software.

That's why our GO-240 and GO-250 composite terminals offer raster operators, with opportunities for pop-up menus, downloaded character fonts, window management, and the ability to upload and download bit maps.

OPEN UP WINDOWS AND MORE

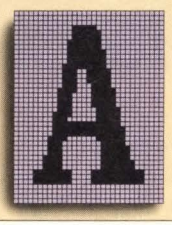
Raster operators allow a terminal to store rectangular groups of pixels, or rasters, in local video memory. The simple ability to move rasters quickly on and off the screen opens a world of possibilities.

GraphOn's raster operators support window management, allowing the terminal to "remember" the contents of overlapping windows. Whatever portion of the screen is covered by a window is simply copied and stored off screen until that part of the window is "uncovered."

In the same way, pop-up and pull-down menus can be downloaded from the host and stored in the terminal. When the menu is used, raster operators copy a block of the screen, move it off screen, and move the menu onto the screen in its place. When you're through with the menu, the stored area of the screen is brought back in just one video cycle—or 1/60 of a second.

WHAT YOU SEE IS WHAT YOU GET

Raster operators also allow you to download special character fonts from the host to the terminal's memory, from where they can be called to the screen at any time. With the capability of using various type styles and sizes, you can see exactly what a page will look like before it's printed—complete with proportional spacing, tabs, columns and headlines.



Why Raster Ops?
Using vectors, it might take dozens of commands to send a special character from the host to the screen. With raster operators, the image is stored in the terminal as a raster and can be called to the screen with a single keystroke.

GRAPHON GIVES YOU MORE

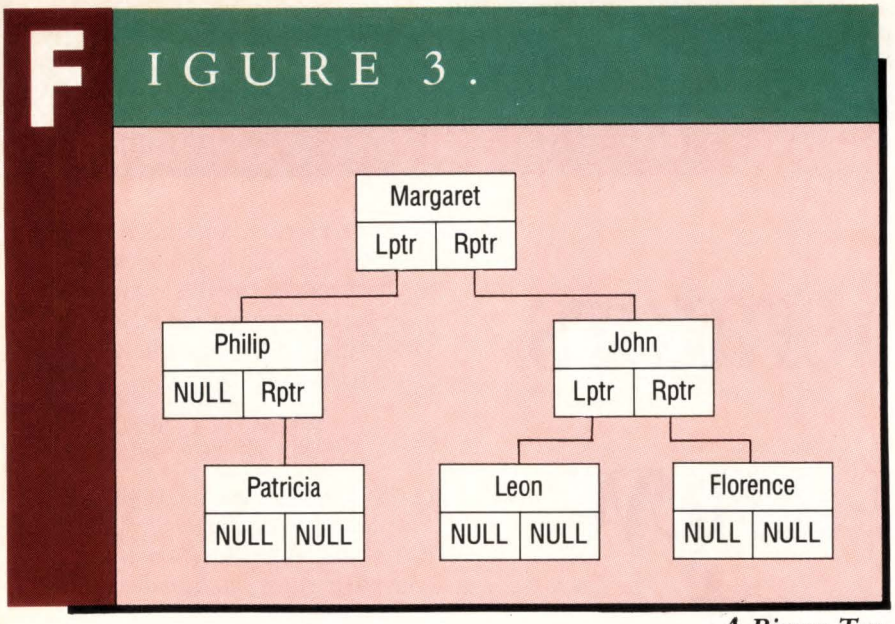
GraphOn's leadership in establishing raster operator standards is just one way we build outstanding value, quality and reliability into our terminals.

We start with bulletproof emulations of DEC VT220 and VT100 alphanumeric terminals and Tektronix 4010 through 4015 graphics terminals. Then we add high-speed data communications and fast, flicker-free video refresh. Plus an unparalleled set of advanced features, such as ReGIS compatibility, local interactivity, and true pan and zoom.

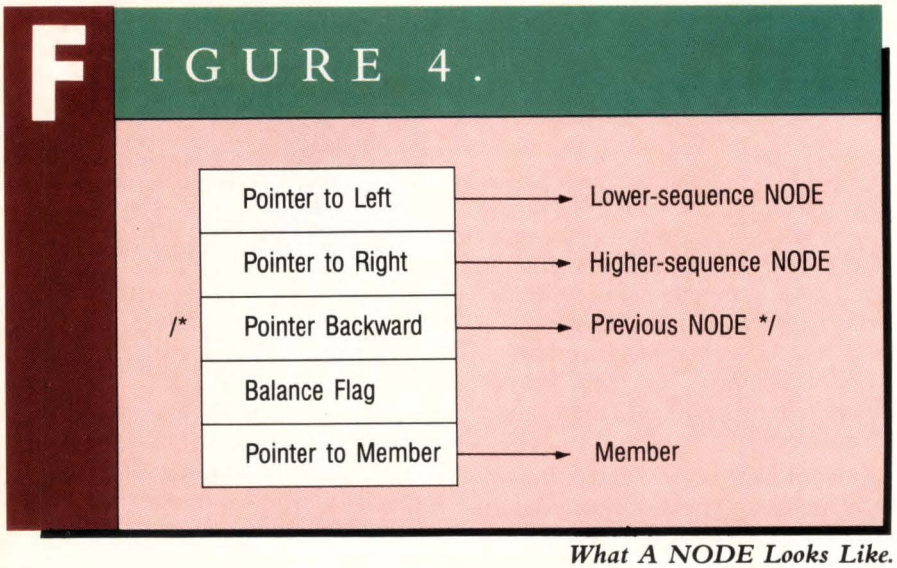
We'll be glad to send you a free technical bulletin on raster operators, or arrange a demonstration of GraphOn's full range of capabilities. Call **1-800-GRAPHON**, or write GraphOn Corporation, 1901 S. Bascom Ave., Campbell, CA 95008.

ENTER 211 ON READER CARD

GraphOn
drawing out the best



A Binary Tree.



What A NODE Looks Like.

Sequential retrieval can be done by either incrementing an index to the array or walking down the chain.

The Binary Tree

A third method combines the advantages of the array and the linked list, minimizing the space required to hold the list in memory while providing fast loading and retrieval. This structure, the binary tree, is an extension of the linked-list concept (Figure 3).

Each element consists of the member (or a pointer to its location in memory) plus two pointers, one to a member higher in the collating sequence and one to a lower member. Either pointer may be null (zero). A third pointer, to the preceding node in the tree, may be added if it is desirable to traverse the tree from any given member back to the root. This is recommended for sequential retrieval of the loaded members, since the next higher member in the collating sequence may precede the current member in the tree structure.

In the simplest form of binary tree, members are added in the order they are

. . . the binary tree is an extension of the linked-list concept . . .

read, and each new member becomes the lowest node in some branch of the tree. If the new member is lower in the collating sequence than the root member, a left-hand branch is taken; if higher, the program takes the right-hand branch. This is repeated until the pointer to the next member in the appropriate direction is zero. The zero pointer then is changed to a pointer to the new member, and two zero pointers (to left and right) are associated with the new member.

This will produce a useful tree structure if the members are loaded in totally random order — that is, there is no inherent bias in the order of the members.

In the worst case, however, the elements are already in the desired collating sequence or in the reverse of that sequence. When this happens, a degenerate binary tree is produced that looks exactly like a linked list: There is only one branch, and all the pointers on one side of each member are zero.

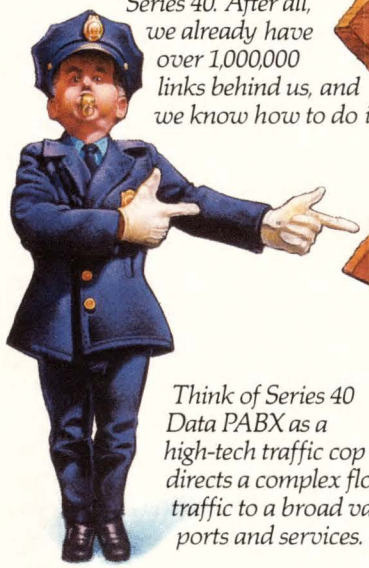
The tree may be balanced, however, so that the degenerate case never occurs. Typically, this is done immediately after the addition of each element that would cause an imbalance, using a recursive balancing algorithm.

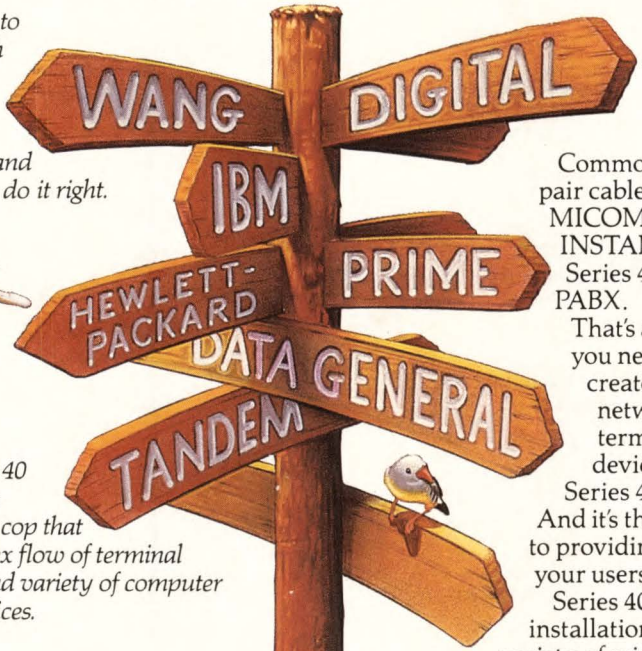
"Perfect" balance of a binary tree means that the number of nodes between the root and the bottom of any branch is at most one greater than the number of nodes between the root and the bottom of any other branch. This can be achieved, but the algorithms to do it are quite CPU-intensive and almost eliminate the binary tree's advantage in speed of loading. Obviously, if the con-

INSTANET6000™ Series 40 local and wide area data PABX

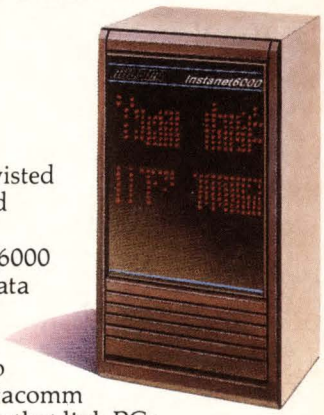
If you're having trouble making the right connections, it's time for a switch.

Networking all your terminals to all these computers is easy with Series 40. After all, we already have over 1,000,000 links behind us, and we know how to do it right.





Think of Series 40 Data PABX as a high-tech traffic cop that directs a complex flow of terminal traffic to a broad variety of computer ports and services.



Common twisted pair cable, and MICOM's INSTANET6000 Series 40 Data PABX.

That's all you need to create datacomm networks that link PCs, terminals, and other asynchronous devices to incompatible computers.

Series 40 is easy to install and manage. And it's the most cost effective solution to providing the right connections for all your users.

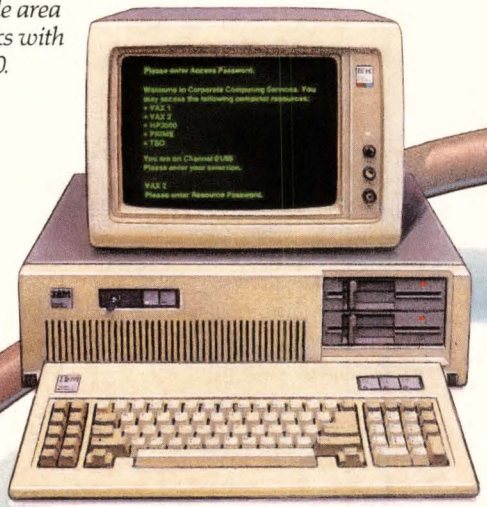
Series 40 also solves more than cost and installation problems. It provides a broad variety of wide area connections. Built-in X.25 and IBM BSC or SNA interfaces. Local multiplexors. T1 bulk transfer of up to 120 channels at a time. And direct connection of 120 channels to DEC VAX computers on two twisted pairs with the new INSTABUS1080.™

As you'd expect, it's easy to get connected with MICOM, the world leader in data PABX technology.

To see what we mean, just call us for application assistance. You see, we know how complicated and confusing datacomm can be. So we're here to give you all the help and advice you need.

And for a datacomm company, that's a real switch.

PC users make all the right connections to both local and wide area networks with Series 40.



No complicated cabling required here. INSTANET6000 Series 40 Data PABX uses the inexpensive twisted pair wiring that's already in your buildings.

1-800-MICOM-US

DATACOMM BY MICOM

More ways to help computers do more.

MICOM Systems, Inc., 4100 Los Angeles Avenue, Simi Valley, CA 93062-8100. Europe: UK-(44) (635) 832441. Int'l: USA-(01) (805) 583-8600.

PROGRAM 1.

```
/*   intree.c

     Generalized AVL-balanced binary tree insert routine

     Usage:    NODE *
               intree    (key, ptr)
               char      *key;
               NODE      *ptr;

     The  variable <key> is a pointer to the key value.  If
     the  key  is not of type char,  the pointer  should  be
     coerced in the calling statement.  The variable  <ptr>
     should be the root pointer in the tree;  since the root
     of the tree may change, the user code should read:

          root = intree (key, root);

     which ensures a valid pointer to the root of the tree.

     Two  routines  may  be specified by the  user:  one  to
     compare two keys, and one to perform any desired action
     if the key is already in the tree.  The default compare
     routine  is strcmp () and the default on-match  routine
     simply returns.

     To change these, define tree_c or tree_m as an external
     pointer to a function returning int and then assign the
     address of the desired function to the pointer.

     Code  for  implementation of backward pointers  is  in-
     cluded  in this version but is commented out to  retain
     forward-only functionality.  If backward pointers  are
     desired, simply remove the indicated comments.
     Author:   Philip G. Anthony
               6640 Sprague Street
               Philadelpha, Pa. 19119.

     The author makes no warranties,  express or implied, as
     the usefulness or correctness of this routine.

     Copyright (C) 1984, 1985, 1986 Philip G. Anthony
     General  permission  to  copy or modify,  but  not  for
     profit,  is  hereby granted,  provided that  the  above
     copyright  notice is included and reference made to the
     fact  that  reproduction  privileges  were  granted  by
     Philip G. Anthony.

     V1.01     29-Aug-84      Creation - pga.
     V1.02     15-Apr-85      Fix dumb bug - pga.
     V2.01     28-Jun-86      Add  backward  pointer logic -
                              pga.
*/

#include <stdio.h>

typedef struct tree_n   {
                        struct tree_n   *left;  /* Pointer to lower member */
                        struct tree_n   *right; /* Pointer to higher member */

                                                /* Uncomment next declara-
                                                   tion to implement back
                                                   pointers */
/*
                        struct tree_n   *back;  /* Pointer to last member */

                        int             bal;    /* Balance factor: -1, 0, 1 */
                        char            *key;   /* Pointer to key */
} NODE;

static int      h;                              /* Height-increased flag */

/* Compare, assign, and match found routines */
extern int      strcmp ();
extern int      m_found ();

int     (*tree_c) () = strcmp;
int     (*tree_m) () = m_found;

NODE    *
intree          (x, p)
char            *x;
NODE            *p;
{
        NODE    *intr ();

        /* Uncomment ", (NODE *) NULL" to implement back pointers */
        return (intr (x, p /*, (NODE *) NULL */ ));
}

/* Uncomment ", o" and "NODE *o" in function declaration to implement
```

straint were imposed that addition of any member might result in the linkage of the entire tree having to be recalculated, binary trees would be a mathematical oddity, of interest only to theoreticians.

A less stringent criterion for balance that results in a tree not very different from a perfectly balanced tree is this one:

A tree is balanced if and only if for every node, the heights of its two subtrees differ at most by 1.

Application of the criterion yields a relatively simple balancing algorithm with low overhead. The average search path for random retrieval of a member of such an AVL-balanced tree (the criterion is named by the initials of its discoverers) is only a little bit longer than for a perfectly balanced tree — on the average, one extra compare. (More complete discussion of perfectly balanced and AVL-balanced binary trees may be found in Niklaus Wirth's wonderful book, *Algorithms + Data Structures = Programs*, available from Prentice-Hall.)

Insertion into an AVL-balanced tree is significantly faster than for either an array or a linked list. If m is the number of members inserted so far, the average number of compares necessary to place a new member in its collating sequence is about log2(m). The balancing routines have to be invoked at most log2(m-1) times, and balancing is necessary only one time out of three. Further, two times out of three that the balancing routines are used, balance is obtained at that level with no need to modify the higher levels in the tree.

Random retrieval is as fast as finding the correct location to insert a new member — that is, just about as fast as binary search. Exactly the same analysis for finding a member and establishing that a member is not in the list applies, with the limitation that one additional

GRAPHICS PLUS GP-220

THE NEW GP-220:

The most versatile text and graphics terminal available today.

- Accurate Tektronix 4014, 4010 emulation.
- Full DEC VT220, VT100, VT52 emulation.
- Fully programmable VT220 style keyboard.
- 1024x780 high resolution display.
- Four level gray scale.
- Extended graphics capability such as pan, zoom, area erase, area move, seed fill, 4 to 16 frame animation and conic section draw.
- Two 200K byte display memories.
- 75 pages of off-screen, scrolling memory.
- 80 or 132 columns.
- 24 or 50 or 66 lines.
- Four complete set-up configurations.
- Printer support with built-in print buffer.
- Transparent mode with History Buffer.
- Optional Mouse and digitizing tablet.

Northwest Digital Systems
P.O. Box 15288
Seattle, WA 98115
(206) 524-0014

ENTER 208 ON READER CARD

PROGRAM 1 . . . continued

```
   back pointers */
static NODE     *
intr            (x, p /*, o */)
char            *x;
register NODE   *p;
/*
NODE            *o;
*/
{
        int             rslt;
        register NODE   *p1, *p2;
        NODE            *new ();
        void            rol (), ror ();

        /* Bottom of the tree - allocate a new guy */
        if (p == NULL) {
                p = new (sizeof (NODE));
                p->key = x;                     /* Assign the key pointer */
                p->left = p->right = NULL;      /* No pointers */

                /* Uncomment the following line to implement back
                   pointers */
/*
                p->back = o;                    /* Backward pointer */

                p->bal = 0;                     /* Balance always 0 */
                (*tree_m) (x, p);               /* Do whatever's needed */
                h = 1;                          /* Height increased */
                return (p);
        }

        /* Not the bottom - continue; rebalance after insert */
        if ((rslt = (*tree_c) (x, p->key)) == -1) {     /* Key less */

                /* Uncomment ", p" in next line to implement back
                   pointers */
                p->left = intr (x, p->left /*, p */);   /* Down left side */
                if (h) {                                /* Height increased */
                        h = 0;
                        switch (p->bal) {
                                case 1:                 /* Balanced */
                                        p->bal = 0;
                                        break;
                                case 0:                 /* Off by 1 */
                                        p->bal = -1;
                                        h = 1;
                                        break;
                                case -1:                /* Needs balancing */
                                        p1 = p->left;
                                        /* Single LL rotation */
                                        if (p1->bal == -1) {
                                                rol (p, p1);
                                                p->bal = 0;
                                                p = p1;
                                        }
                                        /* Double LR rotation */
                                        else {
                                                p2 = p1->right;
                                                ror (p1, p2);
                                                rol (p, p2);
                                                if (p2->bal == -1)
                                                        p->bal = 1;
                                                else
                                                        p->bal = 0;
                                                if (p2->bal == 1)
                                                        p1->bal = -1;
                                                else
                                                        p1->bal = 0;
                                                p = p2;
                                        }
                                        p->bal = 0;
                                        break;
                        }
                }
                return (p);
        }
        if (rslt == 1) {                                /* Key greater */
                /* Uncomment ", p" in next line to implement back
                   pointers */
                p->right = intr (x, p->right /* , p */); /* Down right side */
                if (h) {                                /* Height increased */
                        h = 0;
                        switch (p->bal) {
                                case -1:                /* Now balanced */
                                        p->bal = 0;
                                        break;
                                case 0:                 /* Off by 1 */
                                        h = p->bal = 1;
                                        break;
                                case 1:                 /* Needs balancing */
                                        p1 = p->right;
                                        /* Single RR rotation */
```

. . . NODE defines what each node in the tree looks like . . .

compare may be necessary in AVL-balanced trees.

Program 1, intree.c, is a C subroutine for inserting members in an AVL-balanced tree. The structure named NODE defines what each node in the tree looks like (see Figure 4); it consists of a left-hand and a right-hand pointer, an integer reserved for a "balancing factor" required by the algorithm, and a pointer to the member itself (and any associated data that may be tacked on). Commented out is the backward pointer that references the node at the next level up in the tree.

The routine assumes that each member will consist of character data, and that if the calling program attempts to insert a member twice, it should be ignored. The user may modify this by performing coercion on the pointer to the member and by assigning different values to the two pointers to functions tree__c and tree__m, which are invoked by intree( ) to compare two members (the default is strcmp ()) and to perform any necessary action when a member is found already there.

The actual code is adapted from the PASCAL code in the Wirth book. As implemented here, the function intree ( ) returns a pointer to the root, which should be established in the calling program as a pointer to type NODE. The user code to insert a new member mem would be:

```
root = intree (&mem, root);
```

where "&mem" means "pointer to the member" (the "&" is implied, of course,

East of the sun.
West of the moon.
Windjammer.

A place to live your fantasies.
A place to free your soul.

To cozy up to the Caribbean sun.
To dance among a thousand stars to the rhythms of steel drums.
To play on sparkling white and pink sand beaches.
To discover the underwater paradise of the reefs.
To find a new friend and share the intimacies of a sensuous night.

To come alive and live.
To remember for a lifetime.

6 days and 6 nights. From $625.

Reservations toll free
1-800-327-2600
In Florida 305/373-2090.

Windjammer 'Barefoot' Cruises
Post Office Box 120.
Miami Beach, Florida 33119.

ENTER 322 ON READER CARD

"Cap'n Mike, rush me my free, full color 'Great Adventure' booklet and show me the way to Paradise for 6 days and 6 nights from $400."
Windjammer 'Barefoot' Cruises.
P.O. Box 120. Dept. 4288 Miami Beach, Fla. 33119.

Name _____
Address _____
City _____
State/Zip _____

PROGRAM 1 . . . continued

```
                                        if (p1->bal == 1) {
                                                ror (p, p1);
                                                p->bal = 0;
                                                p = p1;
                                        }
                                        /* Double RL rotation */
                                        else {
                                                p2 = p1->left;
                                                rol (p1, p2);
                                                ror (p, p2);
                                                if (p2->bal == 1)
                                                        p->bal = -1;
                                                else
                                                        p->bal = 0;
                                                if (p2->bal == -1)
                                                        p1->bal = 1;
                                                else
                                                        p1->bal = 0;
                                                p = p2;
                                        }
                                        p->bal = 0;
                                        break;
                                }
                        }
                        return (p);
                }
                /* Match was made - do what's needed and go home */
                (*tree_m) (x, p);
                h = 0;
                return (p);
}

/* Allocate space for a new NODE */
static  NODE    *
new     (size)
int     size;
{
        register NODE   *ptr;
        char            *malloc ();
        void            fputs ();

        if ((ptr = (NODE *) malloc (size)) != NULL)
                return (ptr);
        fputs ("?Maximum memory exceeded in new ()\n", stderr);
        exit (1);
}

/* Roll left */
static  void
rol             (ptr1, ptr2)
register NODE   *ptr1, *ptr2;
{
        /* Adjust the forward pointers */
        ptr1->left = ptr2->right;
        ptr2->right = ptr1;
        /* Uncomment the following lines to adjust back pointers
           if back pointers are implemented */
        /*
        ptr2->back = ptr1->back;
        ptr1->back = ptr2;
        if (ptr1->left)
                (ptr1->left)->back = ptr1;
        */
}

/* Roll right */
static  void
ror             (ptr1, ptr2)
register NODE   *ptr1, *ptr2;
{
        /* Adjust the forward pointers */
        ptr1->right = ptr2->left;
        ptr2->left = ptr1;

        /* Uncomment the following lines to adjust back pointers
           if back pointers are implemented */
        /*
        ptr2->back = ptr1->back;
        ptr1->back = ptr2;
        if (ptr1->right)
                (ptr1->right)->back = ptr1;
        */
}

/* Default what-to-do on match routine */
static  int
m_found (value, pointer)
char    *value;
NODE    *pointer;
{
}
```

if the member is a character string). Checking the address of the root at the end of each insert is necessary because the balancing routines may force a change. It should be noted that intree ( ) is a recursive routine — that is, it calls itself until the bottom of the correct branch is found — and so extra stack space may be needed if long lists are to be processed. This is minimized by extensive use of register variables (the PDP standard of three available registers has been used).

If a backward pointer is desired, the commented-out code in the definition of a NODE and in the functions ror ( ) and rol ( ) should be restored.

It should be relatively easy for the user to write a retrieval routine for members of the tree created in intree ( ). All the routine has to do is compare the actual members with the desired member, starting at the root, and call itself using either the left-hand pointer or the right-hand one as appropriate until the member or a zero pointer is found. The routine then would return a pointer to the member node or zero if the member isn't in the list.

Deletion of a binary tree member is significantly more difficult than insertion. Fortunately, most real-life data processing applications involve creating and processing a list, rather than deleting members from an already created list. If you need this function, you might want to try your hand at translating the PASCAL code in the Wirth book.

Not For Disk Files

The binary tree is not recommended for disk files, although it can be applied to them. In disk-resident lists, binary-tree search — like binary search — tends to lead to a high disk access rate, and other methods such as hashing and ISAM give better efficiency. Application of various linked-list and tree structures

PROGRAM 2.

```
/*      tstree.c

        Test driver for tree.c

*/

#include <stdio.h>

typedef int     VOID;
typedef struct  tree_n  {
                        struct tree_n   *left;
                        struct tree_n   *right;
                        int             bal;
                        char            *key;
} NODE;

NODE    *root = NULL;
int     level = 0;

extern int      (*tree_c) ();

main    ()
{
        char    buf[81], *gets ();
        int     ftty (), atoi (), intcmp ();
        char    *intptr, *allint ();
        NODE    *intree ();

        tree_c = intcmp;
        while (1) {
                if (ftty (stdin))
                        fprintf (stderr, "Int: ");
                if (gets (buf) == NULL)
                        break;
                intptr = allint (atoi (buf));
                root = intree (intptr, root);
        }
        fprintf (stderr, "\nRoot        = %06o\n", root);
        fprintf (stderr, "Root->right = %06o\n", root->right);
        fprintf (stderr, "Root->left  = %06o\n", root->left);
        putc ('\n', stderr);
        prtree (root);
}

prtree  (ptr)
NODE    *ptr;
{
        register int    i, j;

        if (ptr != NULL) {
                ++level;
                prtree (ptr->left);
                for (i = 1; i < level; i++) {
                        for (j = 0; j < 6; j++) {
                                putchar ('\040');
                        }
                }
                printf ("%04d\n", *((int *)ptr->key));
                prtree (ptr->right);
                --level;
        }
        else {
                putchar ('\n');
        }
}

int
intcmp          (int1, int2)
register int    *int1, *int2;
{
        return ((*int1 < *int2) ? (-1) : (*int1 > *int2) ? 1 : 0);
}

char    *
allint  (i)
int     i;
{
        register int    *p;
        char            *malloc ();

        if (p = (int *) malloc (sizeof (int))) {
                *p = i;
                return ((char *) p);
        }

        fputs ("?Maximum memory exceeded in allint ()\n", stderr);
        exit (1);
}
```

And even sequential output of the entire binary tree may be speeded . . .

to disk processing can be found in Dennis Thibeault's article "BASIC-PLUS Techniques for Table Organization and Lookup" in *VAX/RSTS PROFESSIONAL*, August 1983 (Vol. 5, No. 4). Similarly, the working set size of programs using large binary trees should be adjusted so that the entire tree may be kept memory-resident on virtual memory machines. This will avoid page faulting, which becomes highly I/O-intensive with modified pages — the fallacy of the virtual memory machine.

But for many applications, the binary tree provides a method of handling memory-resident lists that is cheaper in program space and CPU time during load than the common array method. It also is far faster in time required for random retrieval than the linked list. While its speed in sequential retrieval (with use of a back pointer) is not as good as for arrays or linked lists — taking twice as long as the other methods to traverse the list — its efficiency in loading and random access more than makes up for this deficit when access modes will be mixed.

And even sequential output of the entire binary tree may be speeded significantly by making recursive calls to access the members (see Program 2, the test driver for intree ( ), tstree.c). The number of recursive calls using this technique is limited to log2 (n) + 1, rounded to the next higher integer, where n is the total number of members.

Philip G. Anthony is a Philadelphia-based consultant.

Buying a VAX controller shouldn't be any harder than this.

Emulex makes the choice so easy. You can pick the exact disk, tape or communications controller for your VAX computer. Or you can select from many complete subsystems containing controllers and peripherals. All for less cost and all from one convenient source.

DISK AND TAPE PRODUCTS FOR THE VAX UNIBUS...

SC41/MS—This high performance, low cost MSCP controller lets you run large capacity SMD disk drives on any VAX UNIBUS. Supports drives with 2.5 MByte/sec transfer rates and high capacities.

TC13—Tape controller supports industry-standard "Pertec" formatted ½" tape transports, including conventional NRZI, PE, and GCR start/stop units. Features a 3.5 KByte buffer and 800 KByte/sec transfer rates.

VAX-11/750...

SC7002—Powerful Massbus controller, ties directly to the CMI bus and supports up to four industry-standard removable or Winchester SMD drives in mixed configurations of 825 MBytes or more. High transfer rate of 2.5 MBytes/sec makes the SC7002 an ideal choice for such drives as Fujitsu 2361A or 2333.

SC7003—Our newest high-speed controller supports 80 to 850 MByte drives with transfer rates to 3.0 MBytes/sec, including CDC 9772.

SC758—Massbus controller accommodates up to eight disk drives. Supports capacities from 80 to 675 MBytes and transfer rates up to 1.8 MBytes/sec.

VAX-11/780/785...

V-Master—Houses one or two disk controllers, or a tape controller, or a combination of a disk and tape controller. Each disk controller supports up to four disk drives—up to eight with the SC788 controller.

SC7002—Change a few switches and this "750" controller becomes compatible with the VAX-11/780/785; also supports 2.5 MByte/sec transfer rates and capacities to 825 MBytes.

SC7003—Switch selectable to run 11/780/785, operates transparently with UNIX BSD 4.2, ULTRIX-32, and VMS; also features a large 16K buffer.

VAX 8600/8650

Side Car—Field proven V-Master controller configured in a cabinet that attaches directly to VAX 8600 or 8650.

SC7002—Handles up to four drives entirely transparent to the drive address.

SC7003—Features up to eight drive ports, each transparent to the drive address, which can be set up on any port and changed without controller reconfiguration.

SC788—Supports a transfer rate of 1.8 MBytes/sec and up to eight disk drives.

TC7000—With switch changes, this tape controller is compatible with 11/750 or 11/780/785; mounted in a Side Car runs with 8600 or 8650. Supports up to eight formatted drives. Emulates DEC's TM03/TU77. Works with "old" or "new" GCR 6250 drives and features transfer rates to 1.5 MBytes/sec.

COMMUNICATIONS PRODUCTS FOR THE VAX-11/730 THROUGH THE VAX 8650...

CS21—Single hex board emulates DEC's DH11 and DZ11 communications multiplexers, and asynchronous portion of DMF-32 multi-function controller; also interfaces with three alternative 16-line distribution panels.

CS23—Still need more lines? On a single hex board the CS23 will give you up to 32 communications lines. Emulating DEC's DHU11, it is transparent to VAX software and diagnostics.

CS32—Add high performance data transfers to all your VAX IIs. It's transparent to DEC's new DMF-32 and supports up to 128 lines per board.

CS41—This new T1 compatible UNIBUS communications multiplexer lets you connect up to 144 asynchronous terminals to your VAX. With a single controller, up to six 24-line remote distribution panels can be connected to a host computer 5000 ft. away. Ring networks exceeding 5000 ft. can also be created with minimal restrictions. CS41, an inexpensive way to connect the most terminals to your VAX for the least money.

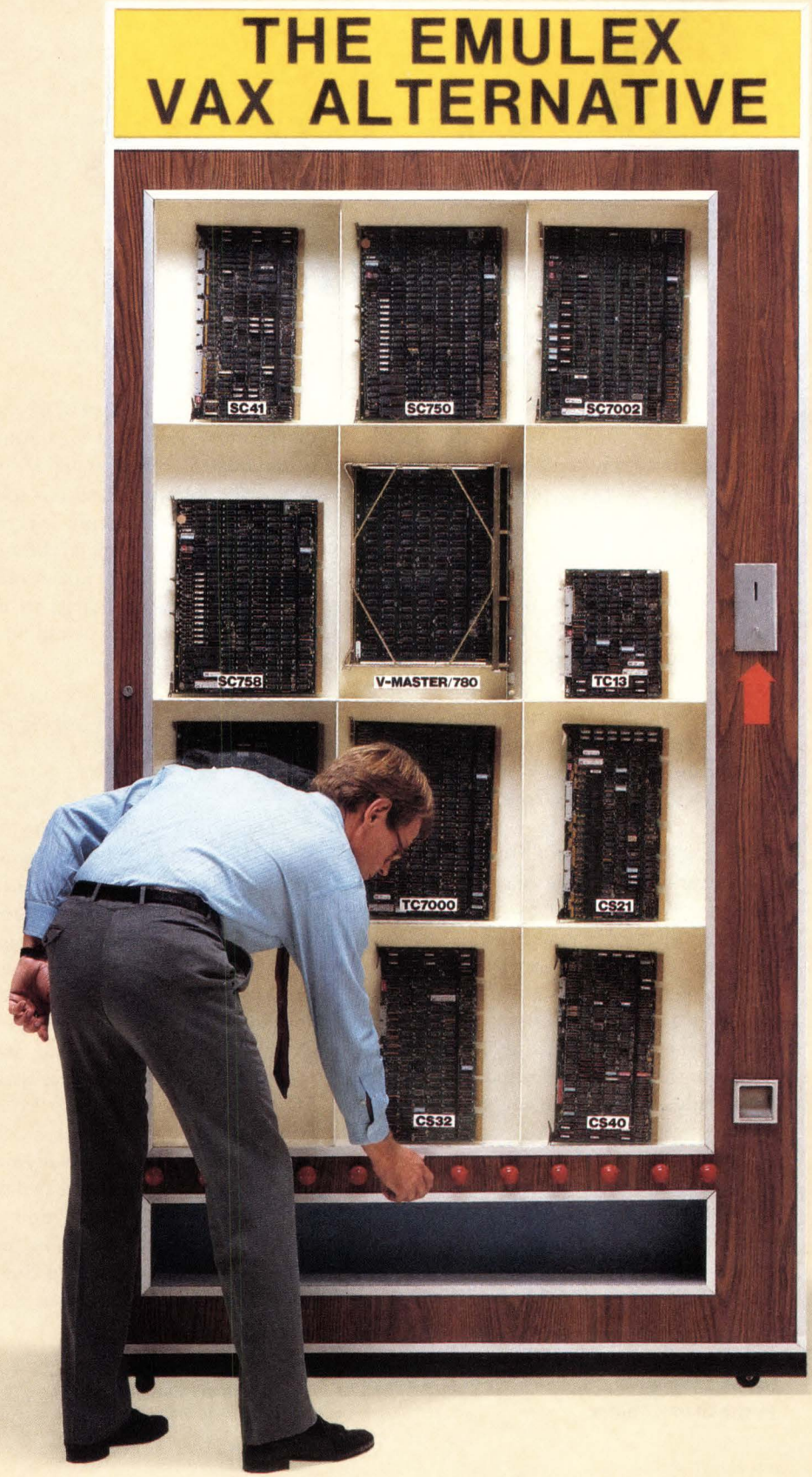
The performance is Emulex. The choice is yours. Call Emulex today toll free 1-800-EMULEX3. In California, (714) 662-5600. Or write Emulex Corporation, 3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, California 92626.

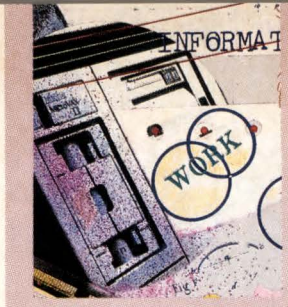
The genuine alternative.

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, Montreal, Quebec (514) 332-1016; France, Montrouge (1) 735-7070; United Kingdom, Bracknell, Berkshire (344) 484234; West Germany, Munich (089) 304051.

ENTER 24 ON READER CARD

THE EMULEX VAX ALTERNATIVE





VAX

AMERICA'S CUP

By Mason Killebrew

Can A VAX, A Stock Polygon Modeling Program, And GraphOn Terminals Bring It Back Where It Belongs?

Since 1851, the America's Cup yacht race has proved the standard of excellence in international yachting competition, with American yachtsmen turning in winning times and taking home the coveted trophy. Then, in 1983, Australia II defeated the American defender Liberty, quite possibly setting the stage for a rematch this January in Perth, Australia, most likely between the U.S. and the Australians. For the first time since the race began in 1851, the U.S. team will be challenging, not defending the cup. But racing skill and yachtsmanship are not the only competitive factors in the upcoming contest.

THE WINNING TIME in 1983 for Australia II, was the result of a revolutionary winged-keel concept developed in total secrecy, using the most sophisticated high technology available. Next year's margin of victory may well depend on which nation's naval architecture and computer design capabilities can lead to the fastest boat. The technology used by the American ship designers, includes a DEC VAX 11/780, and GraphOn (GO) alphanumeric/graphics terminals from GraphOn Corporation, Campbell, California.

Yachtsman Dennis Conner, determined not to be beaten by superior yacht design, is the favorite to win the right to be America's challenging skipper in the 1987 race. Conner and the Sail America Foundation which backs him, have pledged to bring together, not only the best yacht racing crew, but to design the fastest, most advanced 12-meter boat yet built — the *Stars & Stripes*.

WHAT IS A 12-METER yacht? The term refers to the formula used to design America's Cup boats. Boats in this class are designed so that when measurements of various speed-producing factors (such as length, sail area, stability, and freeboard) are cranked through a simple formula, the result does not exceed 12 meters. Of course, all measurements are metric. (The non-metric equivalent would be 39.37 feet.) The formula is:

$$\frac{L + 2d + \sqrt{Sa} - F}{2.37} = \text{Rating (12 meters)}$$

Designing and building the fastest 12-meter racing yacht, to win back the America's Cup from the Australians, actually began in 1983, and to date has cost over $15 million. In addition to using design concepts from naval architects Britton Chance, Jr., Bruce Nelson and David Pedrick, contributions to the design of *Stars & Stripes* came from Grumman Aerospace, Boeing, and NASA.

Using the yacht *Liberty* as a standard, Sail America designed four *Stars & Stripes* vessels between 1983 and the present, at a cost of $500,000 a piece, each a totally new concept in under-the-water hull and keel design. *Stars & Stripes* '87 is the culmination of the total design experience built into its predecessors, *Stars & Stripes* '83, '85 and '86. Since October, 1985, Dennis Conner has been testing all four

yachts in Hawaii, in preparation for the 1987 America's Cup challenge.

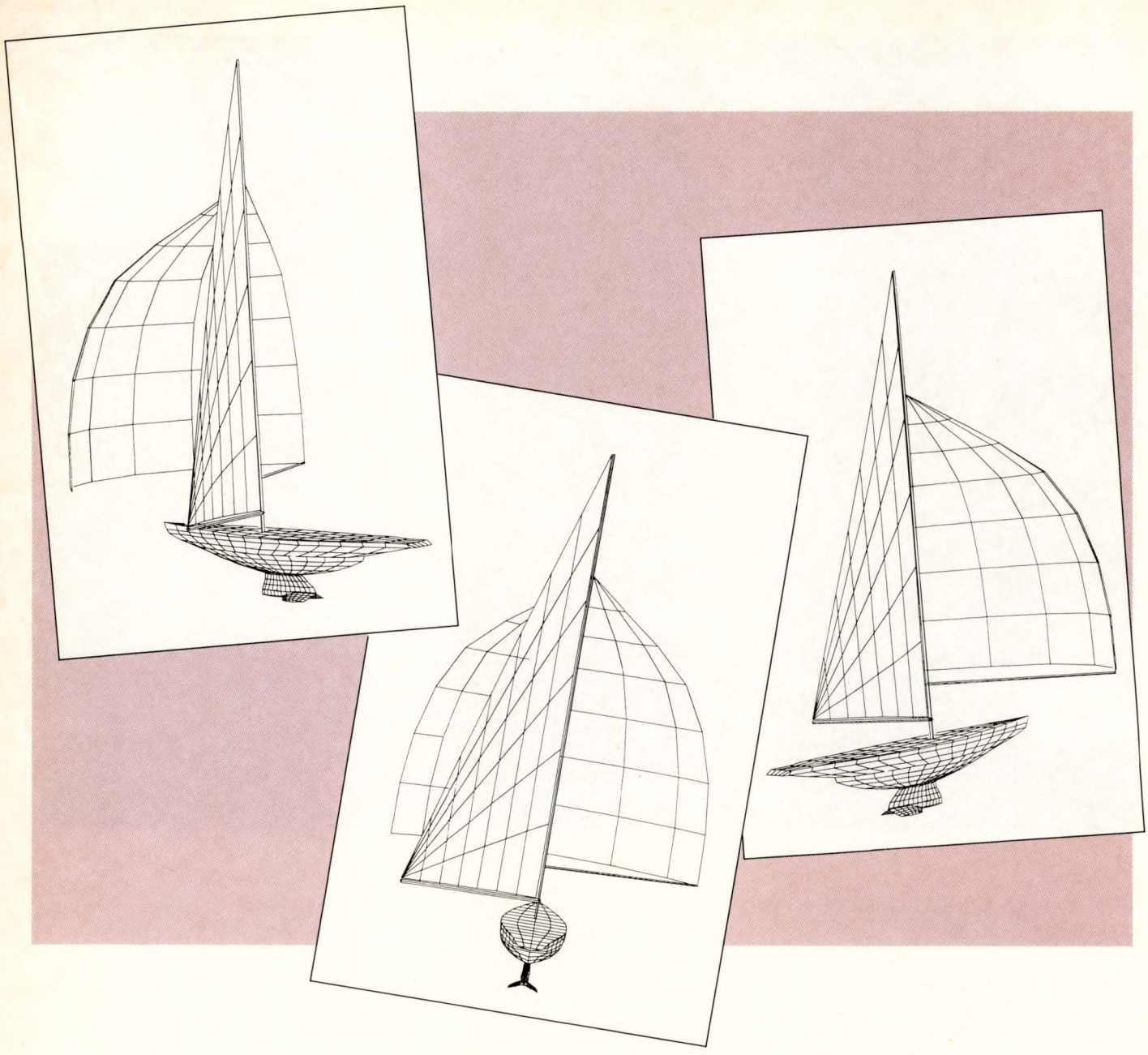
Building A Better Boat

Science Applications International Corporation (SAIC), of La Jolla, California, a major high technology research and development contractor to the U.S. Department of Defense, performed critical computer simulations of 12-meter yacht designs for each of Sail America's *Stars & Stripes*. Using a line drawing of a proposed hull design, John Talcott, staff scientist at SAIC, measured the blueprints and constructed a polygon model of the hull. With off-the-shelf polygon modeling software from Brigham Young University, Talcott used the GO terminals to verify that the models were correct.

The GO 250 terminal provided high vertical resolution, with pan and zoom options. Zooming at high speeds increased resolution for real productivity gains. In addition to a visual comparison between the model and the terminal screen, Talcott could produce hard-copy via a laser printer.

Stereo views of the hull design also were an option, in reference to the terminal's two planes of graphics, allowing for a three dimensional image. More than 100 hull and keel designs were evaluated by SAIC.

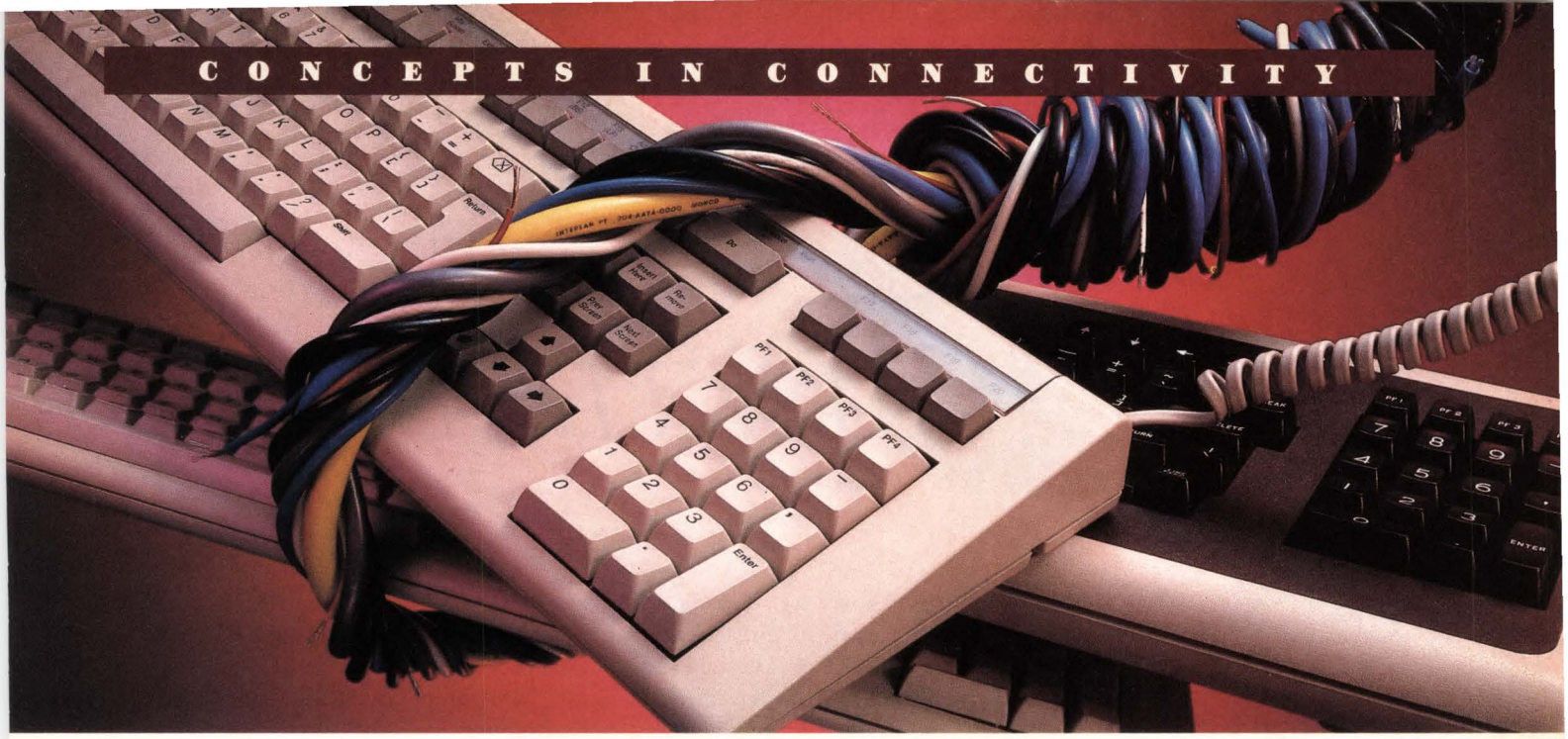
A velocity prediction program also was developed using two different boat designs and simulating a race. Computer graphics revealed the performance characteristics of each boat design. If design parameters looked good, large scale models could be built and tested. Additional computer analysis included dividing the hulls and keels by segments, and



treating panels as part of the database. Further analysis revealed the performance of each panel in relation to the flow of water and the turbulence it would encounter. Using "what/if" analysis, scientists were able to determine the impact of even the slightest change in the length or depth of the design.

Prior to losing the cup, 12-meter yacht designers hadn't used state-of-the-art hydrodynamic codes. Now, all 12-meter designers are using hydronomic codes in the design of their boats. Since 1983, the Sail America design team has been committed to the three-step process of traditional naval architectural design, computer modeling, and large scale testing. Hopefully, it soon will lead to the return of the coveted America's Cup.

Mason Killebrew is director of marketing for GraphOn Corporation, Cambell, California.



How To Hang On Terminals Without Getting Hung Up.

Don't send a host-to-host network to do a terminal network's job!

A lot of manufacturers will tell you that a "network is a network"—but while contention-type networks may be appropriate for the long interactive file transfers of host-to-host communications, they can be more of a problem than a solution for high-volume terminal communications. In fact, when large numbers of terminals are clamoring for network access, the software and collision overhead can become so overwhelming that it can cause a dramatic slowdown—or even crash the whole network.

So give your terminals what they deserve—a non-contention network without the software overhead associated with long packet communications, but with the *true* flexibility to put terminals and printers wherever you need them. With the complete support of T-1, RS-422 and fiber optics for remote networking. With access to multiple hosts—PC resource sharing—real ease of use. *Because when the question is terminal networking, the answer is ABLE.*

ATTACH—the True Terminal Network

ATTACH is a multihost terminal network which supports from 8 to over 15,000 ports (at 128 terminal lines per subsystem), all of which can be connected to any host by a single composite cable. ATTACH is compatible with all DEC host operating systems and, with its Magic Key, allows single-stroke, no-menu switching.

MUX MASTER™—128 Terminals with a Single Cable

Get rid of the sea of terminal cables with MUX MASTER, a multidrop distributed multiplexer system, which supports up to 128 connections through a high-speed composite link on any UNIBUS or Q-BUS computer. MUX MASTER LS allows PCs to share resources as well as access a central host, while the new MUX MASTER LP gives you control of parallel high-performance line printers where you need them.

Communication Boards Boost MicroVAX II Productivity

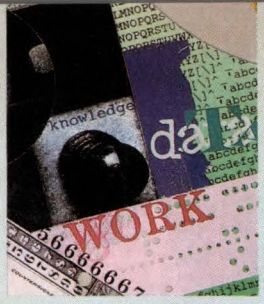
And when your Q-BUS computer needs a throughput boost, turn to ABLE for the largest offering of asynchronous connections to Q-BUS on the market. Ask for QDHU, QHV, and QHV Plus—all at a very low cost per line. So hang on terminals without getting hung up. Call ABLE COMPUTER, (714) 979-7030, 3080 Airway Ave., Costa Mesa, CA 92626, TWX 910-595-1729, TLX 668307. CANADA, Suite 101, 101 The Queensway West, Mississauga, ON L5B 2P7, Canada, (416) 270-8086. EUROPE, 287 London Road, Newbury, Berkshire RG13 2QJ, England, (0635) 32125, TLX 848715.

From an individual board to a 15,000-line system—ABLE meets communications network requirements.

ABLE COMPUTER

ATTACH is patented. DEC, MicroVAX, UNIBUS, and Q-BUS are trademarks of Digital Equipment Corporation.

ENTER 286 ON READER CARD



SOFTWARE

DISKIT/VMS

Software Techniques Inc.'s Newest Solution To Disk Fragmentation Problems In The Production Shop.

By Dave Mallery

Software Techniques made its initial dent in the DEC market about five or six years ago, with a product called *DISKIT*. It was intended for RSTS users, and produced what then was the elusive "well-structured disk." In RSTS, this consisted of a disk with directories pre-extended and centered, and any file that could be made contiguous, so made. It also included a superfast directory utility and an open-file display.

Now, *DISKIT*/VMS has made its debut, and it maps the old product in its scope, although there's a shift in the relative utility of the components. VMS isn't RSTS, yet there's a great deal in common, since both use disks and approximately the same basic allocation methods. The tree-structure directories of VMS are a massive improvement over the linked lists of RSTS, yet the very efficiency of the VMS directory structure, over time, will tend to mask disk fragmentation.

VMS directories are RMS indexes. That means that the tree structure of the index will distribute the overhead rather evenly. The fragmentation will be in the gradual randomization of the clusters that make up the files themselves. Over time, an active disk with little free space will randomize itself. When the many clusters of file segments start to locate all over the disk surface, the head movement for simple access becomes excessive. DSU (Disk Structuring Utility), the main component of *DISKIT*, addresses this problem explicitly.

DSU IS CAPABLE of an in-place restructuring and rebuilding of a VMS ODS-2 volume. It also can use extra work space assigned on another disk, although this space is not necessary. Since there's no standalone option yet, you can't use it on a single-disk system. *DISKIT* can run unattended.

DISKIT applies the following techniques to produce the "well-structured" disk. It places directory files close to, or interlaced between, segments of the master index, INDEXF.SYS. This reduces head movement. DSU calculates the best location for both. System files like the page file are made contiguous and centered.

You can specify certain user files for specific placement as well. DSU consolidates fragmented user files and attempts to make them contiguous, and also tries to co-locate files that are in the same directory. The fragments of free space existing on the disk are likewise consolidated and located at the end (or at another user-specified location). Optionally, these clusters are erasable.

In sum, *DISKIT* systematically applies just about every known efficiency trick to your disk. In one pass, it cleans up all the little messes and, better than an image backup/restore, takes positive steps with the physical disk structure that reduces head movement and directory overhead.

I first tried DSU on my "safety valve" — an RM03 look-alike that I keep around for booting when all else fails. As suggested, I ran:

```
$analyze/disk_structure DRA2:
```

And when no errors were reported, I boldly typed:

```
DSU DRA2:
```

The entire process took five minutes. This was a very simple test on a disk built by VMSKITBLD and hardly ever run. The main purpose was to convince me that the product would work.

I then remounted and checked the finished disk. This revealed a single error not there before:

```
Blocks Incorrectly Marked Allocated
LBN 67136 to 67137, RVN 1
```

This can be removed by the /repair option of analyze/disk_structure, and is trivial. Interestingly enough, I ran:

```
analyze/disk/repair/confirm dra2:
```

Analyze reported the error; didn't confirm it, but fixed it anyway.

Last, it was necessary to perform a full-image backup at an off-prime time. Then, the few "lost" files on the disk needed repair. The disk chosen for the honor was DRB1, an Eagle (415 MB), profoundly neglected for several years. It had about 94,000 free blocks out of 800,000. This disk is the home base of most of the production work done on the VAX, including our Editorial Department with its huge (500-plus document) MASS-11 directories.

The analyze/repair phase was interesting in that it needs several passes to fully repair a disk. On the first pass, the files reported out of any directory are placed in [syslost]. On the next pass, their incorrect back links are fixed. A final pass confirms that there are no further problems.

At this point (4:50 p.m. on a Sunday, after backup), I was ready for the acid test. I made several discoveries in the next few hours. My first recommendation is that you call the weather service before proceeding — an ominous-looking cloud formation provided a threatening backdrop for the rest of the procedure.

The amount of time DSU requires is a direct function of the following:

1. The randomness level of the disk
2. Disk size
3. The DSU-task working set size.

. . . DSU decides the final location of each block on the disk and a strategy for getting the data there, in one move.

DSU RUNS IN THREE discernable phases: First, it scans the directory structure of the disk. This consumed about 40 minutes. The DCP monitor showed roughly an 85 percent hit rate in the cache during this phase.

The next phase is the killer. Here, DSU decides the final location of each block on the disk and a strategy for getting the data there, in one move. This is like a game of solitaire with 800,000 cards! No I/O is performed. The task's virtual page count grows to about 10,000 pages, and the page faults begin. We did about 1,300 soft page faults per *second* for the next four hours and 15 minutes (Total = 16,800,000.) That was with a working set size of 2,048.

Clearly, someone other than a reviewer would have terminated the job as soon as this became evident. DSU runs in isolation after the weekly image backup; therefore, you can give it truly huge working set sizes with no problem. My perverse curiosity impelled me to see just how long it would take. I went home after about an hour of phase two, and started viewing the job with:

```
show process/cont/id:xxx
```

It was then that the virtual page count became obvious. I went over to MONITOR mode and saw the system spending 75 percent of its time on the kernel stack servicing the page faults. That means that if I had a working set nearly equal to the virtual set, the phase would have taken one hour rather than four.

DSU is interruptible at any point up to the end of phase two; i.e., you can scrap the effort and regroup. Once that phase is done, you're committed to running to completion while the actual rebuild takes place. At about 9:30 p.m., when the second phase was completed, I looked up to see the first lightning bolt of the thunderstorm.

The next hour and 20 minutes were thrilling, to say the least. This is why the manual insists that you have a complete backup in hand before you start. By some miracle, we made it to the end. I remounted the disk and went to bed. Elapsed time: six hours and 15 minutes — a new record for the worst case. This was quite a difference from the freshly built RM03 I did for a trial run in five minutes.

On Monday morning, I received a copy of a demo program from Software Techniques called FRAG.EXE, which will scan a disk's allocation and print a summary of the free space and its location. I used it to display the status of the disk I reorganized over the weekend, as well as the disk I planned to do next.

The following Saturday, I did the same job after the weekly image backup. This time, I did the following:

1. Modified the SYSGEN parameter WSMAX to 10288
2. Modified the SYSTEM account for WSEXTENT of 10288

APTools

A breakthrough in the concept of software development tools. Offering for the first time a combination of a unique two-in-one software technology:
1) A professional programmer's environment.
2) Powerful productivity tools for RDB and RMS users.

APTools is a different way of reducing software complexity. It enforces proven software engineering practices without restricting the creativity of the system designer. The overall effort needed throughout the product life cycle is drastically reduced.

APTools offers to VAX/VMS users the following modules: a programmer's environment; development of interactive form based programs; automatic prototyping; interactive queries; report generation. All the modules are based on the APTools Data Dictionary (ADD) and the APTools pre-processor.

APTools places special emphasis on the performance of the developed software. Your applications will be native mode executable images, ensuring efficient utilization of machine resources.

U.S.A.-Head Office
APTools INC.
945 Concord Street
Framingham, MA 01701

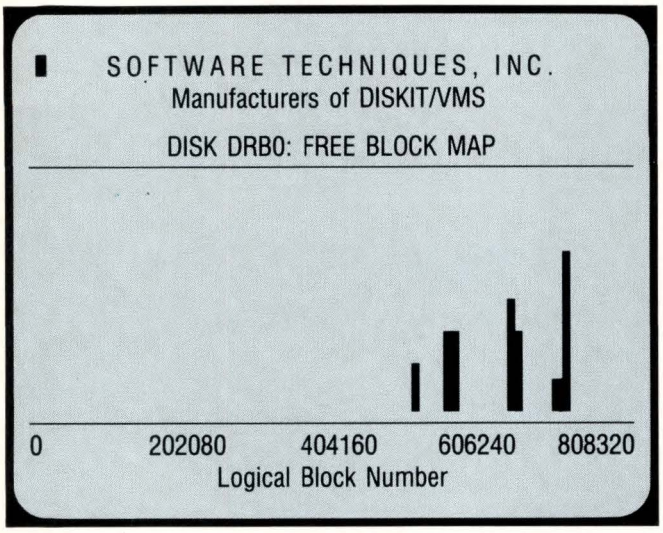
EUROPE-Head Office
Sunbelt International
8 Sq. Leon Blum
Puteaux, France 92800
Tel. (1) 47-67-0404

CONTROL DATA — 3rd Party Software Services
Box O, Minneapolis, MN 55440
1-800-828-8001 Ext. 1900
MINNESOTA (612) 921-8001 Ext. 1900

PSA—PROFESSIONAL SOFTWARE ASSOCIATES INC.
1900 East Fourth Street, Suite 215
Santa Ana, CA 92705
(714) 558-0145

ENTER 200 ON READER CARD

NOTE: BIGDIR.COM displays the extents of INDEXF.SYS, does a full directory/ grand_total, then shows the extents of a particular large file (PROSUB.DAT).



Screen 1. DBRO before backup: scrambled. See Step 1.

STEP 1.

```
Directory DRB0:[000000]

INDEXF.SYS;1      LBN          0,      6 blocks
                            1008,      3 blocks
                          405273,      3 blocks
                          404232,   1041 blocks
                           81552,   1002 blocks
                          140700,   1002 blocks
                          278190,   1002 blocks
                          356331,   1002 blocks
                          272715,   1002 blocks
                          678120,    618 blocks
                          429135,   1002 blocks
                          385107,   1002 blocks

Total of 1 file.

Direct I/o = 20
Wall = 00:00:05.17
CPU = 00:00:01.77

Grand total of 137 directories, 8227 files, 874767 blocks.

Direct I/o = 17003
Wall = 00:16:27.00
CPU = 00:08:20.95

Directory DRB0:[DAVE]

PROSUB.DAT;2 LBN
```

STEP 1...continued

```
336951,    7131 blocks      408837,     174 blocks
618474,    5115 blocks      415029,     288 blocks
608340,    5016 blocks      415350,    1281 blocks
 95532,       3 blocks      453594,     759 blocks
 95574,       3 blocks      472344,    1188 blocks
 95595,       3 blocks      626211,      27 blocks
 95790,       3 blocks      645858,     216 blocks
 95802,       3 blocks      653820,    1179 blocks
 95868,       3 blocks      662949,     513 blocks
 95931,       9 blocks      679590,       6 blocks
 96009,       6 blocks      679626,       6 blocks
110706,      24 blocks      705210,      99 blocks
110820,      27 blocks      768846,     588 blocks
110889,      54 blocks      769452,      69 blocks
111042,      81 blocks      794886,      27 blocks
112428,       6 blocks      805575,      21 blocks
243048,      42 blocks      806292,     540 blocks
287385,      27 blocks      806835,     246 blocks
288609,      51 blocks      807090,     483 blocks
317760,      54 blocks      807576,     327 blocks
318672,       3 blocks      602463,    3006 blocks
334494,    2052 blocks      605502,     429 blocks
336597,     276 blocks      605964,    2343 blocks
344082,     228 blocks      613389,    2472 blocks
344724,       9 blocks      617064,       9 blocks
405870,     693 blocks      617076,      18 blocks
406596,     132 blocks      617103,      27 blocks
406761,     495 blocks      617793,     648 blocks
407289,     573 blocks      623622,    2307 blocks
407865,       3 blocks      626184,      27 blocks
407895,     645 blocks      626454,     699 blocks
408573,     231 blocks      627186,    2640 blocks

Total of 1 file.
    6-SEP-1986 13:43:16
dave.bso> sd sys$login
dave> run frag
Disk? <SYS$DISK>drb0:

SOFTWARE TECHNIQUES, INC.
Manufacturers of DISKIT/VMS

Disk DRB0: fragmentation summary:

Fragment    Number      Total      Percent
  size      fragments   blocks     of total

1200+          3         4095       22.8%
 750+          4         3480       19.4%
 375+          9         5313       29.6%
 186+          6         1410        7.9%
  93+         15         2085       11.6%
  30+         25         1248        7.0%
   0+         38          315        1.8%

Largest contiguous space = 1563
       Total free blocks = 17946
```

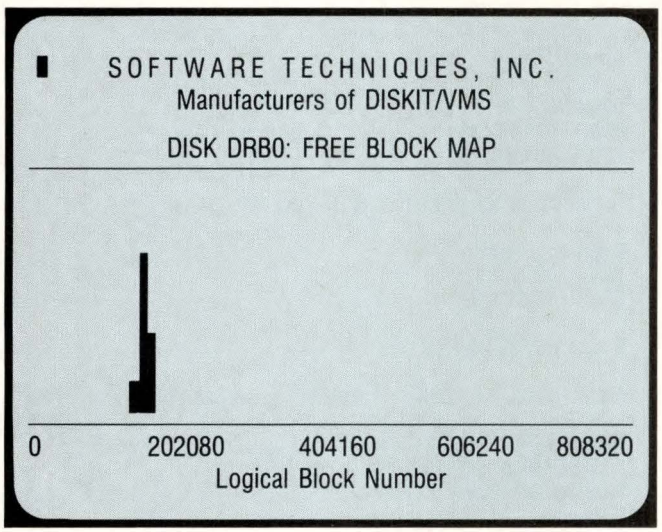
The program ran 100 percent user mode and did one page fault per second.

3. Went down and up to allow the WSMAX to take effect.

The results were somewhat different. The elapsed time was 2:20 rather than 6:15. The page fault count was 9800 rather than 16,800,000. The largest working set size was 6775 pages. The program ran 100 percent user mode and did one page fault per second. The four-hour solitaire game took 29 minutes!

This was done without giving any extra work space on another disk, which might speed up another phase. Something tells me that the finished product contains fewer compromises as well.

THE NEXT JOB was DRB0:. This used to be my V4.1 system disk, and also is an Eagle. If anything, it was more neglected than the first disk; there were a number of errors for analyze/disk to repair, and a few of them were "sticky" — when I fixed them one way, they showed up another way. I had to delete the files to clear them out. When I had a clean disk, I dismounted it and started DSU. After five minutes, DSU reported: "Doubly



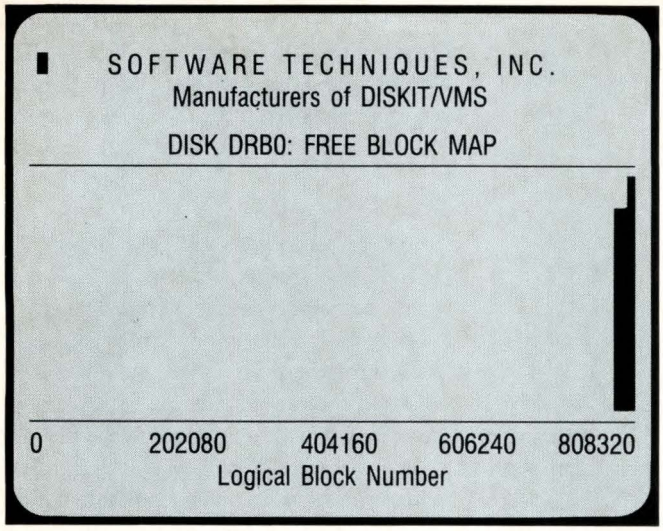
Screen 2. DRBO after image/restore. See Step 2.

STEP 2.

```
$ @bigdir
    6-SEP-1986 15:19:46

Directory DRB0:[000000]

INDEXF.SYS;1      LBN          0,        6 blocks
                            1008,        3 blocks
                          412905,        3 blocks
                          404232,     8673 blocks

Total of 1 file.
```

STEP 2...continued

```
Direct I/o = 21
Wall = 00:00:03.70
CPU = 00:00:01.65

Grand total of 137 directories, 8226 files.

Direct I/o = 8667
Wall = 00:06:56.46
CPU = 00:03:40.22


Directory DRB0:[DAVE]

PROSUB.DAT;2      LBN       219279,      65528 blocks

Total of 1 file.
   6-SEP-1986 15:26:53
$ set def drb1:[dave]
$ run frag
Disk? <SYS$DISK>drb0:

S O F T W A R E  T E C H N I Q U E S ,  I N C .
Manufacturers of DISKIT/VMS

Disk DRB0: fragmentation summary:

Fragment      Number       Total       Percent
  size       fragments     blocks      of total

15000+           1         18906        100.0%

Largest contiguous space = 18906
        Total free blocks = 18906

Type <CR> for map display:
```



Screen 3. DRBO after subsequent DSU. See Step 3.

STEP 3.

```
$ set def sys$login
$ sho def
   SYS$SYSROOT:[SYSMGR]

$ analyze/disk drb0:
Error opening QUOTA.SYS
No such file
$

$ dism drb0:
$ dism drb1:
$ dsu/interlace drb0:
DSU Version 4.3

DSU will run in accordance with the following parameters:

        Target disk: __DRB0:
Index file placement: Middle

File headers and directory data will be interlaced.

Should DSU proceed with the restructuring operation: yes
15:33:48 DSU will require no further user input, proceeding . . .
15:33:56 DSU is deciding new file locations.
16:01:41 DSU surveying the target disk's structure, please stand by . . .
16:22:25 WARNING: DO NOT interrupt DSU during this phase.
16:22:25 DSU has disabled CTRL/Y.
16:22:25 DSU is updating the file retrieval pointers.
16:29:13 DSU is executing data transfers.
16:34:39 Transfer phase 10% complete, estimating completion at 17:23
16:39:28 Transfer phase 20% complete, estimating completion at 17:20
16:44:31 Transfer phase 30% complete, estimating completion at 17:20
16:49:14 Transfer phase 40% complete, estimating completion at 17:19
16:54:20 Transfer phase 50% complete, estimating completion at 17:19
16:59:04 Transfer phase 60% complete, estimating completion at 17:19
17:03:40 Transfer phase 70% complete, estimating completion at 17:18
17:08:51 Transfer phase 80% complete, estimating completion at 17:19
17:16:06 Transfer phase 90% complete, estimating completion at 17:21
```

STEP 3...continued

```
17:25:31 DSU has completed data transfer phase.
17:25:31 DSU is updating allocation bitmap.
17:25:32 DSU has reenabled CTRL/Y.
17:25:33 DSU complete—you may now remount __DRB0:
$
$ mount/nocache drb0:
__Label: vaxvmsr14
__Log name:
VAXVMSRL4 mounted on __DRB0:
$ mount drb1: userfiles user
USERFILES mounted on __DRB1:

$ set def drb1:[dave.bso]
$ @bigdir
    6-SEP-1986 18:04:59

Directory DRB0:[000000]

INDEXF.SYS;1      LBN          0,          6 blocks
                            1008,          3 blocks
                          412905,          3 blocks
                          414006,       8673 blocks
Total of 1 file.

Direct I/o = 21
Wall = 00:00:04.13
CPU = 00:00:01.69

Grand total of 137 directories, 8226 files.

Direct I/o = 8742
Wall = 00:07:13.32
CPU = 00:03:47.39

Directory DRB0:[DAVE]

PROSUB.DAT;2      LBN       219279,      65528 blocks

Total of 1 file.
    6-SEP-1986 18:12:23
$ set def drb0:[dave]
$ run frag
Error activating image FRAG
Image file not found DRB0:[DAVE]FRAG.EXE;
$ set def drb1:[dave]
$ run frag
Disk? <SYS$DISK>drb0:

S O F T W A R E  T E C H N I Q U E S ,  I N C .
Manufacturers of DISKIT/VMS

Disk DRB0: fragmentation summary:

Fragment      Number       Total        Percent
  size      fragments      blocks       of total

  7500+          1          13347         70.8%
  2250+          1           4560         24.2%
   375+          1            663          3.5%
   186+          1            291          1.5%

Largest contiguous space = 13347
        Total free blocks = 18861

Type <CR> for map display:
```

C.Itoh gives a lesson on printing technology.

By today's standards, early computer printers were slow-moving dinosaurs. But then, so were computers.

And you could easily tell a computer printout from typewriter output.

As computers became smaller, faster, less expensive and more versatile, so did printers.

With the advent of the PC, C.Itoh and other manufacturers developed new technologies for low-cost dot matrix and solid-character daisy wheel printers.

More recently, additional advances in speed and flexibility have been made with the introduction of low-cost laser technology for non-impact page printers.

And now, in 1986, C.Itoh introduces the CIE 3000 Ion Deposition Printer based on a whole new technology.

This new non-impact page printer combines high volume and high throughput with new lows in purchase price, maintenance and per-copy costs.

For comparison purposes with the printer you're using now, a CIE 3000's recommended volume per month is as high as 150,000 pages. The preventive maintenance cycle is approximately every 400,000 pages. The printing drum life exceeds 1,000,000 pages. And it has a machine life in excess of 5,000,000 pages.

It's all because this new printing technology requires very few moving parts and incorporates unusually rugged components, requiring a minimum of service.

Available in two models, the CIE 3000s print at 30 or 45 pages per minute. The print resolution of 300 x 300 dots per inch gives clear, crisp characters in either portrait or landscape orientation.

Using ordinary, non-treated, pre-printed or plain letter-size or legal-size paper, the CIE 3000 very reliably and quietly fulfills all of your printing needs.

INTRODUCING THE CIE 3000 ION DEPOSITION PRINTER

Its overlay forms (including text) and multiple copy capabilities reduce the load on your host computer and further improve throughput for even greater cost effectiveness.

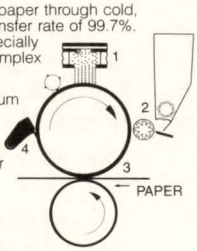
The new C.Itoh 3000 Ion Deposition Printers. A lesson in high volume, high speed, high print resolution and low costs.

To learn more, just write or call C.Itoh Electronics Group, Image Systems Division, 19300 South Hamilton Ave., Torrance, CA 90248, (213) 327-9100.

Phone toll free 1-800-843-6143. In California, call 1-800-323-2024. Telex: 652-451. TWX: 910-343-7446.

Ion Deposition Printing is a revolutionary concept using a simple, inexpensive four-step process.

1. An electronic image is generated from the ion cartridge toward a rotating drum.
2. Mono-component toner is attracted to the latent electrostatic image on the drum.
3. Toned image is transfixed to paper through cold, high-pressure fusing for a transfer rate of 99.7%. This high transfer rate is especially important as high volume, complex images are generated.
4. Toner traces remaining on drum after transfixing are aggressively scraped off. Charge is neutralized and ready to instantly accept the image for printing the next page.



C.ITOH
Ion Deposition Printers

ENTER 223 ON READER CARD

DSU can run unattended, once the backup is finished.

Allocated Extension Header," and stopped.

This was disturbing because here was an error that eludes analyze/disk_structure, yet is really there!

The effort was scrubbed for that week. (By the way, my apologies to all you ARIS people who couldn't get onto the bulletin board on several Saturdays — I have to do this stuff sometime!)

The next weekend: a bright idea. Maybe an image backup and restore will cure the directory error. That way, I can just do a benchmark of the worst-case disk, then, of the fresh image restore, and last, of the DSU result. (See steps 1-3 for the runs.) The result is a little disappointing: There's no real difference between the image numbers and the DSU numbers.

The Philosophy Department

Is it really worth it? I think it is; but no reasonable man would run DSU without an image backup of the subject disk. Unless you're loaded with empty disks, this means a full-image backup, anyway. DSU will save you from the possibility of destroying your backup tapes through mishandling on the restore. DSU can run unattended, once the backup is finished. There are no tapes to mount. The interlacing of directory segments with segments of INDEXF.SYS is a unique feature; it should add marginal performance.

DSU will get ALL of the directories centered. BACKUP will get them centered until the restore has passed the center, then they'll be scattered. DSU also will make intelligent decisions about file placement; i.e., it will not fragment a large contiguous file over the center if possible. BACKUP will.

All in all, DSU is a good addition to the arsenal of the serious production shop. Any level of insurance against the accidental loss of an image save set through operator mishandling or tape-stretch is well worth the price alone. The product is from a reputable firm with a fairly long track record in the market. They were prompt with revision level upgrades for the RSTS product, and always very responsive over the phone.

Toolbox

DISKIT comes with two utilities: XDIR and PROCESS. I suspect they're there because they were in the original RSTS product.

XDIR is a directory program with some capacities in excess of the VMS standard. I used it with the /location = (base, extents) option in my benchmark. It has extensive listing file formatting capacity. These listing files can be very handy in making up control files for file transfer, etc.

Another nifty capacity of XDIR is to sort your listing by almost any list element. For instance:

XDIR/SORT = LOCATION/LOCATION = EXT

produces a list of this directory in lbn order. Another noteworthy feature is the /by_location qualifier:

XDIR/BY_LOCATION = 123454

which tells you the name of the file that includes that logical block. This takes time, since a scan of the directory structure is indicated, but the facility is real and can save you, once in a blue moon.

The Feature:

XDIR/BY_FID = fid

finds and tells you the name and directory of a file known only by its file-ID.

The program is quite robust and worth more than a cursory glance. In the RSTS product, the speed of the XDIR equivalent was blinding. Not so here, but STI promises large improvements.

The really neat utility is PROCESS. Rather than "yet another" open file display, PROCESS can be spawned as part of your login.com, or on demand. Once spawned, a CTRL-F will deliver the display on demand right to your screen. This is super for programmers, while testing, and for knowledgeable production persons.

—Dave Mallery

Software Techniques Incorporated
6600 Katella Avenue
Cypress, CA 90630
(714) 895-1957
Hardware Environment: VAX/VMS
Prices vary with CPU.

Risk Free Trial Offer

Resolution

One more reason

We're Going Beyond the Competition

Our new higher resolution is only one reason to look into the Ditto 221XL, we have many other features as well. Dual host port ability, a large 14" screen and nation wide service to name a few. We also have greater options; a word processing keyboard, Tektronix graphics and the industry's lowest priced three year warranty. All of this adds up to reliability and quality at the best price around.

So call us today to find out more about the Ditto 221XL.

***DEC VT220 emulation**

*Ditto 221XL

Networx™
DATA PRODUCTS COMPANY, Inc.

188 Main Street • Northport, NY 11768
1500 Industrial Way #1 • Belmont, CA 94002

For More Information Call Within Your Region

(800) 447-9988

(800) 531-0019

In California Call (415)595-4330

In New York Call (516)754-2798

Ditto 221XL

Video Display Terminal

★DEC VT220 is a Registered Trademark of Digital Equipment Corp.

★Tektronix is a Registered Trademark of Tektronix Co.

ENTER 45 ON READER CARD

DBMS

RX FROM COGNOS

By Bill Hancock

For Applications Pain: Try *POWERHOUSE*!

Applications development is frought with pain. As with any endeavor, the ultimate goal is to survive with the minimum amount. Unfortunately, in the classic application development world, pain is normal, chronic, and frequently acute.

These days, however, there is a growing number of products that allow application development with minimal pain and minimal classic programming knowledge. These are called application generators, fourth-generation languages, or other select terms.

Many companies jump on the bandwagon to promote their product as a fourth-generation language or development tool, when it is, in reality, neither. *Datatrieve* is a good example: While it is quite true that it can manipulate data and allow non-programming personnel to create applications and define procedures, it still lacks a good screen builder and a reasonable procedural language.

DEC is quick to point out that the use of the Common Data Dictionary and other layered products allows all of the features of a fourth-generation development environment, but that is not true. Field-level validation is not available directly in TDMS, nor are pre-insertion triggers available in FMS. So, caution must be exercised with any claim that a company asserts (even a company as large as DEC) regarding an application development environment requiring no programming expertise.

In reality, most applications development environments provide certain basic tools: data definition utilities, screen builders, and, occasionally, some sort of procedural definition language. Beyond that, there's usually precious little else in the way of tools to help develop applications, and users of the packages must resort to tricks to get things done.

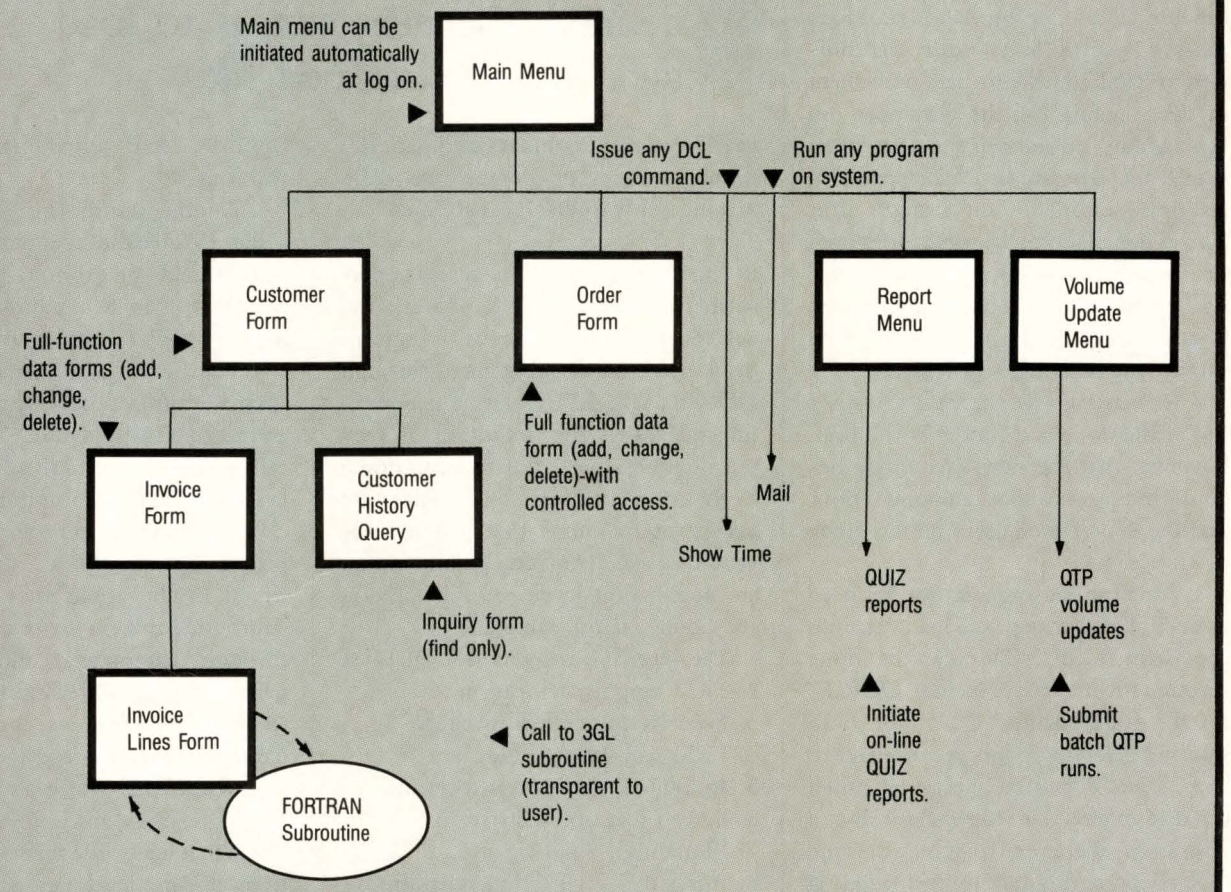
REALIZING THIS, an enterprising company named COGNOS created a powerful development kit named *POWERHOUSE*. Billed as a fourth-generation language and application development environment, *POWERHOUSE* lives up to most of the expectations of a non-programmer-oriented applications development environment, and also manages to provide the features of a database (such as transaction rollback), while operating against RMS files.

The *POWERHOUSE* development system consists of four main development facilities: *PhD* (the *POWERHOUSE* Data Dictionary), *QUICK* (the screen creation and transaction processor), *QTP* (the bulk file manipulator and processor), and *QUIZ* (a report writer). Through the harmonious interplay of the four components, a *POWERHOUSE* user can define somewhat sophisticated applications quickly, and provide a useful computing environment for consumers with minimal expertise.

It is important to note that *POWERHOUSE* is non-intuitive; i.e., you *must* read the manual set to make heads or tails out of how it works and what it's capable of doing. I usually dive headlong into a product to see how intuitive it is to the user, and I quickly found *POWERHOUSE* to require some preparation before use.

FIGURE 1.

Typical POWERHOUSE application.



HEAVY USERS of DEC products such as FMS and TDMS will be tempted to use cursor-control keys and tabs when moving between fields. *POWERHOUSE* will not be pleased, since it uses its own commands. A knowledge of the standard screen representations throughout the product set is extremely necessary for success in the generation of *POWERHOUSE* applications. Read the manuals first; a major degree of frustration will be removed.

POWERHOUSE applications are developed by defining the record layout into a central data dictionary (*PhD*), then, using the stored definitions to define screens and menus, and to report formats and bulk transaction procedures. Through the use of the data dictionary, *POWERHOUSE* provides a unique feature for file manipulation application builders: Transactions are performed against standard RMS file formats and not database-structured file(s).

PhD allows the application developer to define how a file or group of files will be organized, and how data will be represented in the file. This provides a great deal of assistance to the developer in the areas of help facilities, data pattern and storage definitions, security, and other related functions. In some

The QUICK component allows rapid construction of on-line interactive applications in which heirarchies of menu and data forms perform updates to files, issue operating system commands, or run other programs on system, including calling 3GL subroutines.

cases, the system automatically will generate data definitions for certain types of fields, depending on previous actions provided by the developer. Through this "intelligent dictionary" approach, the developer of *POWERHOUSE* applications is quite capable of developing data definitions quickly, with minimal effort. In addition to standard field-to-field movement methods (using //s), the developer can "chaingang" commands together into a single line, that causes *PhD* to perform multiple commands on a single line. This is useful as you become more proficient with the application but do not wish to spend time floundering between fields, using *POWERHOUSE*'s field movement command structure.

In other words, there's a new-user mode and an expert mode. You'll find, however, that the new-user mode becomes tedious in a short amount of time, and the expert mode will be the mode of choice.

After the data organization has been defined, the next step is to load data into the defined files. This can be done through the interactive facility, *QUICK*, or the bulk facility *QTP*. For bulk loading, *QTP* is strongly recommended, since *QUICK* definitely is better suited for the interactive user. Basically, a definition of the existing file (the one that contains the data to be loaded) is created in the dictionary, and a procedure is written that takes the data from the source file and loads it into the defined target file.

One of the strong points of *QTP* is its ability to provide data validation constructs, conditionals, calculations, and sort operations on the data as it's read from the source and placed into the target file. The effect is that a very highly customized file may be created that may contain new fields (based on calculations, tests, etc.) useful to the application being developed. Other *QTP* features include the ability to zero-out date information (for monthly or yearly reset operations), automatically generate rollups, or provide transaction posting with rollback capabilities.

After the data organization has been defined, the next step is to load data into the defined files.

INTERACTIVE APPLICATION access is performed using *QUICK*. First, the developer creates the menus and screens to be used, by defining them through *QDESIGN*. *QDESIGN* is quite powerful and allows the definition of very precise processing action to occur down to the individual field level. There are highly useful items that provide advanced screen definition capabilities that any application developer will appreciate. Some examples include:

1. Pre-insertion triggers (LOOKUPs)
2. Field range specification
3. Security restriction checking
4. Field pattern definition
5. Individual user access lockout
6. Screen function restriction
7. "Required" field input
8. Imbedded verification capabilities

In addition to the macro-features, the ability to specify highlighted fields (reverse video, bold, halftone, etc.), line drawing, custom field and text positioning (using row, column placement capabilities), and a variety of date display and search options, add to an impressive screen creation ability. Of particular note is the ability to show more than one screen at a time on a physical display.

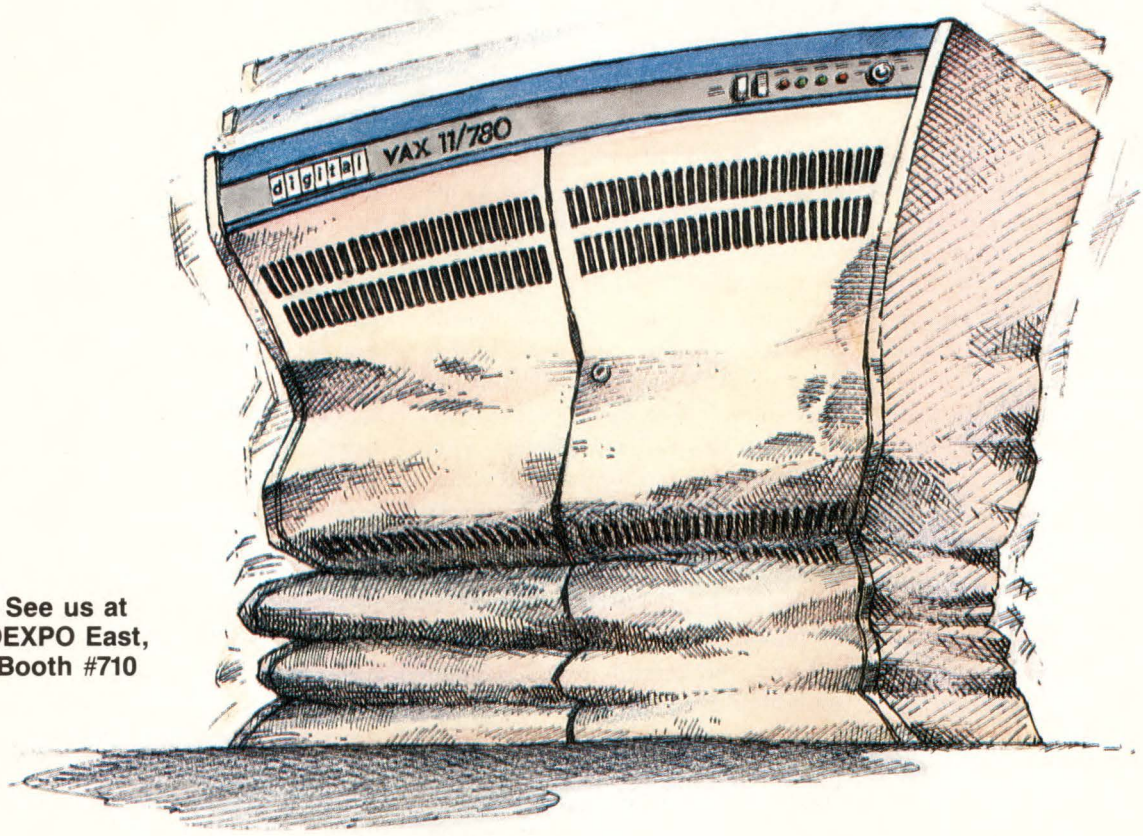
In the cases where a smaller screen might be the next logical screen in a path, it's possible to design screen applications in such a manner that the smaller screen actually may appear *on* the same screen as the previous screen, making screen display complexity very flexible, and allowing it when warranted.

Another useful set of features is the ability to force the screen to display only certain fields or prompts if a previous condition is met (conditional prompting), as well as pass information between screens in a manner similar to the way subroutines pass information back and forth. Finally, *QUICK* screens may call externally written subroutines (in languages that conform to the VAX/VMS calling standard), to provide additional processing capabilities that may be useful in the application. The called subroutine may be passed information through parameters, and also pass generated or modified information back to the *QUICK* screen, through parameters, as necessary.

While this feature may be used sparingly, it is a powerful tool for those shops that have code for special applications already developed, and may wish to use it in the *POWERHOUSE*-developed application. By the way, *QDESIGN* is quite capable of generating applications screens without developer assistance. This provides the ability to quickly create an application without a great deal of effort.

THE FINAL COMPONENT of *POWERHOUSE* is *QUIZ*, the report writer. With *QUIZ*, quick and dirty (but attractive) reports may be written quickly, simply by specifying the file

What to do when your VAX 780 is crippled at 4MB and you can't afford a new system.



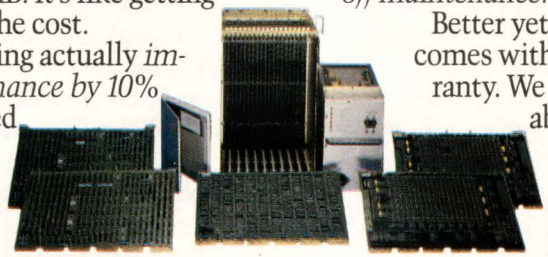
See us at DEXPO East, Booth #710

It's simple. Just replace your old 16K VAX® 11/780 memory with a new EMC memory subsystem.

And expand your present 4MB memory—in 8MB increments—all the way up to 64MB. It's like getting a brand new VAX for a fraction of the cost.

EMC's paired memory interleaving actually *improves your overall system performance by 10% to 30%*—before the benefit of added capacity.

And its state-of-the-art RAM technology increases memory reliability by 280%.



Our memory subsystem conversion also fits neatly into your CPU cabinet. Which means it extends the life of your VAX without extending its "footprint."

And for the first time, your 780 has all the extra capacity it needs for VAX clustering.

Extra capacity at no extra cost.

The cost of an EMC memory conversion is surprisingly low. For example, a 16MB conversion costs just $19,750. That includes the memory, a new backplane, dual interleaved memory controllers, interface card and power supply.

You can actually quadruple your memory capacity at no extra cost. *You can lease our memory system for the money you save by taking your old memory system off maintenance.*

Better yet, each EMC memory subsystem comes with an unconditional lifetime warranty. We also offer 24-hour replacement absolutely free.

For more information—or to order—call the toll-free number below today. Or write EMC Corporation, 12 Mercer Road, Natick, MA 01760.

And turn your 4MB weakling into a 64MB powerhouse.

For more information or to order, call

1-800-222-EMC2

(In MA, call 617-655-6600)

In Canada: 416-922-0419; European Headquarters: In London (088385) 2434; International Number: + 4488385 2434; U.S. TELEX 948615 EMC CORP NTIK.

VAX is a registered trademark of Digital Equipment Corporation.

EMC² No one is more committed to memory.

ENTER 21 ON READER CARD

COGNOS offers technical newsletters, access to various user groups, educational services, consulting support, telephone assistance, and a service called Application Exchange . . .

name (which implies its dictionary definition), telling *QUIZ* which fields to report on, and telling it to GO. A fairly useful report is generated, which is quite suitable for most reporting needs.

Of course, *QUIZ* provides a much more sophisticated report writer capability for those developers desirous of nifty looking reports. Multiple files may be included in the report generation; headers, footers, margins, fillers, justification and other layout commands may be specified. Developers also may take advantage of screening operators (such as record selection and if-then functions), field concatenation, sorting, creation of intermediate or external files, computation functions, and many other features.

One attractive feature is run-time prompting for conditional operations. This can be useful if a generic report facility is desired with occasional customization of exclusion of records. Companies in need of bulk letter creation will find *QUIZ* features useful. Form letters are a breeze to create and manipulate and label generation is about five lines of *QUIZ* commands.

I found *POWERHOUSE* to be flexible and quite capable of handling the tasks put to it. Of major concern was its performance. In my experimentation, I found that ill-defined procedures could wreak havoc on an out-of-the-box VAX 11/785, and cause serious page-faulting problems. I also found *POWERHOUSE* to be memory hungry. Disk I/O was heavy in some instances, but that was to be expected; after all, its purpose is to manipulate files and provide an application execution environment.

I DISCUSSED *POWERHOUSE* performance with some knowledgeable COGNOS personnel, and was told that there are plans to rectify the problem. Exact time frames were not disclosed. I found that adjustment of VMS parameters for an I/O-intensive environment, and adjustment of process parameters to allow extensive working set sizes, yielded the best performance results.

Another item that helps, is the use of batch procedures in the pre-setup of application files. In short, use of *QTP* to format and sort application files in a certain way, or creation of a master application file with necessary information, tended to yield better application performance. Think ahead when defining *how* an application will execute, and when its various sections will be used. Then, it's possible to set up the application so that its performance can be improved dramatically. Proper definition of screens, procedures, and application flow, did more to improve application performance than any other technique attempted.

In the purchase of any application product for use in a computing environment, it's important to understand what happens after the sale. COGNOS has a well-trained support staff that can handle most problems. There is also a "well-groomed" sales force.

COGNOS is a profitable, successful company with an impressive customer list (including an unusually large number of installations at DEC) and personnel. Updates seem to be easy to apply, the documentation is good, and COGNOS personnel are accessible.

This all may be due to the company's origin as a consulting firm. Such a beginning gives a company an understanding of the need for good, reliable service. COGNOS offers technical newsletters, access to various user groups, educational services, consulting support, telephone assistance, and a service called Application Exchange which allows *POWERHOUSE* users and developers to exchange developed applications, preventing new users from having to start from scratch.

As with any company, COGNOS was reluctant to discuss the future, but the customer rumor mill proved interesting. While there were the standard "this will be improved" and "that will be improved" responses, a recurring comment was the imminent placement of *POWERHOUSE* on top of the DEC *Rdb*/VMS product.

THIS MOVE could be very valuable to both COGNOS and DEC, since *Rdb*/VMS is notoriously poor in the area of application development tools and screen builders (FMS and TDMS are tedious, and ACMS is not full featured). With the addition of *POWERHOUSE* to *Rdb*/VMS, *POWERHOUSE* users not only could develop applications with

RMS files, but also exchange data between RMS files and *Rdb*. (This is currently difficult to do, and usually requires external-loading programs, or the use of the dreaded *Datatrieve* to perform bulk loading facilities.)

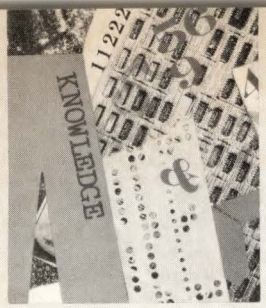
Rdb users also may receive a good development environment, fulfilling a dual function: Should *Rdb* be inappropriate for certain operations, RMS files can be used. Also, *POWERHOUSE* is much easier to use than *Rdb*'s *RDO* and *Datatrieve*, so applications can be developed much faster. If the winds sing correctly, this enhancement could prove substantial for DEC and COGNOS.

POWERHOUSE is a useful and productive product. Its performance is lacking in some areas, but this can be compensated for, to some extent, by proper application flow definition and presetting files. Caution should be exercised in application development, however, not to be caught in the web of bad standards and development methodology.

If application development is traditionally a pain for you and your company, you may find *POWERHOUSE* to be a stiff shot of Novacaine. As with that anesthetic however, expect a small initial pain (reading the documentation) in order to alleviate the large, nagging kind. If your discomfort continues after *POWERHOUSE* therapy, you may find that you enjoy pain, and would achieve true happiness using a 3083 equipped with *IMS*!

Bill Hancock is an independent systems and network consultant in Arlington, Texas.

POWERHOUSE
Cognos Corporation
2 Corporate Place, I-95
Peabody, MA 01960
(800) 4-COGNOS
Hardware Environment:
VAX/VMS
Supports *RMS* and *RdB* data management systems.
Prices available upon request.



DBMS

INTELLIGENT DATABASE MACHINES

By Philip A. Naecker

Britton Lee's Hardware Approach To Database Management Can Lead To Efficient And Host-Independent Database Access. Part 2.

In Part 1, we discussed the issue of special-purpose versus general-purpose database solutions, the architecture of the Britton Lee, Inc. (BLI) database machine, and the options available using this hardware approach. Now, we will look at host software, distributed processing, and redundancy.

The BLI database machines don't really have a user interface. The functions of query processing and display of results are left to the host computer, which communicates with the database machine in a proprietary protocol packaged within a public communications protocol, such as IEE-488 or XNS. The term "host" may be misleading, though, since it can refer merely to a low-end PC that allows users to compile requests in a language such as SQL, or using one of the several end-user query generators.

At its simplest level (if not the simplest to use), you can query a BLI database machine by constructing a query in SQL or IDL (a BLI variant of QUEL, and yet another SQL-like query language for relational databases). For an application developer or experienced database user, this is a perfectly acceptable, and perhaps even efficient, means of accessing data. IDL and SQL are supported on all hosts that interface with the database machines. BLI states that its SQL is compliant with the recently proposed ANSI Standard for SQL.

Third-generation language programmers also can write programs with imbedded SQL or IDL code. These programs then are precompiled to use subroutine calls to a standard BLI run-time library, and passed to the host language compiler. Alternately, the programmer can make calls to the run-time library directly. Not every host and operating system supports all the languages, but on the VAX, there is a C precompiler, and a FORTRAN precompiler is said to be on the way.

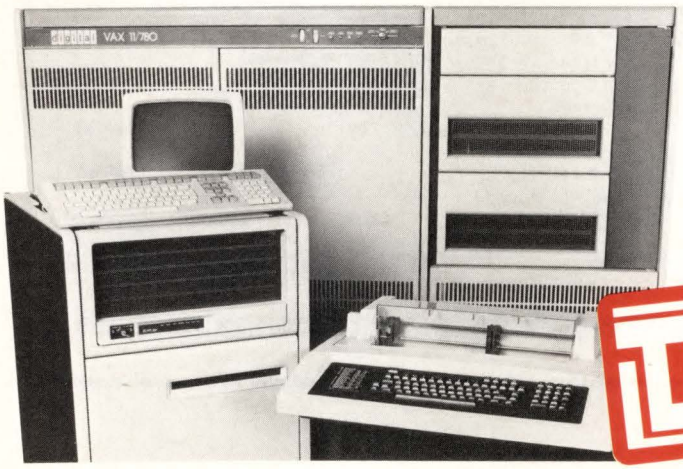
There also is a version of *OMNIBASE*, available from Signal Technology, Goleta, California that uses the BLI machines as a database back end. *OMNIBASE* is an application development package designed to aid users in managing data, and as a run-time library for programmers to call for data manipulation.

OMNIBASE provides a number of ways to develop applications that access the database machines, including a pair of components called *SmartDesign* and *SmartQuery*. *SmartDesign* lets you build a form using an FMS-like forms editor, then create a database directly from that form. It's about as easy as falling off a log. Then, using *SmartQuery*, you or someone else can operate on that database — adding, deleting, modifying, and retrieving data. Both systems are fully supported by online help that's more than adequate for most casual users, as well as for those with significant experience.

With *SmartQuery*, you can do a fill-in-the-blank type of query, including Boolean

The Dynalectron Service Network continues to grow in the product lines it expertly supports. From micros to minis to mainframes, and their peripherals, we offer the most efficient, high-quality, one-stop DEPOT SUPPORT service possible.

Our new THREE DELTA DIVISION has spent over a decade specializing in the repair and service of DEC computers and their subassemblies—from LSI to VAX. You can expect 10-working-day-turnaround, with expedite services available. And a 90-day warranty on all parts and labor.



You can also expect all repaired units to be dynamically tested on host computers to help ensure integrity and full functionality.

Best of all, you can expect all this efficiency and quality at repair prices from 15% up to 25% LESS than DECmailer.

Besides being d'experts on DEC equipment, THREE DELTA specializes in repairing core and semiconductor memory systems.

d'World of DEPOT SUPPORT service is here. All divisions of The Dynalectron Service Network offer only one product. Service—to help make YOU more competitive. Call today.

d'World Of Depot Support Service Is Here.

DEPOT SUPPORT™

ANNOUNCING:
Repair Service for Micro VAX II.

See us at DEXPO East Booth #1046

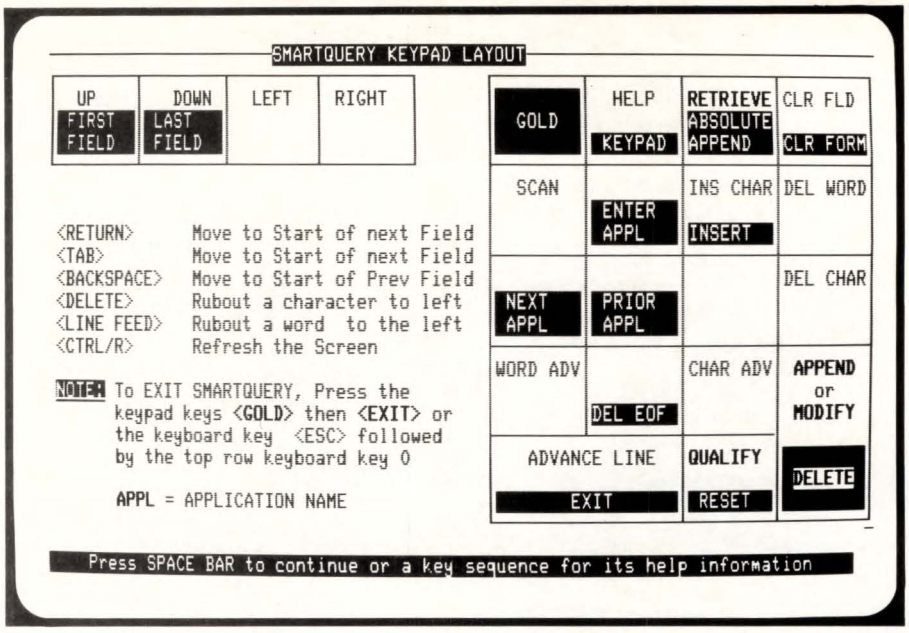
The Dynalectron Service Network

1875 Whipple Road
Hayward, CA 94544
(415) 489-6996

ENTER 74 ON READER CARD

We Are d'Experts On DEC Repair.

The **SmartQuery** *Keypad functions for VT100- and VT200-series terminals.*



logic statements like "greater than," "less than," and "not equal to." You can create such queries using the keypad on your VT100 or VT200 terminal, touching the main keyboard only to input search elements, such as names or numbers (see Figure 1).

You're not going to build full-blown, disk-crunching relational database applications using these tools, but they certainly give non-sophisticates access to relational techniques. Of course, databases created using *OMNIBASE* also can be accessed via any of the other host software tools available for the database machines, and vice versa. I used *SmartDesign* and *SmartQuery*, and found them to be consistent. They are a reasonable compromise between power and ease of use.

Also available on the VAX, is a tool called *Freeform*, from Dimension Software Systems, Inc., Grand Prairie, Texas. *Freeform* is more of an application generator, and not quite as geared to the end-user. But it has powerful retrieval methods, and provides good assistance for the user trying to do a sophisticated query. Besides running on VAXs under VMS, *Freeform* also is available under UNIX and PC-DOS.

BLI has the PC software market well covered. Another product called *PC/SQL*, from Boulder, Colorado-based Micro Decisionware, has been out for over a year, providing users with query access to relational databases on the BLI database machine. BLI co-markets *PC/SQL*. Since virtually every one of its sites has at least one PC, the market seems significantly large.

PC/SQL walks the user through the creation of SQL statements to retrieve information from the database machine. Using a windowing scheme close to the familiar "index card" paradigm, the user walks through a tree of questions to build a valid series of SQL statements. Once the query is complete, a keystroke sends the results off to the database machine. The machine returns the results as a single relational table that the user can view, or convert to another, more useful format. Included with the software, is the capability to convert the results to several standard spreadsheet formats (*SYLK*, *Lotus*, etc.), as well as the capability to form a coherent display of the results on the PC screen.

As of today, there is no update capability included with *PC/SQL*. This is not unlike a number of other end-user tools for relational databases. The problem with updating, is that there is a lot less room for ambiguity in the specification of the records of interest. After all, if you perform a query and get a few extra records or fields, you probably won't care. But, if you access a few extra records for an update of your shipping database, you might get some nasty calls from customers asking why their bills are so large this month! Of course, the BLI databases support all the traditional access protections to prevent unauthorized users from modifying the database, but that's not the issue here. In a friendly end-user database access tool, it's tough to make sure that a user who has the right to modify the database, performs only the modifications intended.

PC/SQL has a number of other convenient features. First, you can select the database machine from any on the XNS network, or you can select one connected via a PC RS232 link. If you want, the machine, and even the data-

. . . "metadata," literally, is "data about data" . . .

base of interest (there may be many databases on a single database machine), can be specified in a startup file on the PC, so the user need not even know how to connect to the database machine.

The fact that you're dealing with a relational database itself, provides the best indication of ease of use. One attribute of a true relational database is that all the information about the structure of the database *is itself stored in the database*. This information, called "metadata," literally, is "data about data," and is stored in special parts of the database called the "system relations." All databases have the same system relations, which describe things such as the data relations found in the database, the type and size (number of bytes) of all the fields in the database, the fields found in each relation, the keys or indexes in the various relations, etc. For a product such as *PC/SQL*, the system relations are a gold mine. *PC/SQL* downloads the system relations the first time it opens the database; then, it can tell the user all about the database.

How does it download the system relations? Since system relations are exactly like any other data in the database, *PC/SQL* just generates some SQL statements to query the database machine, which politely returns the system tables as data to the PC!

For example, suppose a novice user asks *PC/SQL* for information from a particular database. The user may not even know the names of the fields in the database, or the names of the relations. He doesn't have to: *PC/SQL* finds the information by querying the system relations. If the user says, "I want some

information," *PC/SQL* puts up a menu with the names of all the relations in the database, and asks the user to select the one he wants, with the cursor.

Besides making navigation of the database simpler, this approach also reduces keystrokes. If there's a database you access repeatedly, *PC/SQL* allows you to save the metadata definitions on the PC. Hence, it doesn't have to perform that metadata query and download each time you do an information retrieval.

Now, there's nothing magic about the BLI database machine that makes the operation of *PC/SQL* better than with any other relational database. All "true" relational databases have the same kind of system relations, with the same kind of available information. But a tool like *PC/SQL*, lets casual users with PCs get to a vast corporate database stored on a database machine, and do useful things with the data. Since the SQL statements generated by the menus are plainly visible on the machine, *PC/SQL* also is a teaching tool to help new or occasional users learn SQL for direct database access.

There are other user interfaces for access to the BLI database machines, but as of this writing, they aren't yet fully available. Among them, is a product called *BL Today*, from BBJ Computer Services, Inc., an Australian company with offices in Santa Clara, California. This is a powerful application-generation tool closer to systems like Cognos' *Powerhouse* (see article on page 80), *Focus*, from Information Builders, Inc. of New York City, or DEC's *Rally*. Look for reviews of *BL Today* and *Focus* in upcoming issues.)

BL Today is written in C. It is the intent of BLI to port it to all of its major markets, including VMS, all of the UNIX variants, and PC-DOS/MS-DOS. The PC-DOS version is about to enter alpha testing, thus, it may not be too far off. Already, there are entire applications developed in *BL Today* that are on the market as standalone vertical applications running on BLI database machines. Some cost as much as $100,000.

Distribution And Redundancy

If you spend much time looking at database solutions, you'll soon find each vendor claiming to have a "relational database." Sadly, most vendors offer products having woefully few relational features, much less adhering to the relational approach entirely. Some claim "this" or "that" relational feature, then discount the other tenets of the relational model with statements such as, "That feature's not needed in the real world," or, "That feature isn't consistent with good performance."

Today, having a relational database is not like being pregnant — you *can* be partially relational, but the most worthy vendors admit their products don't have all the relational attributes that a perfect relational database should have. They state openly that they're seeking ways to add additional relational capability. For those looking at BLI as a relational database solution, I'm happy to report that the company falls into this latter category.

Distributed Processing

Distributed capability is one of those features that the less sophisticated vendor calls "unnecessary." But nowadays, it's not enough to have a fantastic relational solution; it's essential that it be distributed, too. Distributed processing requires more than just spreading the disks out over the computer room or the state, however; it necessitates a far more rigorous design and implementation of the relational approach. And, like all other relational features, there are various degrees of support for the distribution of databases.

If you'd like to have a database exist simultaneously at several locations, BLI database machines may be the solution. For these machines, the situation is meaningful only when the synchronization between databases is on the order of minutes, and not instantaneous. For example, one BLI customer has phone directories throughout West Germany. Each machine has many operators performing simultaneous queries and updates to the database propagate, through all the machines, and in a matter of thirty minutes or so.

This sort of update process, where copies of the database are maintained in a loosely coupled fashion, obviously would not suffice if the data were bank balances instead of phone numbers. First, bank balances change a lot more frequently than phone numbers (and mostly in a downward direction, it seems). Second, I wouldn't want to keep my money at a financial institution that allows a husband and wife to simultaneously withdraw their entire balance from two different branches!

The truly distributed database requires a two-phase commit. A "commit" is database lingo for telling the database to make the change permanent. The opposite is a "rollback," in which the transaction actually is rolled back, as if it never occurred. For you database types, a two-phase commit reduces to roughly the following steps:

1. Tell database A to prepare to commit.
2. Tell database B to prepare to commit.
3. Wait for both A and B to tell you everything is OK.
4. If both databases answer in the affirmative, tell both databases to commit; otherwise, tell them both to rollback.

A database may tell you it can't commit for a variety of reasons. It may be that someone just pulled the plug on the disk, for example. Or, perhaps it doesn't tell you anything at all — the communications line was cut by the phone company. In any case, at least you have a fighting chance at keeping both databases in synch.

I say "fighting chance" because of one small problem that I don't believe commercially available database management systems have solved: What if both databases answer the affirmative to

In most cases, a little human intervention, should the database say "I'm confused," isn't such an intolerable thing . . .

step three, but in step four, it turns out one of them lied? For example, in that fraction of a second between the time the database says "OK," and the mediating host gives the go-ahead to commit, the communications line might go down or the disk head finally hit that proverbial floating smoke particle.

Simply put, although the database *claimed* it was ready to commit, it couldn't make good on the promise. This problem requires what is called a "three-way handshake," and a great deal of code to implement the solution, which only recently has been understood in the technical literature. Of course, you may not care about this relatively low-probability event, unless you are a bank making transactions for millions of dollars. In most cases, a little human intervention, should the database say "I'm confused," isn't such an intolerable thing, as long as both databases know that things are "not right" and it's something that can be fixed once both machines come back up.

BLI says it is working on a two-phase commit, but as of today, BLI database machines can't give you this Nth degree of functionality. What they *can* give is good redundancy for access to a single database, much like the shared disk access on VAXs. In this scheme, called a dual system, database machine A is given both read and write access to the database, while machine B has read-only access. This provides a good measure of redundancy if either database machine fails. Crossover from one machine to the other in the case of a failure is mediated by the host (no simple task in itself). And, since this scheme is based on dual-ported disks, what we really are talking about is redundant data access rather than true distribution of the database. Together with disk shadowing, however, this level of redundancy may be all you need in your database product.

Is It Good Enough?

Now that we know that the BLI answer has several advantages over some of the software-only solutions available in the relational database market, you may want to know about some of the shortcomings of this approach and its specific implementation.

In Part 1, we discussed the potential pitfalls in the price/performance game. Whether price/performance is a big enough win depends on your specific circumstances with respect to capacity, expansion, the size of your existing and potential new database applications, frequency of use of the database machine, and related factors.

One potential difficulty in the BLI implementation is that it doesn't provide support for "cursors." Simply put, cursors are pointers into streams of records being passed from the database to the application. They allow the application to get a single record at a time. With multiple cursors, the application can even hang onto a record from "here," another from "there," and make decisions based on both records.

One use of cursors is to imbed an update in a query. Your program can construct a query with an update inside the loop that's retrieving the records in a one-at-a-time fashion. Then, if you decide you want to update the "current" record, a cursor will let you tell the database which record you're referencing. In the BLI case, you'll have to use the current record to construct a unique key, then submit a new record stream (from within the query record stream, if you like) to update that record. A bit of a pain, but not disastrous unless this type of operation is a frequent one in your application environment.

Another limitation is that only C currently is supported by a precompiler. Although a real database jock may want to diddle with calls to the database, for the most part you want the development assist of a good precompiler. Not only is it easier to imbed a fourth-generation language (e.g., SQL) code inside your program, it takes fewer lines of code to write an application using a precompiler. And, a good precompiler often actually can improve performance over what a non-jock might generate.

Not many data management programmers are fluent in C, and C is not known for lending itself to highly maintainable code. A FORTRAN precompiler is on its way, I'm told, but there is no mention yet of a precompiler for COBOL or other languages.

There also has been a lot of press in the past year or so about Britton Lee having difficulty keeping customers. When I asked about this, the firm admitted some problems leading to some customers abandoning their machines. It also accepts blame for some problems in the area of hardware and software support after the sale. But in at least some cases, it appears the problems were the same as for many software-only databases — the customer underestimated the resources required to get a large project up and running. Of course, with a software product, no one can tell

whether it's running or not, so perhaps we shouldn't be so hard on BLI or the customers who've pulled their machines.

My assessment of the BLI offerings is that they are well crafted. There seems to be a solid commitment toward a first-rate relational database, and it certainly isn't a here-today, gone-tomorrow organization; not with roughly $30 million in annual revenue and an installed base of 600 IDMs and a bunch of RSs.

What I saw in two days (not much time), was that the firm has a good product that fills an important niche in the information management market: that of a data sharing device between dissimilar machines. I am most impressed with the richness of the user software offerings, and with the breadth of choices in hardware and host environments. There simply are not that many alternatives available if you want to access a database from PCs, VAXs, and other large hosts. The languages offered are good implementations of the various flavors of SQL, and I found the error messages to be clear and well formatted.

If you find you need a database machine, Britton Lee should be near the top of your list.

Philip A. Naecker is a Southern California-based consulting software engineer.

Britton Lee Intelligent Database Machines
Britton Lee, Inc.
14600 Winchester Boulevard
Los Gatos, CA 95030
(408) 378-7000
Price: From $50,000 (Relational Series 310) to $300,000 (IDM 500XLE).

BL Today
BBJ Computer Services, Inc.
2946 Scott Boulevard
Santa Clara, CA 95054
(408) 727-4464
Hardware Environment: Runs on more than 60 different operating systems and computers, including VAX/VMS, most UNIX and XENIX minis and micros, MS-DOS, and HP3000, 9000, and VECTRA systems.
Price: From $950 to $15,000, depending on configuration. Runtime library — from $150 to $6,000.

Freeform
Dimension Software Systems, Inc.
605 East Safari, Suite C3
Grand Prairie, TX 75050
(214) 262-8201
Hardware Environment: Britton Lee database machines; VAX UNIX, ULTRIX, VMS systems. Also, ATT UNIX System 5, IBM PC MS-DOS, Alpha Micro.
Price: From $7500 to $25,000, depending on configuration.

OMNIBASE
Signal Technology, Inc.
5951 Encina Road
Goleta, CA 93117
(805) 683-3771
(800) 235-5787
Hardware Environment: Britton Lee IDM or RS 310.
Price: From $21,000 for a MICROVAX II/IDM configuration, to $50,000 for a VAX 8600/IDM configuration.

PC SQL
Micro Decisionware
2995 Wilderness Place
Boulder, CO 80301
(303) 443-2706
Hardware Environment: Britton Lee database machines; IBM MVS, VM; Teradata database machines.
Price: $5,000 for the first five PC licenses, to $295 for 500 PCs or over.

"and we meet at the Invitational Computer Conferences throughout the world"

For 16 years, the "OEM Only" ICCs have brought OEM manufacturers to where the volume buyers live and work. And only the ICCs cover 17 major OEM territories throughout the U.S. and Europe — time and cost efficiently.

In one day, regional design engineers/system integrators can attend a full day of high-tech seminars and meet with major OEM suppliers of mini/micro computers, disk/tape drives, printers, terminals, controllers, etc. And the ICCs unique business hospitality format, unlike big national shows, make it easy for manufacturers to meet their invited guests one-on-one. So don't miss out! If you are a computer and peripheral OEM manufacturer, call us today to reserve space. If you are a volume buyer, call your local OEM supplier, or our offices, for an ICC invitation.

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

In Europe, contact C. J. Nicholl & Associates, Ltd., 37 Brompton Road, London SW3 1DE, England, Phone 01-581 2326/9, Telex 888068 CJNAD G.

1986/87 U.S. SERIES:
Newton, MA – 9/4/86
Dallas, TX – 9/16/86
Minneapolis, MN – 9/30/86
Gaithersburg, MD – 10/16/86
Westlake Village, CA – 10/28/86
Irvine, CA – 1/8/87
Ft. Lauderdale, FL – 1/29/87
Raleigh, NC – 2/19/87
Austin, TX – 3/3/87
San Jose, CA – 3/17/87
Nashua, NH – 4/2/87

1986/87 EUROPE SERIES:
Munich, W. Germany – 9/10/86
Stockholm, Sweden – 9/16/86
London, England – 9/22/86
Frankfurt, W. Germany – 1/22/87
Paris, France – 1/27/87
Milano, Italy – 2/3/87

ENTER 271 ON READER CARD

HARDWARE

VT200 SERIES

Gateway To The Computer, Part 3.

By Eliezer May

Editor's Note: In Part 2 of this series, we explored the evolution of the VT200, the ANSI terminal standards, seven- and eight-bit codes, control codes, and keyboard functionality. Now we look at the area of host control of the VT200 terminal.

Bi-state functions of the VT200 series terminals are controlled by an escape sequence ending either in "h" (high — set) or "l" (low — reset). These functions include smooth or jump scroll, normal or reversed video screen, 80- or 132-column mode, and others. The only exception to this rule of which I am aware is application or numeric keypad mode.

Figure 1 shows the format of the sequences. The <numeric-digits> are one or two characters in the numeric range 0 to 9. Sequences defined in ANSI 3.64 are represented in the first two lines of Figure 1. Sequences added by DEC in compliance with the ANSI 3.64 standard guidelines of the "h" and "l" bi-state controls include a question mark, as in the last two lines.

Cursor Control

Host software can position the cursor in absolute or relative terms. As in "h" and "l" clans, the numbers used here are sequences of numeric characters and not the ASCII character defined by a numeric value. For example, 32 would be the character 3 followed by the character 2, and not a space whose decimal value is 32. To move the cursor to absolute coordinates, send either:

```
<CSI><top-row-number>;
  <bottom-row-number>f
```

or

```
<CSI> <row-number>;
  <column-number>H
```

The new position is relative to HOME (upper left-hand corner), or relative to the scroll region, depending on whether the user-defined origin mode (DECOM) was set.

You also may move the cursor a specified distance in any of the four directions from the current position. The sequences for this are:

1. <CSI> <distance> A Up
2. <CSI> <distance> B Down
3. <CSI> <distance> C Right
4. <CSI> <distance> D Left

Note, that each has the same associated direction as that in the codes sent by the terminal for each of the directional arrow keys.

Other codes that affect cursor position are back space, carriage return, line feed, IND (INDex), RI (Reverse Index), and NEL (NExt Line). The back space returns the cursor one position backward if not in column one. The carriage return moves the cursor to the first column of the current line. The line feed advances the cursor to the next row without affecting the column position.

Note that host software often returns both a carriage return and a line feed when the user presses the carriage return key. IND (or <ESC>D) also moves the cursor down one line, and, if at the bottom of a scroll region, scrolls up the text one line leaving the bottom line of the region blank. RI (or <ESC>M) moves up one line, and, if at the top of the scroll region, causes the text in the region to scroll down one line leaving the top line of the region blank. NEL moves the cursor to the first position of the next line. (See "VT200 Series Gateway to the Computer, Part 2," *DEC*

FIGURE 1.

VT100 Mode	VT200 Mode
A. <ESC>[<numeric-digits>h	<CSI><numeric-digits>h
B. <ESC>[<numeric-digits>l	<CSI><numeric-digits>l
C. <ESC>[?<numeric-digits>h	<CSI>?<numeric-digits>h
D. <ESC>[?<numeric-digits>l	<CSI>?<numeric-digits>l

The format for bi-state functions of the VT200 series terminals.

FIGURE 2.

<CSI>0;1m VT200 <CSI>22;4m Terminal <CSI>24;7m Attribute . . .
. . . <CSI>0;5m Control <CSI>1;4;7m Example <CSI>0m

A sample attribute-control command sequence.

FIGURE 3.

<CSI> 0 J or <CSI> J	Erase from cursor to end of screen
<CSI> 1 J	Erase from beginning of screen to cursor
<CSI> 2 J	Erase entire screen
<CSI> 0 K or <CSI> K	Erase from cursor to end of line
<CSI> 1 K	Erase from beginning of line to cursor
<CSI> 2 K	Erase entire line

The commands for erasing.

PROFESSIONAL Vol. 5 No. 10, October 1986, for C1 code definitions.)

Scroll Region Control

At any given time there's only one scroll region on the terminal. However, host software can change the location of the region at will. To define the scroll region, send the following sequence:

```
<CSI><top-row-number>;
 <bottom-row-number>r
```

Scrolling control is performed in conjunction with moving the cursor up or down while in the scroll region, and on reaching either the top or bottom of the region. The specific codes are defined in the cursor control section. Scrolling only can be performed vertically. Hopefully, horizontal scrolling also will be added one day. This would allow more powerful window support, in vogue today.

Tabulator Control

Host software can clear all tab stops, clear a specific one, or set tab stops at will.

To clear all tab stops, send the sequence:

```
<CSI> 3 g
```

To clear a specific tab stop, move the cursor to the specific column, and send the sequence:

```
<CSI> g
```

The use of reverse video display adjacent to reverse video and bold, gives successful results.

To set a specific tab stop, move the cursor to the specific column, and send the sequence:

<ESC> H or HTS (210 octal)

The cursor advances from the current position to the next tab stop when receiving a tab character. A problem that occasionally arises on login is that most of the terminal is blank, and meaningless characters are displayed in column 80. This results from the display of the welcome message, which starts with a tab character on a terminal with no tab stops defined.

Attribute Or Video Rendition Control

Text is displayed in any combination of four video attributes:

1. Normal intensity or bold
2. Underscored or not underscored
3. Blink or no blink
4. Normal video or reversed video.

You also can change the current setting of the video attributes at will. The format of the command is:

<CSI> <Attibute-Code> m

or

<ESC> [<Attribute-code> m

The command also can change more than one attribute by separating the attribute codes with semicolons. The basic codes are as follows:

0	Turn off all attributes.
1	Turn on bold intensity.
4	Turn on underscore.
5	Turn on blink.
7	Turn on reversed video.

New controls that turn off individual attributes have been added to the VT200 series. These codes are:

22	Turn off bold intensity (return to normal intensity).
24	Turn off underscore.
25	Turn off blink.
27	Turn off reversed video (return to normal video).

The assignment of the numeric characters from 0 to 7 is defined in the ANSI 3.64 standard. The gaps in the sequence are a result of DEC's implementation of a subset of the defined options. The nonimplemented functions are low intensity (2), italics (3), and rapid blink (6). Given this numeric character assignment, all but one of the sequences that turn off attributes make sense.

In these sequences the character 2 is added before the identifying digit of the attribute; however, turning off bold intensity logically would be 21 and not 22 — it looks as if someone simply made a "typo." (By the way, 21 does not work on a DEC VT200 series terminal, but has been used by some compatible terminal vendors.)

Another explanation is that 22 is meant to cancel both low and high intensity, and that the choice of 22 is misleading since low intensity is not implemented.

Let's look at an example of attribute control. If we wanted to display "VT200 Terminal Control Example" where "VT200" is bold, "Attribute" is in reverse video, "Terminal" is underscored, "Control" is blink, and "Example" has all attributes set, we would send the sequence shown in Figure 2 (in a continuous sequence and not on separate lines as illustrated).

The use of reverse video display adjacent to reverse video and bold, gives successful results. Some applications of this include displaying the top half of double-high text in reverse video, and the bottom half in reverse video and bold; or, the simulation of "light switches" by displaying OFF in reverse video plus bold, and, directly below, displaying ON in reverse video. The switches might be contained within a box drawn using semigraphic characters, and supporting software could invert the "switch" positions.

Character Size Control

The terminal can display three different sized characters; however, the setting of a character size is for an entire line. All text of that line is displayed in the given size. To set a line to a specific size, position the cursor anywhere in the line, then issue the line size control command. The commands are as follows:

1. <ESC> # 3 Top line of double-high and wide text
2. <ESC> # 4 Bottom line of double-high and wide text
3. <ESC> # 5 Normal sized text
4. <ESC> # 6 Double-wide text.

To display text in double height and width, you must set

CONQUER REELTIME.

SAVE REEL MONEY.

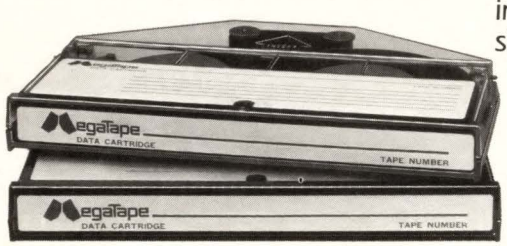
If you have large Winchester disks to back up, you're spending thousands per year in salaries, media, and CPU time.

Consider the MegaTape alternative: painless, foolproof, and fast. And according to a recent University of California report, direct cost savings will completely pay for the system in less than a year!

Each compact MegaTape cartridge holds 432 MB (formatted, 32K blocks). So backing up an entire RA-81 or Fujitsu Eagle drive is as simple as popping in a cartridge and pushing a button.

The low-cost MegaTape drive interfaces just like a 9-track, and the built-in cache means no software modifications. It works with any DEC operating system, on all PDP-11 and VAX family machines. Advanced ECC assures virtually perfect data integrity.

So call today. We'll prove to you that disk backup doesn't have to be an expensive, time-consuming ordeal. With MegaTape, it's so simple, it's un-reel.



(818) 357-9921/TELEX 5106007131

MegaTape Corporation, P.O. Box 317
1041 Hamilton Road, Duarte, CA 91010

MegaTape

The great leap forward in backup.

ENTER 297 ON READER CARD

One of the most significant developments in IBM ASCII terminals is the one you may never use.

Announcing an IBM first: the three-year ASCII terminal warranty.

Here's how it works.

Should you have a problem with any of the three elements* of an IBM ASCII terminal purchased after June 15, 1986, just take the problem element to any IBM Service Exchange Center or IBM authorized remarketer.

They'll exchange the non-working element for one that works. So you'll be on your way with a minimum of downtime.

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

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

IBM's unique plug-in emulation cartridges.

Emulation	3161	3162	3163	3164
ADDS Viewpoint	X	X		
DEC VT220/100/52		X		
DEC VT100/52			X	
DEC VT220 w/Hot Key/ 3708		X		
Hazeltine 1500	X	X		
Lear Siegler ADM-3A	X	X		
Lear Siegler ADM-5	X	X		
TeleVideo 910, 910+, 912, 920, 925, 925E	X	X		
TeleVideo 950			X	
WYSE 50/50+		X		
IBM 3101	X	X	X	X
Enhanced IBM 3708 Attachment	X			

Introducing the 132-column IBM 3162.

But our three year warranty isn't the only significant development in IBM ASCII terminals.

There's our new full-function 3162.

It features a crisp, clear, readable 7 x 12 character matrix.

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

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

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

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

New developments in emulation.

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

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

What isn't new.

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

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

For more information, contact IBM or your marketing representative. Or call 1 800 IBM-2468, Ext. CM/936 for the IBM authorized supplier nearest you.

IBM®

This limited warranty applies only to ASCII terminal models 3161, 3162, 3163 and 3164 purchased from IBM or an authorized IBM supplier in the U.S. and Puerto Rico. A 3-month limited warranty is also available. For more information on the warranty, contact your authorized IBM supplier.

*Keyboard, display and base.

ENTER 320 ON READER CARD

two adjacent rows to be the top and bottom halves, using sequences 1 and 2 above respectively. The text also must be sent twice in perfect alignment in each of the rows. Failure to align the text properly yields strange results. The attributes of each half may be different.

Also note that in double height/width and double width you only can display half of the number of characters possible in normal mode (40 or 66). Finally, semigraphic characters do not properly connect between normal sized lines and any other size line. Double height/width semigraphics characters align with those on double-wide lines, but the horizontal segments are thicker.

Erasure

You can erase from the current position to the top or bottom of the screen, or to the entire screen. The same is true for erasure in a line. Figure 3 displays the commands.

You also can erase any number of characters, starting from the cursor position. The command is:

```
<CSI> <numeric-characters> X
```

For example, <CSI>27X erases the next 27 characters without affecting any other characters on the screen.

Insertion And Deletion

Insertion and deletion can be performed on lines for vertical movement and on characters for horizontal movement. Insertion moves text from the current cursor position downward, the specified number of lines toward the end of the screen or scroll region (if you are within a scroll region). Text that is moved off the screen or scroll region is lost, and the same number of blank lines is inserted at the current cursor position. The command to insert blank lines, pushing text downward is:

```
<CSI> <Numeric Characters of number of Lines> L
```

You also can delete a number of lines, causing text beyond this point to scroll upward from the end of the screen or scroll region, if you're inside a scroll region. The specified number of lines directly below the cursor are lost, and area below the

"Look! That's ALL-IN-1 on my PC screen...and a couple of minutes ago we looked at DATATRIEVE graphs... ***tomorrow*** *Fred's going to show me how to put my LOTUS files into a VAX library!"*

Give Your IBM PC *New* Power as a VAX Workstation with Software from Polygon.

Let your PC join the big leagues. Polygon's® family of terminal emulation, file transfer, and file sharing software lets IBM® PCs (and compatibles) share information with Digital's VAX™ and PDP™ systems.

Our new ***poly-STAR***® file transfer and VT220/VT240™ terminal emulation software has pop-up window menus, hot-key switching, international keyboard support, remote-control features, automated error-free file transfer, smart modem support, an online "phone book" for computer connections, and a user-programmable communication language.

Our ***poly-SHARE*** librarian software creates an easily-accessed VAX-based electronic library of PC and VAX files. PC users can store, organize, and share files and applications with each other as well as with VAX users.

VAXFR enhanced file transfer software – with fill-in-the-blanks formats, wildcard transfers, VAXmail™ pickup and delivery, PC-to-VAX-printer transfers, PC disk and directory backup on VAX, and ALL-IN-1™ support – let even the most inexperienced users accomplish complex data transfers between PCs and VAX systems.

Connect your PC to the power of a VAX.
Call Polygon today for more information at 314/576-7709.

polygon

ENTER 50 ON READER CARD

The ability to move a multiple number of lines in a single command saves communications overhead and time.

text that has scrolled up is now blank. The command to delete lines is:

<CSI> <Numeric Characters of number of Lines> M

These commands differ from INDex and Reverse-Index, defined in scroll commands, in three ways:

1. They do not move the cursor.
2. They move text inside and outside scroll regions.
3. They move text a multiple number of lines very quickly.

The ability to move a multiple number of lines in a single command saves communications overhead and time.

Similar to line insertion and deletion, you can insert and delete a variable number of characters. However, this only affects text in the line where the cursor resides. Using line insertion and deletion along with cursor movement, you can achieve a simulation of horizontal scrolling (unfortunately lacking in DEC terminals).

Since horizontal scrolling is not defined, the operation is done on the entire line, commencing at the current cursor position. Inserting blanks forces the similar number of characters to be lost at the right hand side of the screen. Deletion of characters causes the equal number of spaces to appear at the right end of the screen, and all text is moved left toward the cursor. The command to insert a user-defined number of blanks is:

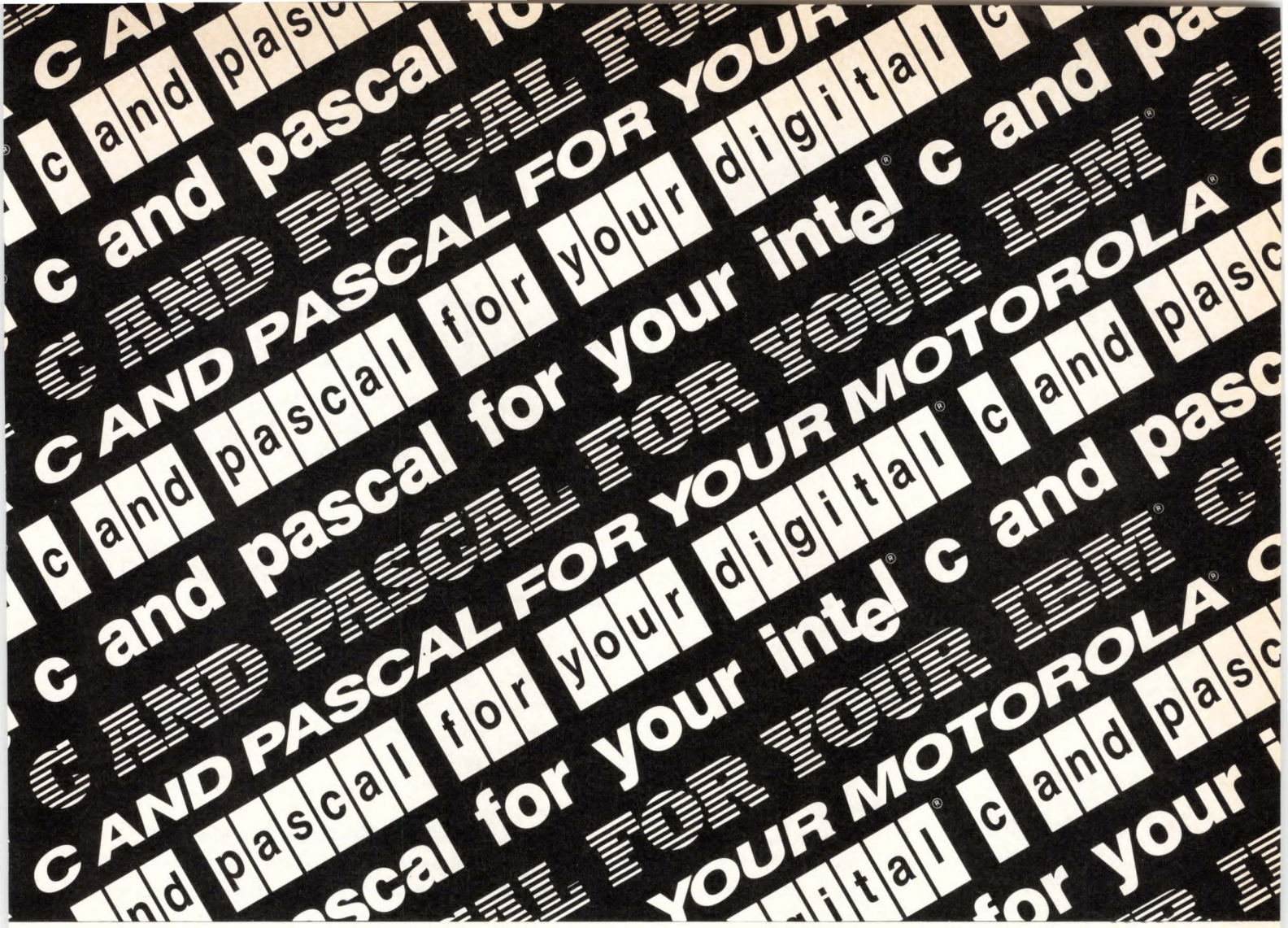
<CSI> <Numeric Characters of blank characters> @

The command to delete a user-specified number of characters is:

<CSI> <Numeric Characters of blank characters> P

Thus far, we've concentrated on basic control of the terminal functions and display. In Part 4 we'll discuss character set control, and the design and loading of a new character set from the host.

Eliezer May is senior software engineer and manager of Tadiran Systems Division Computer Center, Holon, Israel.



Whitesmiths, Ltd. Has The Compiler You Want On The Machine You Use.

For over seven years Whitesmiths, Ltd. has focused its efforts solely on developing and supporting a family of quality systems software. Today, Whitesmiths is the only company offering compatible C and Pascal native and cross compilers for the full spectrum of computers on the market—from the IBM PC to the IBM 370, from the DEC Micro-11 to the VAX 8600, and all of the most popular processors in between.

As a forerunner in the development of C and Pascal compilers, Whitesmiths has played a major role in defining and refining the standards for ANSI C and /usr/group libraries.

The result is a product line built from the ground up to provide a uniform environment for the professional applications developer. Identical source code across all machine architectures; support for ROM-based programs; a uniform run-time environment; and the ability to mix code in assembler and other high level languages are just a few of the many features that comprise these superior compilers.

If you need a C or Pascal compiler for your machine, give Whitesmiths a call at **1-800-225-1030.** Chances are, we have what you want.

Whitesmiths, Ltd.

97 Lowell Road, Concord, MA 01742 • (617) 369-8499 / Telex 750246

INTERNATIONAL DISTRIBUTORS: **FRANCE**, COSMIC S.A.R.L., 52 Quai des Carrieres, 94220 Charenton Le Pont, Paris, (14) 378-8357 • **GERMANY**, GEI, Gesellschaft fuer Elektronische, Informationsverarbeitung MBH, Pascalstrasse 14, D-5100 Aachen, 02408/13-0 • **JAPAN**, Advanced Data Controls Corp., Nihon Seimei Otsuka Bldg., #13-4, Kita Otsuka 1-Chome, Toshima-ku, Tokyo 170, (03) 576-5351 • **SWEDEN**, Unisoft AB, Fiskhamnsgatan 10, S-14155 Goteborg, (31) 125810 • **UNITED KINGDOM**, Real Time Systems Ltd., P.O. Box 70, Douglas, Isle of Man, (624) 26021.

ENTER 67 ON READER CARD

DEC NEWS

CONNECTING THE DOSs

By Bruce Feldman

With Three Simultaneous Product Announcements, DEC Takes Another Step Toward The Integrated Office.

Emphasizing its strong suit, connectivity, DEC recently announced three new products the company expects will further increase its performance in this area. The VAXmate networked personal computer, PC ALL-IN-1, and VAX/VMS Services for MS-DOS, all are designed to help eliminate the word "standalone" from the office automation vocabulary.

VAXmate

The new VAXmate networked personal computer provides both MS-DOS-based personal computing, and access to VAX-based services and resources, from the same source. Through a server located on a remote system, the VAXmate can store and access files on VAX and MICROVAX systems. In addition to facilitating the sharing of data, this reduces the need for local resources like printers and hard disks, since these services can be provided by the remote VAX for all PCs attached to it. With built-in DECnet/"ThinWire" Ethernet local area networking, the VAXmate can access large amounts of information without a hard disk.

The VAXmate is IBM PC/AT compatible and consists of a one-piece monitor/system unit with a built-in 5.25-inch floppy disk drive, keyboard and mouse. The system houses an Ethernet transceiver, video controller, 1 MB of memory, and communications and printer ports. The base VAXmate system is designed to accommodate an additional 2 MB of memory, a 300/1200/2400 baud modem, and a math coprocessor board.

Software for the VAXmate consists of MS-DOS V3.1, and the *Microsoft Windows* application interface. *Microsoft Network* client software, and DEC's VT220 and VT240 terminal emulators also are included.

DEC also introduced an option card for IBM PCs that will add the functionality of Ethernet, a DEC standard (LK-250) keyboard, and a mouse. This card makes IBM PCs compatible to VAXmate and able to work in the same network as the VAXmate. (See sidebar.)

VAX/VMS Services For MS-DOS

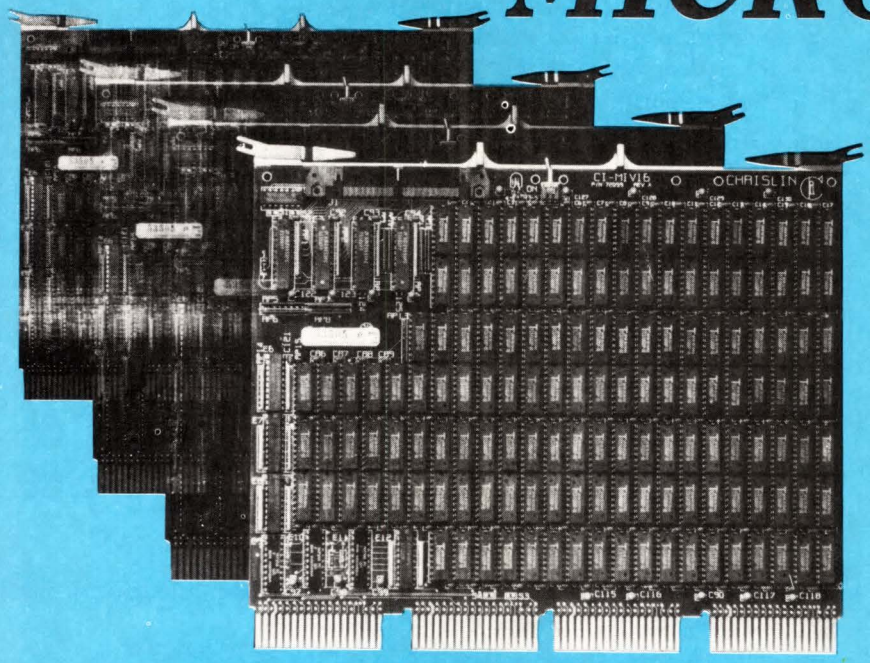
This new product offering allows a VAX, MICROVAX, or VAXmate to act as a server for a group of VAXmates in a DECnet ThinWire Ethernet network. VAXmate users can access the facilities and services of those systems.

The package allows users to share applications, data and resources; transparently access files from remote systems on a network (at 10 Mbit/second speed); and use the information in MS-DOS personal computer applications. These capabilities will extend to the DEC Rainbow, and the IBM PC/XT and AT in 1987, through the addition of an add-on board for these systems.

VAX/VMS Services for MS-DOS was designed specifically for those who use the popular MS-DOS personal computer software applications, but want the information sharing and storage services of a larger organizational network.

The user interface for VAX/VMS Services for MS-DOS, is *Microsoft Windows*, which allows users to perform functions simultaneously on windowed sections of the screen. Data developed within this environment is incorporated easily into other *Microsoft Windows* ap-

16MB FOR MICROVAX II



Now you can bring your Microvax II system to its full memory potential in one option slot, thereby relieving a slot for other needed modules. Another advantage of the memory is low power consumption. Two 8MB cards consume over twice or even three times the power of one 16MB card. Since the module uses 1MB DRAMs, it has one fourth the chips of 8MB cards that use 256KB DRAMs. Fewer chips mean greater reliability. Besides superiority in state-of-the-art design, the CI-MIV16 is a cost effective advantage. Call today for a current quote.

SAVE SPACE • SAVE POWER • SAVE $

COMPLETELY HARDWARE AND SOFTWARE COMPATIBLE

SUBSYSTEMS

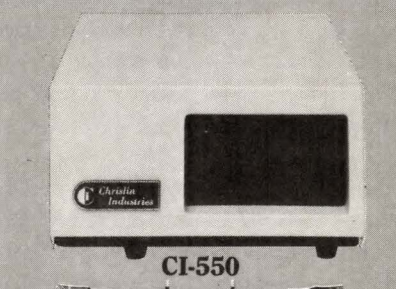
MICROVAX QBUS

CI-1340 SERIES 70MB—600MB winchester with 8" floppy or tape backup.
CI-820 SERIES 20MB—120MB winchester with dual 8" floppy backup.
CI-550 SERIES 10MB—70MB winchester with 5¼" floppy backup.
CI-1220-TF: 2MB dual 8" floppy.

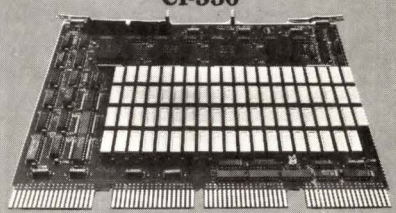
SYSTEMS

QBUS

CI-MICRO-11: LSI-11/23 or 11/73 CPU, 256KB-4MB memory, 20MB-120MB winchester, 5¼" or 8" dual floppy, serial ports, 4 x 8 backplane, power supply all in a rack/table-top chassis.



CI-550



CI-MIV8-EDC

MEMORY

VAX

CI-VAX4: 4 megabyte error correcting for VAX 780/785.
CI-V53: 1 megabyte error correcting for VAX 725/730/750.

MICROVAX II

CI-MIV16/8/4: 16,8,4 megabyte parity modules.
CI-MIV8-EDC: 8 megabyte with error detection and correction w/CSR.

QBUS

CI-1173: 4 megabyte block-mode.
CI-1173-EDC: 2 megabyte error detecting and correcting w/block-mode.
CI-1123+: 1 megabyte dual width.

Chrislin Industries, Inc.

31352 Via Colinas • Westlake Village, CA 91362
Telephone: (818) 991-2254 • TWX 910-494-1253 CHRISLIN WKVG

REPRESENTATIVES: Canada—Tech-Trek, Ontario (416) 238-0366, Montreal (514) 337-7540
U.K.—Imsyst 0344 51195; Peru—General Trading Corporation (51) -14-222506
W. Germany—Dema Computertechnik (089) 272 32 40; Switzerland—DAP (01) 948 0580

ENTER 12 ON READER CARD

The *Real* VAXmate Announcement

The tabloids made much of the VAXmate hardware, through stolen sketches and midnight raids. DEC's announcement made the VAXmate into something almost secondary and coincidental.

In one of the most strategic moves in its history, DEC made what it does best available easily and cheaply to the massive (5 million-plus) installed base of PCs and ATs. Each PC gets an Ethernet board, and a new LK250 keyboard and corporate mouse. You drop a MICROVAX II in the middle as a file server, and string your thin-wire Ethernet coax around. All at once, the networking you always wanted, but no one could deliver *is* delivered — right down to record locking. Should the installation have another VAX, this new entity is a group of new DECnet nodes.

As far as I can see, this product carries the war right into the heartland of Big Blue. Like a brilliant chess move, the attack is carried past all the front line defenses and deep into enemy territory. In fact, right onto the desk of the user. Hello there!

—Dave Mallery

PC ALL-IN-1 is a hedge against obsolescence . . .

plications. Online help and the standard MS-DOS command line interface is available. Other third-party vendors, such as Lotus are expected to offer products to facilitate the use of their software in networked environments, like the ones supported by VAXmate.

VAX/VMS Services for MS-DOS is available for VAX/VMS, MICROVAX, and VAXmate systems. Prices range from $650 to $19,500, depending on configuration. DEC offers server-based licensing for the system, which can be less expensive than a single-user license structure, for many installations.

PC ALL-IN-1

PC ALL-IN-1 is a MICROVAX II-based system that integrates up to 30 previously isolated personal computers into the mainstream of an organization's computational capacity. The package consists of all the hardware, software and service support necessary to make an organization's VAXmates, Rainbows and IBM PCs, XTs and ATs work together.

The package provides users with the desktop processing capabilities of a personal computer, along with access to the full power of the network's entire integrated system, for document processing, electronic mail and data sharing.

PC ALL-IN-1 is a hedge against obsolescence, since it runs existing PC software and, down the road, can be connected with multiple PC ALL-IN-1 systems to serve thousands of users. The system also works in conjunction with other DEC ALL-IN-1 systems, like the departmental-specific configuration for Sales and Marketing, introduced last year.

System management is performed with the help of menu interfaces, allowing non-technical users to manage work group systems. Online help also is available when needed.

Users can share printers and disk storage devices, and consolidate information for organizational use while working with a common user interface. Demands for MIS department service are offloaded, since user requests are standardized into central databases.

DEC reports that nearly 80 percent of the personal computers owned by large corporations are operating in a standalone environment. PC ALL-IN-1 offers the potential to change all that. The system costs $81,160 in a complete package to support up to 30 users. The PC ALL-IN-1 package consists of the following hardware:

1. MICROVAX II with 5 MB of memory
2. DEQNA Ethernet controller
3. DHV11-M RS432 asynchronous ports (16 lines)
4. DZQ11-M for modem/LN03 support
5. Three RD53 71-MB Winchester disks
6. TK50 95-MB streamer tape
7. One LN03 laser printer with stand and supplies
8. VT220 system console.

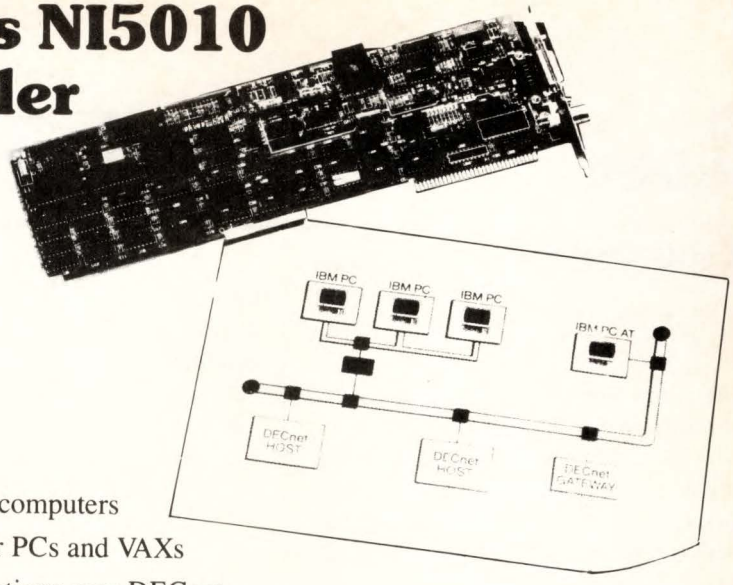
Software for the system includes:

1. Standard ALL-IN-1 menu interface
2. WPS-PLUS word and document processing
3. Electronic mail
4. Electronic file cabinet
5. Third-party software package integration
6. Communication support
7. Menu modification facility
8. Database access through DATATRIEVE
9. Access to VAX/VTX databases.

Services include a full year of on-site hardware and software support, phone support, network design consulting, and on-site systems orientation.

PC ALL-IN-1 will be available in volume shipments, beginning January, 1987. ■

MICOM-Interlan's NI5010 Ethernet Controller lets your IBM PCs join DECnet as peer systems



- Operates with DECnet-DOS V1.1
- Shares disk storage and printers on remote computers
- Creates applications that interact with other PCs and VAXs
- Supports high-speed PC to host communications over DECnet

Available now at MTI Systems

MICOM-Interlan's NI5010 Ethernet Controller teams up with Digital's DECnet-DOS software to allow IBM PCs, XTs, and ATs to participate in DECnet networks.

The NI5010 is an Ethernet link level controller that connects IBM PC/ATs to an Ethernet/IEEE 802.3 local area network. DECnet-DOS runs as application software in each PC. It provides the necessary protocol support for IBM PCs, XTs, and ATs to join DECnet as peer systems, not just expensive terminal emulators.

This hardware/software combination allows personal computers to be nodes in a large network, share disk storage and printers on remote computers and create applications that interact with other PCs, XTs, and ATs.

MTI Systems is an authorized distributor for MICOM-Interlan and can provide fast delivery and expert integration of all your networking and data-communications needs. Call MTI today.

MICOM

MTI SYSTEMS CORP.
A SUBSIDIARY OF DUCOMMUN INCORPORATED

Computer & Data Communications Equipment
Sales / Leasing / Service / Systems Integration

New York
212/226-2337
516/621-6200
518/449-5959
718/767-0677

New Jersey:
201/227-5552

Pennsylvania:
412/931-9351

California:
818/883-7633
714/220-6487

Illinois:
312/773-2300

Massachusetts:
617/932-3876

Ohio:
216/464-6688

Kentucky:
502/499-6656

OR CALL 800/645-6530

ENTER 43 ON READER CARD

DCL DIALOGUE

'Talking' To Batch Jobs

Kevin G. Barkes

One limitation in VMS is the lack of a direct communications link between a batch job and the process that submitted it.

Generally, the only time a batch job "talks" to its submitting process is upon termination, via the /NOTIFY qualifier of the SUBMIT command. Even then, the batch job isn't very specific; the message goes to all terminals owned by processes whose USERNAME, as defined in the User Authorization File, matches the USERNAME of the process that originally submitted the job. And the simple success or failure status message that /NOTIFY provides, may not be informative enough.

There are many instances when it is desirable for a batch job to be able to communicate directly with its submitting process: to advise it of unusual conditions, pass along information regarding some item being monitored, or just to let the submitting process know everything is OK.

Thus, we have two problems: how to let a batch job know who submitted it, and providing the mechanism for it to talk to the submitting process.

THE FIRST SITUATION can be handled by passing information to the batch job at the time it is submitted, via the /PARAMETERS qualifier of the SUBMIT command. Up to eight parameters can be passed along to the batch job; these are assigned to the local symbols P1 through P8. (This corresponds directly to the P1-P8 parameters that can be passed to interactively executed command procedures.)

The information sent along to the batch job will enable it to positively identify its submitting process and communicate with it. We'll obtain this data using DCL lexical functions (See Table 1).

First, we'll determine precisely who submitted the job. This is important since the job may have been submitted from a subprocess spawned specifically to perform this function. The subprocess may have terminated immediately after the SUBMIT, or may not be attached to a terminal that can receive messages from the batch job.

The MASTER_PID item of the F$GETJPI lexical returns the process identification number of the process at the top of the current process tree. With this information, we can obtain the name of the terminal into which the parent process is logged on, using the TERMINAL item.

FINALLY, we get the USERNAME of the submitting process and strip off the trailing spaces with the F$EDIT lexical. While the batch job will have the same USERNAME, we perform the function here to eliminate processing steps within the batch job itself.

These three items are included via the /PARAMETERS qualifier with the SUBMIT command. Five unused parameters remain for passing other data on to the batch job. (Each parameter can have up to 255 characters, but the total length of all eight parameters can't exceed 480 characters. This may not be as generous as you might think, since full filenames — node, device, directory, filename, extension, and version number — can be quite verbose.)

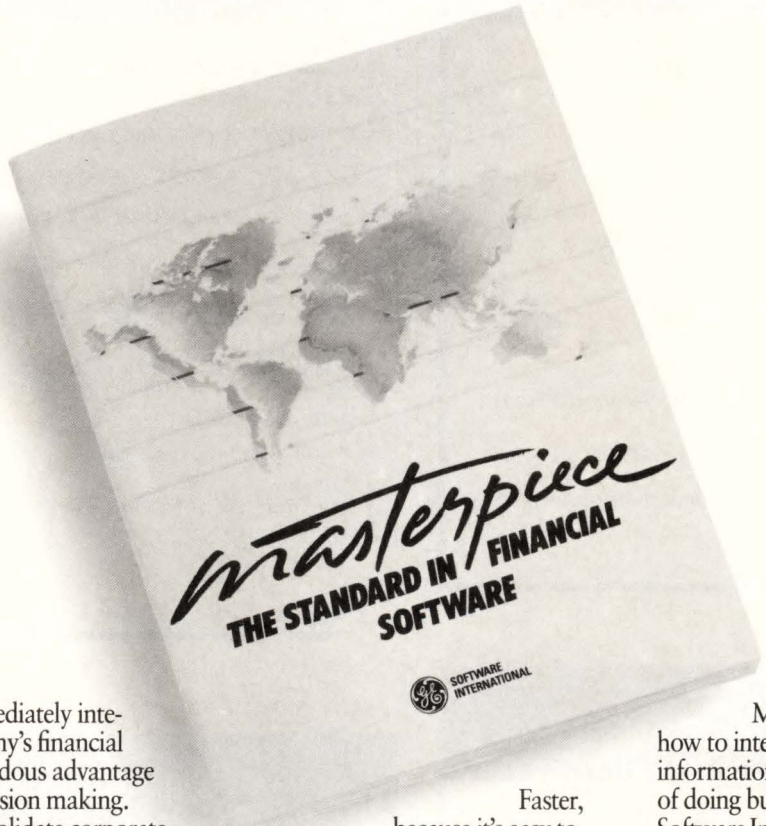
> ***"Generally, the only time a batch job "talks" to its submitting process is upon termination, via the /NOTIFY qualifier of the SUBMIT command. Even then, the batch job isn't very specific . . ."***

Giving the batch job this information solves the first problem. But what mechanisms are available to perform the actual communications?

From the DCL level, only two commands can be used: REPLY and MAIL. A rudimentary command file using these functions is contained in Table 2.

The REPLY command, which requires OPER privilege, will permit the batch job to send messages to a specific terminal, or to all interactive users whose USERNAME matches. In the

ONLY A MASTERPIECE OF FINANCIAL SOFTWARE CAN INTEGRATE THE FULL SPECTRUM OF APPLICATIONS ON YOUR DEC VAX.



Being able to immediately integrate all of your company's financial information is a tremendous advantage to sound corporate decision making.

To selectively consolidate corporate-wide reports. To combine data from accounts payable and accounts receivable with purchase orders, general ledger, fixed assets, payroll and personnel.

The Masterpiece® Series does this for you. It's the only complete portfolio of integrated financial software native to the DEC® VAX® computer.

You'll find it's also faster, more powerful and more intelligently designed than any other financial software.

Faster, because it's easy to learn and quick to use. Information access is enhanced by "borderless" integrated applications.

More powerful, because Masterpiece gives even the occasional user a comprehensive tool to instantly retrieve information in virtually any report format.

And more intelligent, because its efficient, modular design lowers DP/MIS maintenance and raises user productivity.

Call or write for a copy of our new Masterpiece brochure on how to integrate all of your financial information while gaining the security of doing business with General Electric's Software International—providing support for hundreds of DEC VAX users from 30 offices worldwide.

1-800-343-4133
(In Massachusetts 1-800-322-0491)
One Tech Drive, Andover, MA 01810-2497

SOFTWARE INTERNATIONAL

Masterpiece is a registered trademark of Software International Corporation. DEC and VAX are registered trademarks of Digital Equipment Corporation.

ENTER 212 ON READER CARD

example procedure, if both of these attempts fail, a MAIL message is sent to the appropriate USERNAME.

Separate data files containing specific messages to be sent by MAIL can be maintained, or the procedure can write a message to a temporary file from within the batch job, send it via MAIL, then delete the file.

THE MOST EFFICIENT method of communication between the batch job and submitting process would be a user-developed program in a high-level language (such as BASIC), which would use the $BRKTHRU system service to send the message to a terminal. ($BRKTHRU supersedes the older $BRDCST call.) The image could be installed with the required privileges to perform the function, eliminating the need for the process running the program to have OPER, PHY_IO or other higher level privileges.

The parameters passed to the batch job could be handed to the user program by defining the image as a foreign command from DCL. The user program would use the LIB$GET_FOREIGN run-time library routine (See Table 3).

These are "off the top of the head" suggestions; wily readers with more ingenious methods are invited to share them with us. Leave a message in the ARIS Suggestion Box (215) 542-9548, or write *DEC PROFESSIONAL*, P.O. Box 503, Spring House, Pennsylvania 19477.

Kevin G. Barkes is a Library, Pennsylvania-based consultant specializing in VAX systems.

TABLE 1.

```
$!
$! These lines are contained in the command procedure which
$! submits the batch job.
$!
$! Get the process identification number
$! of the "true" submitting process:
$!
$ MASTERPID = F$GETJPI("","MASTER_PID")
$!
$! Get the name of the terminal to which
$! the submitting process is logged in:
$!
$ PARENTTERM = F$GETJPI(MASTERPID,"TERMINAL")
$!
$! Since the batch job will have the same
$! USERNAME (not to be confused with process name)
$! of the process submitting it via this procedure,
$! this step isn't really necessary. The F$EDIT
$! call trims the trailing blanks contained in
$! the name.
$!
$ USERNAME = F$EDIT(F$GETJPI(MASTERPID,"USERNAME"),"TRIM")
$!
$! Now we submit the job, passing the info on to
$! to the batch procedure via the /PARAMETERS qualifier
$! of the SUBMIT command:
$!
$ SUBMIT/PARAMETERS=('MASTERPID','PARENTTERM','USERNAME')
FILE.COM
$!
$! EXIT
```

TABLE 2.

```
$! These lines are contained in the batch job itself.
$!
$! First, we'll get the submitting process' terminal and
$! trimmed username passed from the /PARAMETERS qualifier.
$!
$  MASTERPID = P1
$  TERM = P2
$  USERNAME = P3
$!
$! If no high-level program is available to communicate
$! with the submitting process (via the $BRKTHRU system
$! service), we'll use the DCL REPLY command. The process
$! must have OPER privilege to perform this function.
$!
$! See if the process currently logged in at the terminal
$! still belongs to the submitting process:
```

TABLE 2... continued

```
$!
$ CURRENT_OWNER = F$GETDVI(TERM,"PID")
$!
$! If it doesn't, then branch to our backup plan:
$!
$ IF CURRENT_OWNER .NE. MASTERPID THEN GOTO
BACKUP_PLAN
$!
$! Notify the terminal:
$!
$  REPLY/BELL/TERMINAL='TERM' "Batch job at some important point."
$!
$!
$  BACKUP_PLAN:
$!
$! First try to broadcast a message to terminals owned by the
$! same USERNAME, first checking to see if the user is logged on:
$!
$ SHOW USER 'USERNAME'
$ IF $SEVERITY .NE. 1 THEN GOTO SEND_MAIL
$ REPLY/BELL/USERNAME='USERNAME' "Batch job at some important
point."
$ GOTO CONTINUE
$!
$! If all else fails, send a mail message:
$!
$ SEND_MAIL:
$ MAIL NAME_OF_MESSAGE_FILE.DAT  'USERNAME'
$!
$ CONTINUE:
.
.
.
```

TABLE 3.

```
$! Define the foreign command:
$!
$  BATCHTALK :== $ USERDISK:[USERDIRECTORY]USERPROGRAM.EXE
$!
$! Assuming the user program can perform similar functions to
$! the DCL command procedure:
$!
$  BATCHTALK 'MASTERPID' 'TERM' 'USERNAME' "Message text."
$!
$! The parameters passed to "BATCHTALK" would be handled within the
$! program via the LIB$GET_FOREIGN run-time library routine.
```

BELTRON XT

Personal Computer System

The Beltron line of IBM™ compatible computers offers an inexpensive, quality alternative to IBM™'s XT or AT systems.

Beltron computers are FCC approved. Our systems are manufactured in the USA and come with a full 1 year warranty, parts & labor.

STANDARD FEATURES:

- *Full Hardware & Software Compatibility with IBM™*
- *640K on Motherboard*
- *4.77 MHz 8088 Microprocessor*
- *Eight Expansion Slots*
- *(2) 360KB Double-Sided, Double-Density Diskette Drives*
- *135 WATT Power Supply*
- *8087 Co-processor Socket*
- *Speaker*
- *Power-on Automatic RAM Diagnostics*
- *IBM™ PC/XT Compatible Keyboard*
- *Parallel Port*
- *Game Port*
- *Clock/Calendar*
- *FCC Approval*
- *1 Year Parts & Labor Warranty*
- *Monochrome TTL Monitor*

OPTIONAL FEATURES:

- *Monochrome Graphics*
- *IBM-Type Color Graphics*
- *20MB or 30MB Half-Height Hard Drive*
- *Internal Modem*
- *20MB or 60MB Megabyte Tape Back-up*
- *Customizable BIOS*
- *GW BASIC 2.0*
- *MS DOS 3.1*
- *Full Networking Capability*

$795-Complete With Monitor

call (215) 542-7910

VISA & MASTERCARD ACCEPTED

BELTRON COMPUTERS
P.O. Box 184
Spring House, PA 19477

RESOURCE EXECUTIVE

Short Notes

Ralph Stamerjohn

One of the RSX sessions held at the DECUS symposium last month in San Francisco was the *System Programming Short Notes* session. This is the serious half of what used to be the RSX Magic session. Short Notes is a free format time period for anyone to brag about new RSX tricks or techniques that they have discovered.

I was not in San Francisco, but if I had been, I probably would have talked about the following subjects.

JOB.CMD

I use command files to handle all the routine chores on my system. There also are command files to assemble, compile, and link the various software products my company markets.

When we converted our system to RSX-11M-PLUS two years ago, we started to take advantage of the Batch Processor to run command files. Batch jobs free up terminals and more important, produce a log file that shows every step executed and resulting error messages. I no longer have to keep the ring finger on my left hand hovering over the VT220 hold screen key.

Unfortunately, the RSX-11M-PLUS Batch Processor has one serious shortcoming. Unlike VAX/VMS, RSX-11M-PLUS indirect command files cannot be submitted as batch jobs. The Batch Processor requires each command line to begin with a dollar sign ($) and a $JOB card at the beginning of the file to log the batch job into the appropriate account.

For a long time, each command file I regularly use had its corresponding batch control file. For instance, the command file ASMREQ.CMD assembles either the RSX-11M or RSX-11M-PLUS version of the program REQ. The batch control file BLDREQ.CMD executes ASMREQ.CMD for both versions:

```
$JOB BLDREQ [7,114]
$@LOGIN.CMD
$SET /DEF = DL1:[304,10]
$@ASMREQ MPL
$@ASMREQ 11M
$EOJ
```

As you can see, BLDREQ.CMD simply sets up the proper system disk and UIC and starts the command files. This same sequence of instructions is repeated over and over again in other batch control files.

After writing the 53rd iteration of BLDREQ.CMD, it occurred to me to write an indirect command file that would generate the appropriate batch control file on the fly and submit the job to the Batch Processor. The resulting command file, JOB.CMD, is shown in Program 1. If I want to submit ASMREQ.CMD as a command file and build the RSX-11M version, I would type (assuming my current system disk and directory is SY:[304,10]):

```
>@LB:[1,2]JOB ASMREQ 11M
```

JOB.CMD creates a batch control file that will execute the indirect command file using the same default directory and CLI as the issuing terminal. The command file first sets symbol **dcl** true if you are using DCL and false otherwise. The next step saves the current default disk and directory in variables **olddev** and **olduic**. JOB.CMD then parses logical name **SYS$LOGIN** to set **logdev** and **loguic** to the login device and account. The last setup step is to parse the command file name in **p1** to see if an extension was specified and append ".CMD" if not. JOB.CMD then checks to make sure the command file exists and sets **nam** to the file name.

> ***"When we converted our system to RSX-11M-PLUS two years ago, we started to take advantage of the Batch Processor to run command files."***

JOB.CMD creates the temporary batch control file in your login account. If you have a **LOGIN.CMD** file, the batch file will execute the command with a qualifier of "BATCH" so you can perform special setup for batch environments such as skipping setting terminal parameters. The batch file then sets the default directory to match the original issuing terminal and starts the command file with whatever parameters are desired.

At my site, we chose to have JOB.CMD submit the created batch file with options not to print the log file and to delete the created batch control file.

PROGRAM 1.

```
        .enable substitution
        .enable quiet
        .;
        .; JOB - Build batch control file for command file.
        .;
        .;      @JOB command-file ...
        .;
        .if <cli>  = "DCL" .sett dcl
        .if <cli> <> "DCL" .setf dcl
        .;
        .sets olddev <sydisk>+"'<syunit>':"
        .sets olduic <direct>
        .if olduic = "[]" .sets olduic <uic>
        .;
        .translate sys$login
        .parse <exstri> ":]" logdev loguic tmp
        .sets logdev logdev+":"
        .sets loguic loguic+"]"
        .;
.1000:  .if p1 = "" .asks p1 Command filename
        .;
        .parse p1 "." tmp1 tmp2
        .if tmp2 = "" .sets p1 p1+".cmd"
        .;
        .testfile 'p1'
        .if <filerr> = 1 .goto 2000
                ;
                ; *** Invalid command filename: 'p1' ***
                ;
                .sets p1 ""
                .goto 1000
        .;
.2000:  .sets cmd <filspc>
        .parse cmd "]." tmp1 nam tmp2
        .ift dcl set  def 'logdev''loguic'
        .iff dcl set /def='logdev''loguic'
        .testfile login.cmd
        .setn log <filerr>
        .;
        .open 'nam'.ctl
        .data $ job 'loguic'
        .if log = 1 .data $ @login batch
        .ift dcl .data $ set  def 'olddev''olduic'
        .iff dcl .data $ set /def='olddev''olduic'
        .data $ @'cmd' 'p2' 'p3' 'p4' 'p5' 'p6' 'p7' 'p8' 'p9'
        .data $ eoj
        .close
        .;
        .ift dcl submit /noprint/delete 'nam'.ctl
        .iff dcl submit /noprint='nam'.ctl/de
        .ift dcl set  def 'olddev''olduic'
        .iff dcl set /def='olddev''olduic'
```

PROGRAM 2.

```
                .TITLE  F77ABO
                .MCALL  SVTK$S
;
; Force Fortran programs to abort.
;
        F77ABO::                ;Ref. label
                SVTK$S          ;Turn off SST traps
                BPT             ;Issue breakpoint trap
;
; Take normal exit.
;
        F77XIT::                ;Ref. label
                RETURN          ;Return to caller

                .END
```

You can change these to match your own preferences. JOB.CMD also assumes that disks containing indirect command files are public and thus do not need to be mounted by the batch job.

@ LB:[LIBUIC]

@JOB is now one of the most popular commands on our system. This created a second problem. We put our common command files in LB:[1,2] and users were getting bored typing @LB:[1,2]filename. Was there anyway to set up a default account for command files similar to how tasks are handled in LB:[1,54] and LB:[3,54]?

The answer shows that even RSX wizards (myself) should read the manuals periodically. The last paragraph in Section 2.2 in the new Indirect Command Processor manual tells how to task build Indirect to search an alternate directory if the command file is not found in the current directory. Indirect uses the global symbol D$CUIC to specify alternate directories. You set D$CUIC to the octal equivalent of the directory number. For instance, [1,2] is specified by 000401. If D$CUIC is zero, no alternate directory search takes place. The default D$CUIC value of 1 causes a search of LB:[LIBUIC]. This value is normally LB:[3,54]. So we only needed to move our command files from [1,2] to [3,54] to get what we wanted. If you want a specific UIC, it is easy to edit the Indirect build file and change the D$CUIC value.

I/O Bound vs. CPU Bound

I recently assisted in the conversion of a monitoring system from RSX-11M to RSX-11M-PLUS and in the process, made some interesting observations about I/O versus CPU bound systems.

The heart of the monitoring application is a loop that reads hundreds of A/D samples and converts the raw data into engineering values. The loop is

scheduled from the clock queue. One goal of the system is to run the loop as often as possible. Under the old RSX-11M system, one pass of the monitoring loop took about 25 seconds so the programs were started with a reschedule interval of 30 seconds.

We did not expect any dramatic improvement when the new RSX-11M-PLUS system was brought up and were surprised when the loop processing time dropped almost in half to 14 seconds.

> ***"The heart of the monitoring application is a loop that reads hundreds of A/D samples . . ."***

The reschedule loop was lowered to 20 seconds. The improvement is from disk caching. This particular application is ideal for a disk cache. The RMDEMO caching display shows a 98 percent hit read hit rate even after the system is up for five days. The RMDEMO I/O display shows an average of six QIOs/second with caching enabled versus 25-30 QIOs/second when cache is turned off.

You would think such numbers would be a reason for dancing in the streets. Quite the contrary, there was much gnashing of teeth from the operator consoles and programmer terminals.

The explanation is simple. The monitoring tasks run at priorities ranging from 150 to 75 (after all, this is why the system was bought). Under the old system, enough of these tasks block waiting for disk I/O to let programs such as EDT give a fairly interactive response. But when disk caching has a 98 percent hit rate, there is no waiting on disk I/O. It is not amusing to be in

EDT and have a 14 second pause every 20 seconds. The system feels doggy, even though it is running faster than it ever has.

By raising the priorities of various interactive user programs and EDT to appropriate levels, we get the best of both worlds. However it is best to do task builds at lunch time.

FORTRAN Post-Mortem Dumps

One of the hardest type of bug to fix is the production program that aborts at random, infrequent intervals. All you can do is install the program with post-mortem dumps enabled (INS file/PMD = YES) and wait for the problem to reoccur.

Unfortunately, FORTRAN programs do not abort. Instead, the FORTRAN OTS catches the synchronous system trap and outputs some standard error message. The FORTRAN OTS then does a normal exit. No post-mortem dump is triggered.

You can get a FORTRAN task to abort by using the USEREX subroutine to specify the F77ABO routine shown in Program 2 as a user specific exit routine. Just before the FORTRAN OTS executes the normal exit to the operating system, the OTS now will call F77ABO. The routine simply turns off synchronous trap handling to prevent an endless loop and issues a breakpoint trap (BPT) instruction. The task will abort and you can get a post-mortem dump.

This technique has one flaw. F77ABO will be called even when the task is exiting normally. The problem is avoided by calling USEREX to just be the task exit again and change the user exit routine to F77XIT.

OPEN Tricks

The OPEN command is the RSX wizard's magic wand. With it, the wizard can cure the unabortable task, the locked-up system, and the frozen device. True Grand Wizards skip mess-

ing with editors, assemblers, and TKB and use OPEN for all programming chores.

The OPEN command lets you examine and deposit any location in physical memory, including the I/O page. For example, my system has a DZ11 at address 160100. DZ11 line 2 (TT3:) is hooked up to a Racal-Vadic modem which we use to dial out to other systems using Kermit. We set TT3:'s permanent characteristics to slave

> ***"The OPEN command is the RSX wizard's magic wand. With it, the wizard can cure the unabortable task . . ."***

and no echo to prevent problems when using Kermit. The modem needs the DTR signal from the DZ11 to operate but RSX only turns on DTR for remote terminals. I do not want to operate the line as a remote terminal as the SET /REMOTE command resets the terminal characteristics. Instead, I use the following OPEN command to turn DTR on for TT3:.

```
>OPEN 17760104
17760104 /000000 1000<ESC>
>
```

The I/O page is always at the top of memory, so the 16-bit 160100 address is 17760100 in 22-bit notation. The DZ11 DTR mask bits are the high byte of the third word, so depositing 1000 in 17760104 enables DTR for the second line.

The various OPEN features are well documented in section 3.34 of the *MCR Operations Manual*. If you have never used OPEN before, you should read this

section carefully before attempting the tricks shown below.

One common problem with RSX is the task which will not exit because it has outstanding I/O. Even the abort command is fruitless. You can tell if a program is in such as state by doing an ATL command. The task status should include RDN, HLT, and ABO status and the I/O (IOC) is non-zero. If you have waited a couple of minutes and there is no change, it is probably safe to assume the I/O has been lost and will never complete. I see this problem most often with new device drivers or DECnet.

You can use OPEN to zero the task's I/O count and force the task exit to complete. The second field in the first line of the ATL command display is the task control block (TCB) address. If you assume a TCB address of 47124 for the problem task, the following sequence zeros the I/O count offset which is offset 3 of a TCB.

```
>OPEN 47124/KNLD
00047124 /000000 <CR>
00047126 /000767 367<ESC>
>
```

The /KNLD makes sure we open the address in system pool and not executive code. We skip over the first location and zero the I/O count by writing just the low byte of the second word. Before the task exit finishes, we have to take it out of rundown state. This is down by turning off the RDN bit (040000) in the task status word (offset 32).

```
>OPEN 47124 32/KNLD
00047156 /040000 0<ESC>
>
```

Notice how the OPEN command will perform any calculations needed to compute an address in memory.

Because OPEN can modify any memory location, its use has the potential to crash your system. On the other hand, OPEN also can fix system problems when your only other recourse is to reboot the system.

Wish Book

All RSX System Programming Short Note sessions include discussions about what we would like to see at future sessions. My wish this year is VMS-style command line editing. Like many RSX programmers, I spend equal keyboard time on both RSX and VAX/VMS systems. I find myself constantly hitting ↑**B** on the RSX system to no effect.

Ralph Stamerjohn is principal engineer at Meridian Technology Corporation, St. Louis, Missouri.

Norm De Nardi Presents:

The California Computer Show.

Northern California's High-Tech Source!

Your Special Invitation to View the Latest Hardware and Software Products in the Computer Industry

Featuring: CAD/CAM
Graphics Systems
Computers
Peripherals
UNIX
Data Communications
. . . . . And More . . . . . .

When!

December 4, 1986

Where!

At The California Computer Show
Palo Alto Hyatt Hotel
4290 El Camino Real, Palo Alto

Held right here in Silicon Valley, this one-day show gives you the opportunity to meet today's industry leaders and tomorrow's innovators who can furnish you with solutions to your hardware and software needs.

Update Your Calendar Now: Call or write Norm De Nardi Enterprises for your free invitation, 289 So. San Antonio Road, Suite 204, Los Altos, CA 94022. Tel: (415) 941-8440.

ENTER 190 ON READER CARD

I'll Be There!

My interest is:

- ☐ Computers
- ☐ Peripherals
- ☐ IBM
- ☐ Graphic Displays
- ☐ UNIX
- ☐ DEC
- ☐ VME
- ☐ Work Station
- ☐ CAD/CAM
- ☐ H.P.
- ☐ Data Communications

Please send me an invitation to the California Computer Show.
Dec. 4, 1986. Palo Alto Hyatt Hotel. 12 PM - 6 PM.

Name _____

Title _____

Company/Division _____

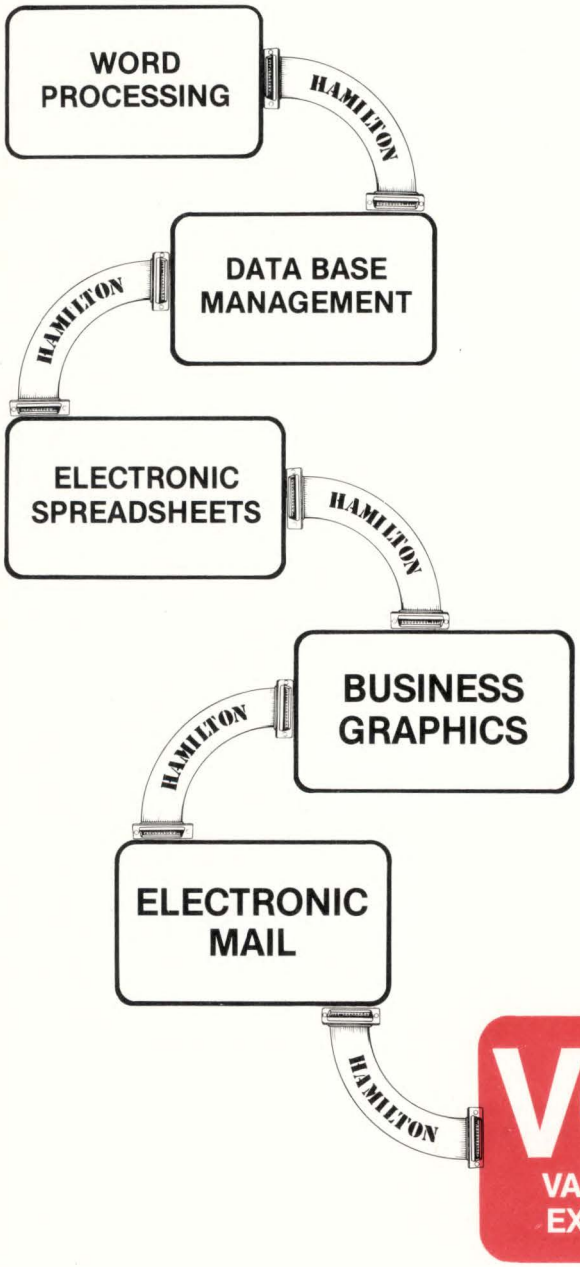
Address _____ Phone No. _____

City _____ State _____ Zip _____

NDN **NDN Enterprises** 289 So. San Antonio Rd., Los Altos, CA 94022
(415) 941-8440

VOX

THE BETTER ALTERNATIVE TO "ALL-IN-ONE" OFFICE AUTOMATION SYSTEMS



VOX: Fully Integrated Office Automation Package:

- VOX supports "Top of the Line" software packages on your VAX in Word Processing, Data Base Management, Electronic Spreadsheets and Business Graphics.
- "The Linkage System" allows FULL transfer of data from one module to another.
- VOX has a comprehensive Office Management Aids package which includes: Personal Time Manager, Phone Book, Calculator, Conference Room Scheduler, Project Manager, File Manager, File Printer.
- The VOX Electronic Mail Package allows transfer of documents and data FULLY intact from one user to another.
- VOX can be purchased—or rented module by module or as the full package for a 6, 12 or 24 month period or more.
- VOX is FULLY supported and trained by Hamilton.

VOX requires minimum CPU usage on your VAX.

Toll Free
800-631-0298
In New Jersey 201-327-1444
In Canada 416-252-6171

HAMILTON HGL Software Limited
6 Pearl Court, Allendale, NJ 07401

New Jersey • Texas
CANADA • CHINA • NETHERLANDS • UNITED KINGDOM • WEST GERMANY • FRANCE • HONG KONG

ENTER 109 ON READER CARD

LET'S C NOW

Style And Maintenance, Part 2

Rex Jaeschke

Editor's Note: Last month, Mr. Jaeschke ended his column with a response to a reader's question. This month we continue with more of that reader's comments and Jaeschke's feedback.

A reader offers some suggestions for future topics:

1. Continued exposition of the basic features of the C language and how to use them to solve a variety of problems. As you have remarked, C is a subtle and flexible language. I continue to be amazed and instructed by the novel ways of using its constructs, many of which are no doubt routine to experienced C programmers.

*2. Dynamic memory management — **malloc**, **calloc**, etc., and its uses with data structures. There are adequate texts on the general principles of data structures and their use in PASCAL, but perhaps there are special considerations in C. I learned how to cast **malloc** to point to a structure and make linked lists completely by accident from the footnotes of a UNIX manual! This is a weak area in my C texts.*

3. Compilation, linking and general organization of multifile programs with complex header files and extensive function modules which are dependent on the headers. The ability to precompile modules and libraries which can be used in a variety of applications is an attractive feature of C. I do not have a comfortable grasp of how best to organize all the pieces to preserve modularity.

4. Mixing assembly code and C. Are there standard practices or general guidelines on how to combine C and assembler either inline or in separate modules?

5. Numerical applications written in C. This use of C is inevitable in view of the proliferation of workstations and minis running C. Are there identifiable advantages, disadvantages, caveats, or preferred practices in using C for numerically intensive tasks?

Keep the columns coming. I always look forward to the next installment.

1. In the September 1986 column, I completed my detailed series of the constructs of C. My aim was to give readers a tutorial on C using some realistic applications. However, given the broad range of applications written by readers, it is not possible to get too much into any one particular application area without alienating the other readers. In this, and future columns, I will endeavor to address specific issues raised by readers.

2. The July 1986 column was entitled "The Run-Time Library - Part II" and contained a detailed description of the memory management library functions. While I did not give an example of a linked-list manipulator, the topic is reasonably well covered in Kernighan and Ritchie in Section 6.5, page 130-134, on Self-referential Structures. The **treenode** allocation function **talloc** could involve a call to **malloc** or **calloc**. Another good reference is Tom Plum's book, *Reliable Data Structures in C*.

3. I agree that good header organization is important and requires significant planning, also organizing functions and external definitions into source code files. In June 1986, Addison-Wesley published my advanced C text called *Solutions in C*. One of the seven chapters is dedicated to "Headers and the Preprocessor" and contains many tips on header design and use. I plan to mention some of the major points from that chapter in a future column. Stay tuned.

With regard to source file design, my philosophy is to place EACH function in its OWN source code file UNLESS the function is declared to be **static**, in which case, it must be in the same file as at least one other function to be useful. I recently worked on a large C project that had 10 source files of between 30,000 and 50,000 bytes each, and they were named AA, AB, AC, etc. — not particularly meaningful. Of course, each file contained many functions, external definitions and macro definitions. The headers that were used were poorly constructed and error-prone. I wasted more time trying to find which functions and globals were defined where than I did in performing useful work.

Having a function defined in a file by the same name with a file type of C makes life easy. If you want to know what happens inside function **abcde**, just load it into your favorite editor and look. It's that simple. So what, if you have 300 functions in 300 files? That's only a problem on small, typically diskette-based systems, and these environments are hardly suited to big projects anyway. Besides, by using a source code and object module librarian, you may need only a few files once you are in production.

If you have a lot of source and object files, the file system overhead for each one can be more than the data they contain, particular for small functions on disks that allocate using a large cluster size. Wasted space may be significant.

ONE SIDE AFFECT of this approach is that I limit my function names to those supported by my file system. Since many file

systems are not case-sensitive and can't handle underscores, I restrict myself to using function/file names of one case and no underscores. It's not too difficult, although it may require some planning if you intend to write portable code for environments whose file systems use file names that are quite different. Like any good rule, it allows reasonable exceptions.

Using the one function per file approach also makes it easier to edit a file, and it significantly lessens the potential for a runaway change macro when using a programmable editor. How many times have you required a given string to be changed for the next n occurrences, only to find that later you also inadvertently changed something else?

Having smaller source files also makes compilation quicker and eases the object module librarian's task. However, linkers do have a maximum on the number of modules they can handle, so you may be forced to combine some functions into one file. Also, for small files that include several small, or one very big, header files, it may take longer for the preprocessor to run than the compiler. If several functions require the same headers and they were combined in the same file, the headers would need to be included only once. Note, though, that while this affects compilation speed, we ultimately are more interested in execution speed. We always can compile things overnight or in background, so compile time is not a significant factor in determining source file organization.

The placement of external definitions also can be a problem. A common approach is that each programmer defines a global in the module in which he decides he needs it, then he tells everyone else to declare it in a certain way, or to include some specific header. Often, such definitions contain an initializer list and, since there is no set place these definitions exist, you have to go hunting for them.

> ***"I can find no technical reason why ALL external data definitions shouldn't be placed in the same file."***

I can find no technical reason why ALL external data definitions shouldn't be placed in the same file. They even could be placed in their own file much like FORTRAN's

BLOCKDATA construct. If you call this file **extern.c**, or any meaningful name, then all programmers on any of your projects know EXACTLY where to look for definitions and initializer lists. Another solution is always to place these definitions at the beginning of the file that contains the function **main**. In either approach, you always know where to look. A by-product of this is that you get more discipline from the programmers, a quality I find sorely lacking in most C shops, and it's not unique to C either. Output and product performance are directly proportional to the amount of design and project management.

A useful aid to file management is a **make**-like tool. The **make** tool originally was available only with UNIX. Basically, **make** reads in a text file that describes the relationships between a set of source files; which source files include which headers, etc. When **make** is run for an application, it checks the last modification date of source and object files and, if the source is more recent, **make** compiles it using some predefined command-line arguments. Also, any headers that have been changed will cause all affected sources to be recompiled. Essentially, **make** is a mechanical, and much more reliable, application builder. Implementations of **make** are available for a number of non-UNIX environments, including MS-DOS, and as part of DEC's MMS package for VAX/VMS.

Source code management systems such as UNIX' SCCS and VAX/VMS' CMS also are useful for large projects. However, they may be overkill on small projects. Such systems slowly are becoming available on other systems as users realize that, maybe, just maybe, software engineering is a science after all.

4. Assembler and C. Some compilers allow assembler to be included in-line using directives something like ***#asm*** and ***#endasm*** as follows:

```
f()
        int i;

        i = ...
#asm
        MOV     (R3)+,6(R5)+
        ...
#endasm
        i = ...
}
```

The only justification for this is that if you REALLY can't afford the overhead of a function call, you've got a special application anyway. The problem with in-line assembler is that it requires an INTIMATE knowledge of the code generated by the compiler. You have to know exactly how it uses registers, the stack, heap, etc., so you know how to access **auto** and **static** variables and external data and functions correctly. Once you have invested all that time in learning this stuff, along comes the next version of the compiler which generates code differently. Perhaps a new or better optimizing pass has been added. You may be able to justify it as rare circumstances, but good luck when maintaining it across system upgrades.

One reason for using assembler is to get better performance or to access some hardware or system software capability. Rather than put such code in-line, it is better to write a gateway routine to access a library of assembler functions. Properly designed, this family can become generally accessible by other programs. If you want to port code, it is easier to replace an implementation-specific assembler routine that it is to change the in-line assembler. Anyway, not all C compilers support in-line assembler.

The C language per se, doesn't make an argument count available to a called function. However, some implementations may do so. If you are calling assembler from C and need to process variable length argument lists, refer to the manual or to generated assembler code (if your compiler provides it).

Another problem is that C does not allow function arguments to be optional. For example, the following function call will not compile:

```
f(arg1, , ,argn);
```

FORTRAN always passes by address, and on RSX, omitted arguments have a special address value of "-1". There is no way to do this in C, so dummy arguments with "default" values must be used as place holders. This can be a problem when calling operating system service routines such as QIO which, like many other functions, allows some optional parameters.

To call assembler from C, you need intimate details of the calling stack frame. This is a nasty problem on Intel 8086/88 machines which support a number of different memory models. In this case, the size of pointers varies depending on the memory model specified during compilation. Thus, you may need a different version of the assembly code for each memory model. This is where assembler conditional compilation directives come in handy.

Many vendors' compiler manuals are inadequate in the area of linkage information, so it is a good idea to always obtain an assembler listing of generated code, if possible, to confirm the actual mechanism used.

ANOTHER ASPECT of code generation is data and code placement. To access globals and static data defined in C, from assembler you may need to know about the PSECTs used.

While I've written my share of MACRO-11 assembler for the PDP-11, and some assembler for the 8088, I don't do enough of it to remember all of the addressing modes. However, occasionally I need to use assembler code for speed, etc. Rather than write the function from scratch, I write a

dummy version of it in C, specifying the argument list and accessing each argument in turn in a simple assignment statement. For example, assuming my new assembler routine **test** has three **int** arguments and returns an **int** value, uses a global double precision variable **d**, and calls an external procedure **f**, I would write a C version as follows:

```
test(i,j,k)
int i,j,k;
{
        extern int f();
        extern double d;

        i = 1;
        j = 2;
        k = 3;
        d = 1.2;
        f();
        return (i + j - k);
}
```

Then, by having the compiler produce an assembler listing, I can find out exactly how I should reference these variables and functions, and set up a return value. In fact, if I can spool the assembler listing to a disk file, I make that the actual assembler source file and modify it accordingly. Rather than start from scratch, I cheat so I'm not handicapped by my infrequent use of assembler. One golden rule I have is that, once you generate an assembler listing and you hand-modify it for whatever reason, that routine is now an assembly-language function and should stay that way. Don't try to keep it a C function, which you hand-modify each time it is compiled.

One warning. I had a nasty experience recently with a compiler on a SUN workstation using UNIX BSD4.2. Unlike DEC's (sensible) compilers, UNIX C does not allow you to generate both object and an assembly listing at the same time; it's one or the other. Unfortunately, I found that if I wrote a function and then compiled it using the -S (generate assembler listing) switch, the compiler failed to do a complete syntactic check. It just generated code the best it could. Once I found that calls to external routines were missing from the generated code, I recompiled creating object, only to find the file contained syntax errors — rather unprofessional engineering in my humble opinion.

5. Numerical applications in C. Numerical "fanatics" have avoided C since they claim they really can't have single and double precision. And they're right; C is generally deficient in this area. However, the proposed ANSI Standard is addressing this potentially huge audience of converts, as we shall see later; but first some history.

While C supports the types **float** and **double**, all **float** values must be converted to **double** when used in arithmetic or when passed as arguments. (Note that many also believe that **float** return values MUST be widened to **double**, although I can find no evidence to support this claim, and I certainly don't believe it. As it happens, some of these believers happen to be compiler writers, so their belief becomes reality.)

A number of compilers have a command-line switch that allows expressions containing **float** operands only, to be evaluated in **float** precision without widening. However, they still widen **float**s to **double**s in argument lists.

THE ONLY ADVANTAGE of **float** in C is that it typically takes up less space (often half) than does a **double** object. So, if you don't need the extra precision, you can save a lot of space with large arrays of **float** objects. However, you pay the price when using these objects in calculations and as function arguments. Fortunately, the way DEC stores single- and double-precision values, conversion between the two simply involves truncation or padding with zero bits. However, other systems are not so generous and may require a subroutine call to convert from one precision to the other.

The ANSI Standard does several things to alleviate this situation. First, it allows an arithmetic expression to be evaluated in any precision, provided the result obtained is the same as that if the widening rules had been followed. (This allows **char** and **short** arithmetic as well as **float**.)

Second, by using a function prototype, a **float** can be passed to a function without being widened as follows:

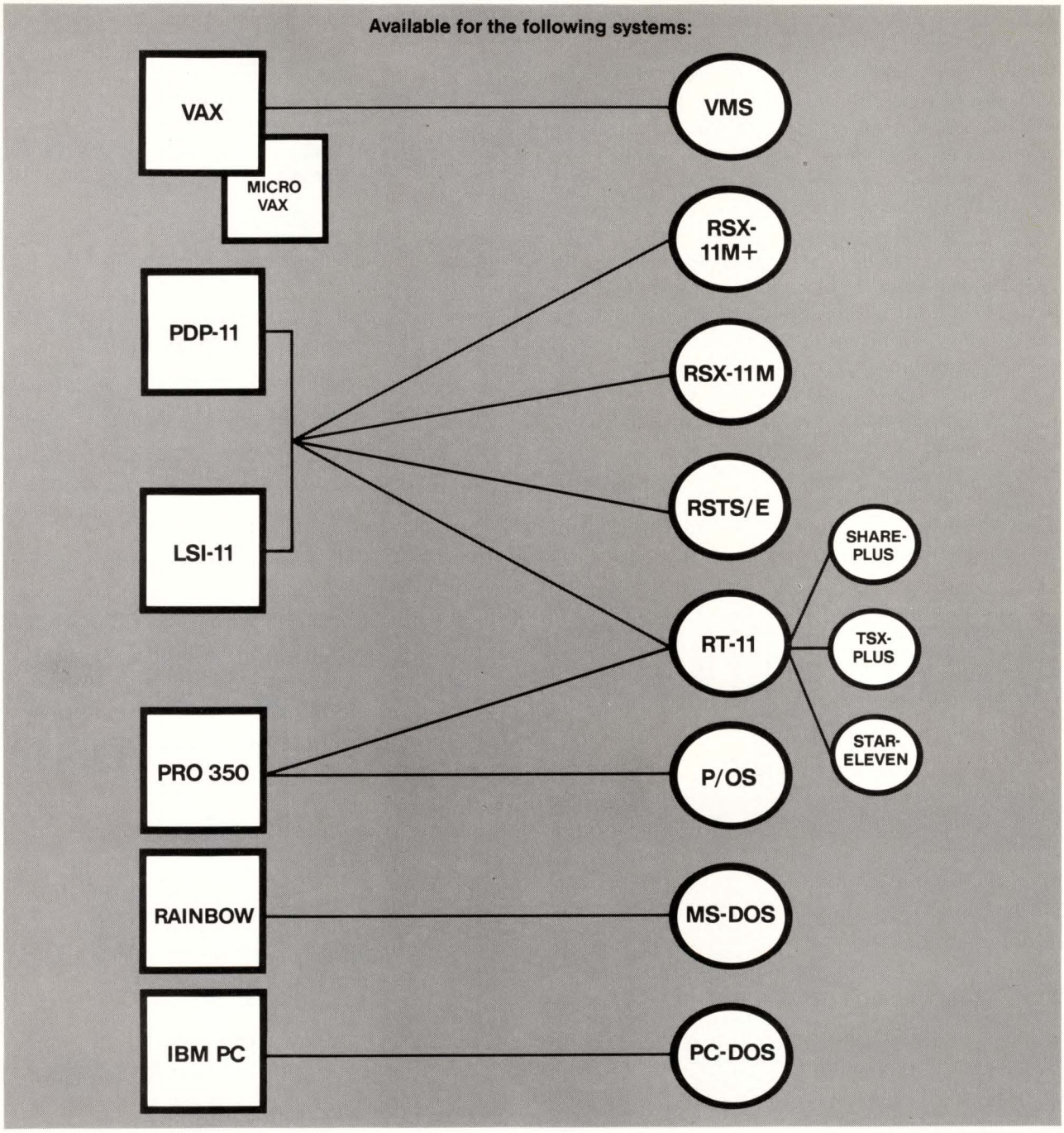
```
extern float g(float arg);

x()
{
        float f = 1.23F;

        f1 = g(f);
}
```

The function prototype for **g** indicates that **g** returns a value of type **float** (currently available in C) and that it expects one argument of type **float**. So, when **g** is called in function **x**, the actual **float** argument **f** can be passed by value as a **float**, without being widened. Note, however, that having this is implementation-defined, so check with your intended compiler vendor before you select their product based on this new "capability"; likewise, for lower-precision arithmetic mentioned above.

Currently, all floating-point constants are of type **double**. With the Standard, the suffix **f** or **F** can be used to designate a **float** constant, and a suffix of **l** or **L** can be used to indicate

RTFILE®

The Interactive Relational Database Management System for DEC End-Users and System Builders



RTFILE/LAN-multiple concurrent PC users access and update shared data residing on VAX and other servers via 3Com Ethernet.

RTFILE is a registered T.M. of Contel
VAX, MICRO VAX, PDP-11, MICRO PDP-11, PRO 350, VMS, RSX-11M+, RSX-11M, RAINBOW, RSTS/E, RT-11, and P/OS are T.M.'s of Digital Equipment Corp.
SHARE-Plus and STAR-eleven are T.M.'s of HAMMOND Software
TSX-Plus is a T.M. of S&H Computer Systems
IBM is a T.M. of International Business Machines, Inc.

To learn how RTFILE can work for you, Contact Contel today.

CONTEL **Business Networks**

4330 East-West Highway, Bethesda, MD 20814
(301) 654-9120.

ENTER 78 ON READER CARD

type **long double**. This is a new floating-point type that is of equal or greater precision than **double**. Since the VAX has more than two floating-point representations (VAX C currently allows two of three precisions), it is likely that **long double** will be significantly more precise than **double** once it is implemented. The modifier **L** can be used with floating-point masks in **printf**, to display a **long double**. The lower-case **l** modifier is still reserved for **long integer**, although **long float** is no longer allowed as a synonym for **double**.

When evaluating C for possible use in compute-bound tasks, keep in mind that there are good and bad implementations of code generation and mathematics libraries in any language. The fact that one particular implementation of C performs floating-point arithmetic slowly and/or imprecisely, does not mean that C is the problem. I can see no reason why C cannot be as good as FORTRAN (the acknowledged master in this area) when it comes to accuracy and precision. After all, C and FORTRAN programs readily run on the same processor using the same basic floating-point native data types. It's really a matter of implementation.

Now that the **float**-to-**double** "problem" has been circumvented, I foresee compiler vendors seriously addressing the needs of numerical analysts. But when shopping, do your homework thoroughly. And, of course, use a FP accelerator/processor, etc., if you want/need it. The same basic FP rules apply to C as for other languages.

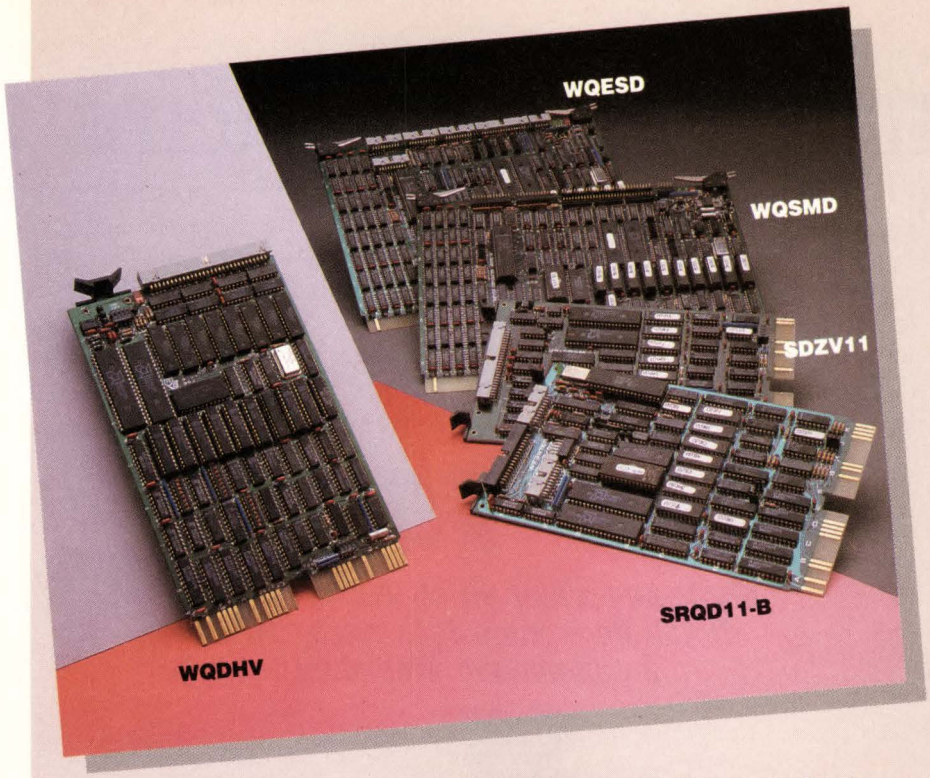
Next issue I'll continue with the topic of style and I'll continue to answer reader mail. Readers are encouraged to submit any C-related comments and suggestions to Rex Jaeschke, 2051 Swans Neck Way, Reston, Virginia 22091.

> ***The same basic FP rules apply to C as for other languages.***

Rex Jaeschke is editor of "The C Journal" and the author of numerous articles on the C language. He is a member of the ANSI X3J11 standards committee for C.

The first 26 "Let's C Now" articles are available in updated form as a two-volume set. See page 91 for ordering information.

The latest dual in our Qbus family.



The Webster WQDHV — 16 lines with full modem control

A Qbus RS232C asynchronous 16-line communications multiplexer. This board is functionally compatible with two DEC DHVlls, but has several operational and performance enhancements. These include Console DL emulation, Line Time Clock, Programmable Baud Rate selection, XON/XOFF flow control and DMA — all on a dual height board.

The use of compact dual UARTS, and a high speed microprogrammed sequencer gives the WQDHV a system building functionality that allows a powerful time-sharing computer system to be assembled with just three other dual height boards — a CPU, memory, and a disc controller.

For the MicroVAX, the WQDHV provides an inexpensive, compact means of adding many serial line interfaces.

MicroVAX is the registered trade mark of Digital Equipment Corporation.

WQESD Winchester Disc Controller

- ☐ ESDI interface, MSCP emulation
- ☐ 24 Megabit data rate
- ☐ Seek optimization
- ☐ Look-ahead reads/drive shadowing
- ☐ Block mode/DMA throttle
- ☐ Dynamic bad block replacement/ECC
- ☐ On-board boot/diagnostics/utilities

WQSMD Cached Qbus SMD Disc Controller

- ☐ One megabyte cache
- ☐ Very high performance large capacity discs.
- ☐ Mass Storage Control Protocol (MSCP) Emulation

SDZV11 8-ch DZ Mux

- ☐ World first — still unequalled
- ☐ 38,400 baud
- ☐ Split Rx/Tx rates
- ☐ Extra silo
- ☐ 22 bit/4 level interrupt

SRQD11-B Winchester Disc Controller

- ☐ Dual height Qbus interface to ST506/ST412 compatible 5¼" Winchester disc drives
- ☐ Implements DEC's Mass Storage Control Protocol (MSCP)

Webster Computer Corporation
1037 North Fair Oaks Avenue
Sunnyvale CA 94089-2183
Telephone (408) 745 0660
Fax (408) 745 1162

International inquiries
Webster Computer Corporation
Australia Telex AA36251

ENTER 97 ON READER CARD

Innovative Australian ideas for DEC users

WEBSTER COMPUTER CORPORATION

MANAGING YOUR MICROVAX

David W. Bynon

Controlling The System

One of the problems with the MICROVAX is its name, "Micro" VAX. Folks take the name seriously. It's only a micro: Give it to the users and let them manage it themselves. Come on folks, get serious! This isn't a PC.

MICROVAX II systems can be configured with as much as 16 MB of memory, hundreds of megabytes of disk storage, 24 terminal ports, networking, and myriad peripheral controllers. MICROVAX systems are true VAX computers and they need VAX systems management.

The goal of the next four articles is to provide insights for those whose jobs require that they manage a MICROVAX/MICROVMS system for others or themselves.

System Manager Advice

Half of the battle of managing a computer system like the MICROVAX, is controlling the resource. Everyone wants a piece of it, and you. Once you let the system get out of hand, it's difficult to regain control. Prepare yourself, get armed!

Every system, MICROVAXs included, needs some type of management base: guidelines and controls if you will. I have adopted a method that involves two documents: a system plan and the standard operating procedure. Why? The answer is simple: control.

A system plan is a document that justifies the existence of the computer system. It should be written during the system procurement stage. However, late is better than not at all. The system plan should be updated frequently, as procedures and policies change.

The system plan states such items as the purpose, usage, training requirements, life cycle, support and control over the system. It should have a direct alignment with the corporate business plan. When endorsed by management, the system plan is as good as gold to the system manager.

The system plan is your lever against the guy who wants to run ALL-IN-1 on your data acquisition system, or the manager who wants to give the system away to another department (Don't laugh, it happens!). It helps you to justify expansion or procurement of a replacement system and, not to be forgotten, it helps you to develop the standard operating procedure (SOP).

The SOP is a document that states procedures used to operate and manage a system on a day-to-day basis. For those of you who are chuckling over the fact that you only have one measly MICROVAX I, keep it up. I remember my two original MICROVAX systems — which turned into 37 VAXstations, then a network, then a VAXcluster. . . . I was ready, though. I had my plan and SOP! Do you?

SOPs should cover such items as emergency shutdown, power distribution panel locations, backup procedures, off-site storage of media, disaster recovery, security and operating hours. It should explain operations in enough detail to allow another qualified person to take over your position, just in case you decide to take a vacation someday. All of which brings me to my next point: procedures.

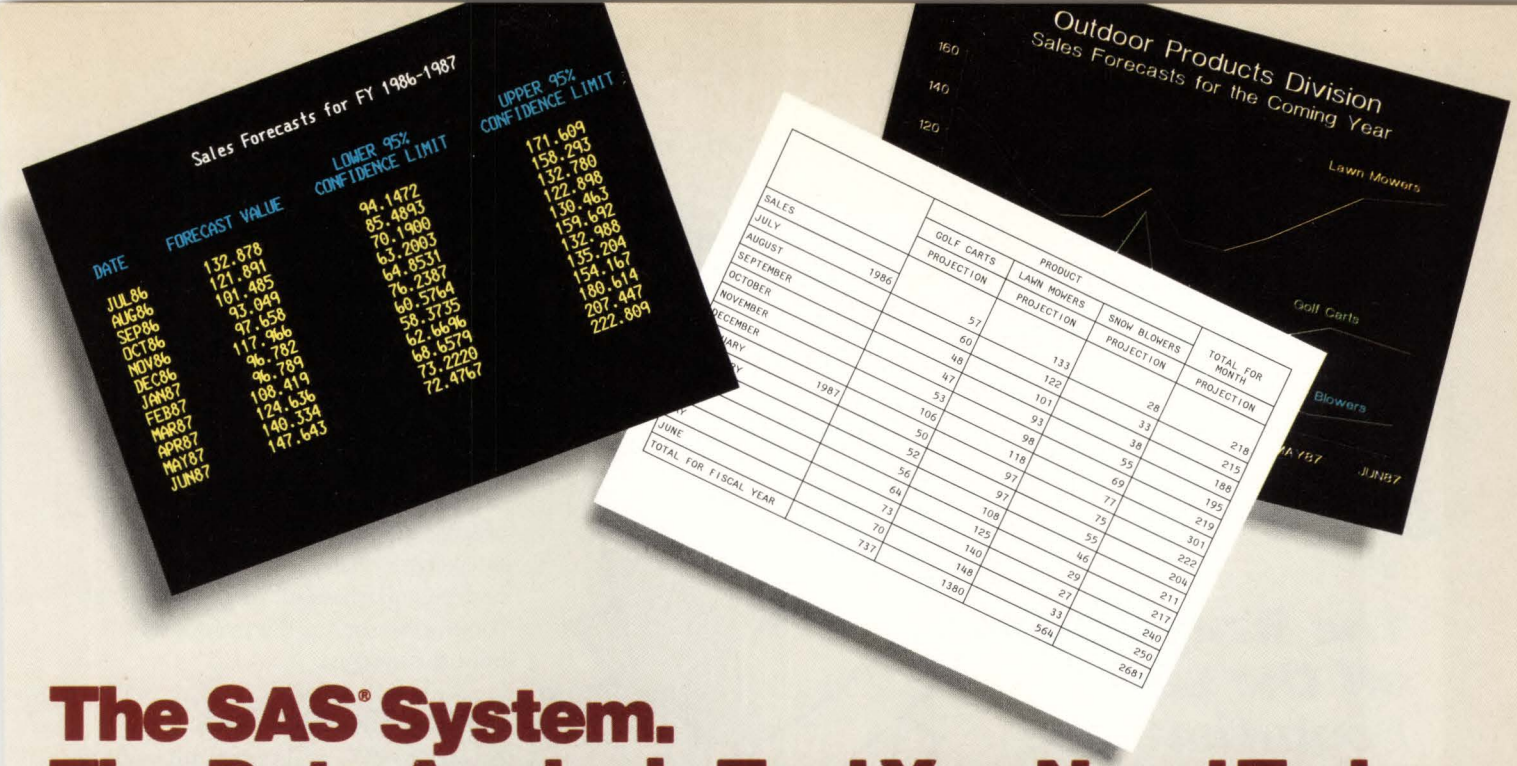
> ***"My theory about all of this is simple: If you do it more than once, write a commmand procedure."***

System management is a routine kind of thing. You perform the same operations day after day. My theory about all of this is simple: If you do it more than once, write a command procedure.

I write procedures to do almost everything; so much, in fact, that I have procedures to manage my procedures. Extreme? Not really. Why should I try to remember how to do something when the procedure can do it for me?

Being a good system manager doesn't mean you have to have all of the answers. It means you have to know where to go to find them.

Your job, as a MICROVAX system manager, is to know your system — what's normal, what's not. Is it a software problem or is it hardware? Is the user fouling it up, or is it the system? Again, knowing how to solve the problem is not always required. Knowing



SALES		GOLF CARTS	PRODUCT			
		PROJECTION	LAWN MOWERS PROJECTION	SNOW BLOWERS PROJECTION	TOTAL FOR MONTH PROJECTION	
JULY	1986	57	133	28	218	
AUGUST		60	122	33	215	
SEPTEMBER		48	101	38	188	
OCTOBER		47	93	55	195	
NOVEMBER		53	98	69	219	
DECEMBER		106	118	77	301	
ARY		50	97	75	222	
	1987	52	97	55	204	
		56	108	46	211	
JUNE		64	125	29	217	
TOTAL FOR FISCAL YEAR		73	140	27	240	
		70	148	33	250	
		737	1380	564	2681	

The SAS® System. The Data Analysis Tool You Need Today. Plus Everything You'll Need Tomorrow.

If your job demands a powerful data analysis tool, the SAS® System is your solution. The SAS System gives you ready-to-use procedures for performing every kind of analysis—from simple descriptive statistics to advanced regression, analysis of variance, discriminant analysis, clustering, scoring, and more.

The SAS System reads data in any structure from any kind of file. You can create new variables, modify old ones, combine files, detect errors, and accumulate totals. Once your analysis is complete, you can report your results in lists, tables, charts, or plots.

And as your needs grow, the SAS System grows with you. All the tools you need for color graphics, forecasting, modeling, "what if" analysis, project management, optimization, and quality control are available in the SAS System. You choose the products you need, and enjoy the same easy-to-use language and syntax in each. Plus, you can use the same software on your personal computer.

The SAS System. It's the most widely installed tool for data analysis among VMS users*... And more.

For details, send us your name and address. Or call a Software Sales Representative today.

SAS Institute Inc.
Box 8000, SAS Circle
Cary, NC 27511-8000
(919) 467-8000
Telex 802505

☐ Send me more about the data analysis tools in the SAS® System.
☐ Send me information about "everything" in the SAS System.
☐ Call me to discuss a 30-day trial.

Please complete or attach your business card.

Name _____
Title _____
Organization _____
Address _____
City _____ State _____ ZIP _____
Phone (_____) _____
Machine _____ Operating System _____

Mail to: SAS Institute Inc., Attn: CC
Box 8000, SAS Circle
Cary, NC 27511-8000

DP1186

* Computer Intelligence, January 1986.

The SAS System runs on these minicomputers: Digital Equipment Corp. VAX™ 8600 and 11/7xx series under VMS™ and MicroVAX II™ under MicroVMS™; Prime Computer, Inc. Prime 50 series under PRIMOS®; and Data General Corp. ECLIPSE® MV series under AOS/VS. The SAS System also runs on IBM 370/30xx/43xx and compatible machines under OS, CMS, DOS/VSE, SSX, and ICCF; IBM XT/370 and AT/370 under VM/PC; and IBM PC XT and PC AT under PC DOS. Not all products are available for all operating systems.

what help to get and where to get it is. And remember, stay in control.

MICROVMS provides a virtual basket load of controls for the system manager. Use them to your fullest advantage. A well-managed system is one capable of managing itself. This is possible using the tools provided by MICROVMS.

The MICROVAX Console System

Like other VAX systems, the MICROVAX incorporates a console subsystem that allows you to communicate with the processor while not under control of an operating system. The MICROVAX has two console operating modes: program I/O mode and console mode. In program I/O mode, the console acts like any other terminal on the system. In console mode, the console subsystem allows you to issue commands to the processor.

From console mode you can load system programs, enter or examine data in memory, start program execution, single step through instructions, or execute diagnostic tests. To manage a MICROVAX system, it is important to understand a handful of these console commands, such as the various ways to boot the system.

Booting The MICROVAX

A MICROVAX is booted (operating system loaded and started) via the console BOOT command. The BOOT command takes the format:

>>>B qualifier device_name

"Qualifier" is a value to be loaded in general register R5 after processor initialization. If no value is supplied, 0 (zero) is assumed. "Device_name" is a device specification in the format "ddcu" where "dd" is a two-letter device mnemonic, "c" is a controller number, and "u" is a unit number.

The most direct way to bootstrap the MICROVAX is to activate the power switch, press the RESTART switch, or enter console mode and type "B". The processor will search for the first available MSCP device with a bootable image. If you wish to boot from a specific device, for example, DUA1, you must specify it:

>>>B DUA1

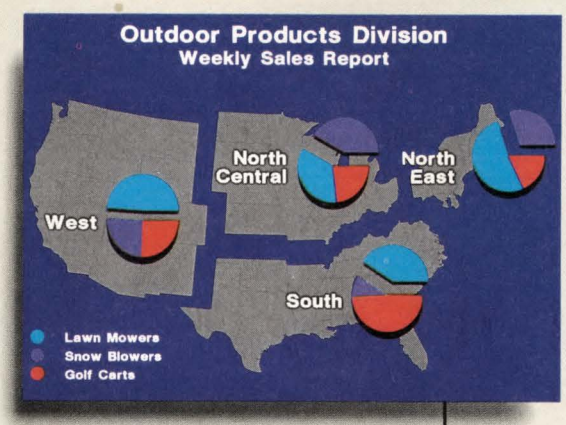
A number of boot modes are available using the /n qualifier:

>>>B/1 ddcu - Conversational boot with SYSBOOT

>>>B/10 ddcu - Boots a Diagnostic Supervisor volume

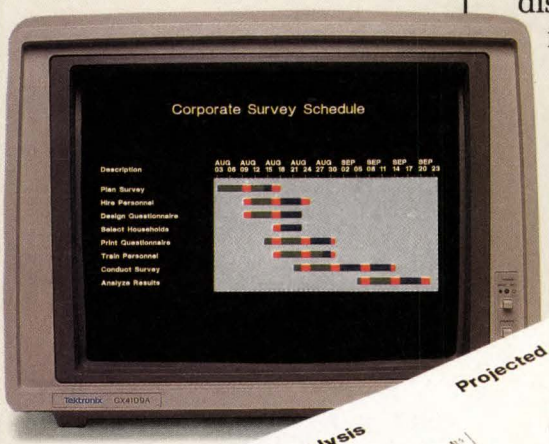
The SAS® System. The Graphics Tool You Need Today. Plus Everything You'll Need Tomorrow.

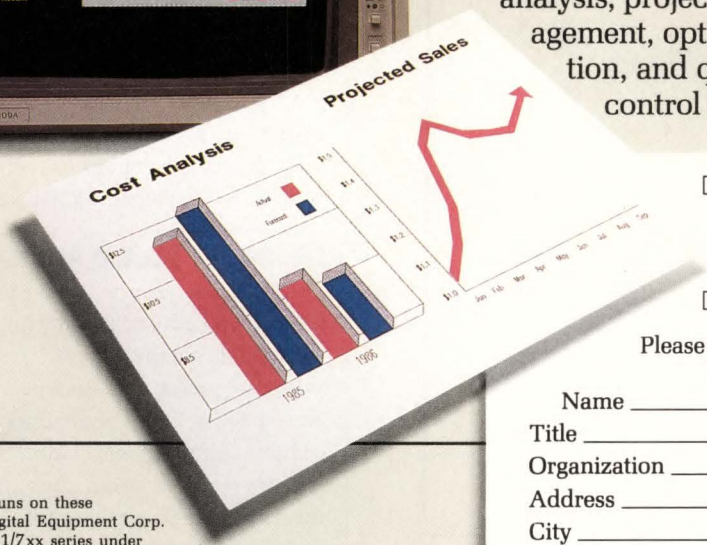
When you've got to turn those numbers into a presentation, turn to the SAS® System. The SAS System includes easy-to-use procedures for charts, plots, maps, and three-dimensional displays. At a glance, you can grasp detailed statistics, spot relationships among items, and trace emerging trends. And when your manager wants more, the SAS System lets you customize your graphs and present multiple displays on the same page for easy comparison. You can produce your graphs on terminals, plotters, transparencies, or slides.



You can even use the SAS System to analyze your data before you present them. We've got tools for every kind of analysis—from simple descriptive statistics to advanced regression, analysis of variance, discriminant analysis, clustering, scoring, and more.

And as your needs grow, the SAS System grows with you. All the tools you need for full screen data entry, modeling, forecasting, "what if" analysis, project management, optimization, and quality control are available in the SAS System. You choose the products you need, and enjoy the same easy-to-use language and syntax in each. Plus, you can use the same software on your personal computer. Or you can use your PC to emulate a VT100 terminal and produce high-resolution color graphics from the host.





The SAS System. It's for those who need a graphics package today, and for those who have an eye on tomorrow.

For details, send us your name and address. Or call a Software Sales Representative today.

SAS Institute Inc.
Box 8000, SAS Circle
Cary, NC 27511-8000
(919) 467-8000
Telex 802505

☐ Send me more about the graphics tools in the SAS® System.
☐ Send me information about "everything" in the SAS System.
☐ Call me to discuss a 30-day trial.

Please complete or attach your business card.

Name _____
Title _____
Organization _____
Address _____
City _____ State _____ ZIP _____
Phone (_____) _____
Machine _____ Operating System _____

Mail to: SAS Institute Inc., Attn: CC
Box 8000, SAS Circle, Cary, NC 27511-8000

DP1186

The SAS System runs on these minicomputers: Digital Equipment Corp. VAX™ 8600 and 11/7xx series under VMS,™ and MicroVAX II™ under MicroVMS™; Prime Computer, Inc. Prime 50 series under PRIMOS®; and Data General Corp. ECLIPSE® MV series under AOS/VS. The SAS System also runs on IBM 370/30xx/43xx and compatible machines under OS, CMS, DOS/VSE, SSX, and ICCF; IBM XT/370 and AT/370 under VM/PC; and IBM PC XT and PC AT under PC DOS. Not all products are available for all operating systems.

>>>B/100 ddcu - To boot from an alternate boot file

Conversational Bootstrap

A conversational bootstrap commonly is used when testing or developing a new system. It allows the advanced user to SET and SHOW system parameters, specify an alternate SYSTARTUP procedure, select an alternate system parameter file, or specify startup parameters.

The conversational bootstrap invokes the SYSBOOT program, which supports a subset of the SYSGEN commands:

1. CONTINUE - Resumes the bootstrap operation
2. DISABLE CHECKS - Inhibits checking of parameter values
3. ENABLE CHECKS - Permits checking of parameter values
4. HELP - Summary of SYSBOOT commands
5. SET parameter - Sets the value of a SYSGEN parameter
6. SET/STARTUP - Sets the name of the system startup procedure
7. SHOW parameter - Displays system parameter values
8. USE file_spec - Specifies parameter file to be used for values

During a conversational boot, you typically would change some system parameters, then continue the boot procedure:

```
SYSBOOT> SET GBLPAGES 2048
SYSBOOT> SET GBLSECTIONS 58
SYSBOOT> CONTINUE
```

The conversational boot often is used to specify a minimum startup to avoid autoconfiguring devices, installing layered products, starting queues, and so on. A minimum startup does not invoke the SYCONFIG or SYSTARTUP procedures. To specify a minimum startup:

```
SYSBOOT> SET STARTUP_P1
"MIN"
SYSBOOT> CONTINUE
```

Note that the SYSGEN parameter STARTUP_P1 will remain "MIN" for the next bootstrap operation unless you reset it to " " using SYSGEN.

MICROVAX Startup And Shutdown

MICROVMS systems are supplied with several procedures for starting up and shutting down the system. They fall into two categories: site-independent and site-specific. Site-independent procedures should never be modified. They execute required commands and invoke the site-specific procedures. The site-specific procedures are yours to modify, as needed, to reflect your system re-

quirements, such as mounting a disk or stopping a process.

Startup Command Procedures

The startup command procedures STARTUP, SYCONFIG and SYSTARTUP are executed when the system is booted. Collectively they control how the MICROVAX will be configured each time it is restarted.

SYS$SYSTEM:STARTUP.COM is the site-independent startup procedure. It sets up devices, parameters and logical names in order for the system to run properly. This procedure invokes the procedures SYCONFIG and SYSTARTUP.

SYS$MANAGER:SYCONFIG.COM is, initially, an empty file for site-specific device configuration commands. For example, if you have a non-standard device, you would use a SYSGEN command in this procedure to load the driver:

```
$ RUN SYS$SYSTEM:SYSGEN
CONNECT device
/DRIVERNAME = driver
EXIT
```

SYS$MANAGER:SYSTARTUP.COM is the site-specific startup command procedure. This file is delivered with many examples for a generic MICROVAX system. SYSTARTUP should contain commands that:

1. Assign logical names particular to your system.
2. Mount disk volumes.
3. Set terminal or modem characteristics.
4. Initialize system queues.
5. Start DECnet if installed.
6. Install programs and known images.
7. Install secondary page and swap files if required.
8. Start accounting or error logging.
9. Purge log files.
10. Submit system batch jobs.
11. Define the number of interactive users.
12. Announce the system is available.

Most of the example commands will be commented-out (so as not to execute). Uncomment and/or modify those that pertain to your system configuration. I highly suggest the use of logical name assignments for any physical devices. By doing so, command procedures or programs written for your system will remain device-independent.

Shutdown Command Procedures

MICROVAX systems are interactive multiprocessors and, as such, are capable

of having multiple process operating at any given time. For this reason you should avoid shutting down the MICROVAX by simply flicking the power switch.

The command procedure SYS$SYSTEM:SHUTDOWN.COM exists to help you shutdown the MICROVAX in an orderly fashion. It is a site-independent procedure. When executed, SHUTDOWN will prompt you for information about the shutdown:

How many minutes until final shutdown [0]?
Reason for shutdown:
Do you want to spin down the disk volumes [No]?
Do you want to invoke the site-specific shutdown procedure [Yes]?
Should an automatic reboot be performed [No]?
When will the system be rebooted [later]?
Shutdown options [None]?

Default values are accepted by typing RETURN. If you answer yes to the question "Do you want to invoke the site-specific shutdown procedure [Yes]?" SHUTDOWN will invoke SYS$MANAGER:SYSHUTDWN.COM. SYSHUTDWN is the site-specific shutdown procedure. If you have any special shutdown requirements they should be entered in this procedure.

SHUTDOWN must be executed from the system manager's account or an account with the SETPRV privilege. Use the command:

$ @SYS$SYSTEM:SHUTDOWN

When SHUTDOWN executes, it will:

1. Broadcast a shutdown message to all users.
2. Disable future logins.
3. Shut down DECnet (if running).
4. Stop the queue manager.
5. Invoke the site-specific shutdown.
6. Stop all users processes.
7. Remove all installed images.
8. Dismount all mounted volumes.
9. Close the operators log file.
10. Invoke OPCRASH.

If you did not specify an automatic reboot, the following message will appear on your console:

SYSTEM SHUTDOWN COMPLETE —
USE CONSOLE TO HALT SYSTEM

The shutdown is finished. You may press the HALT button and shut off the power.

Login Command Procedures

Just as MICROVMS has procedures that configure and tailor the system when

it comes up, the users have command procedures that configure their environment each time they log in. Three login command procedures can be established: system, individual, and user-specified.

The system login command procedure, typically named SYS$MANAGER:SYLOGIN.COM, is executed for each user when he logs in. Generally this procedure is used to define symbols, set terminal characteristics, display

> ***"The tools are all in place for those who will take advantage of them. Use them and be in control, not controlled."***

messages, and assign logical names. The system command procedure is equated to the system logical name SYS$SYLOGIN.

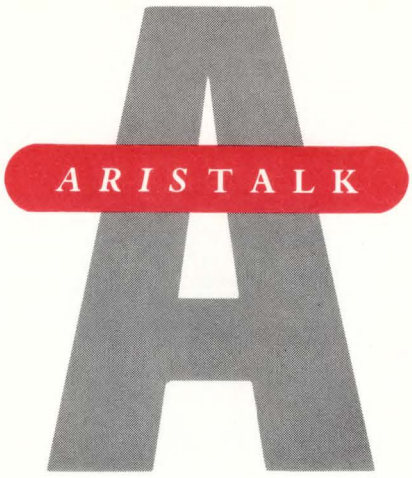
For all accounts you may assign an individual login procedure to be executed after the system procedure. The individual login procedure is specified with the /LGICMD qualifier in AUTHORIZE. It is a means to control single or groups of users differently than others, such as captive accounts. If the procedure is in the users account, it may be developed and maintained by the user. The default individual login procedure is SYS$LOGIN:LOGIN.COM.

Finally, if the system or individual login command procedures are not implemented, MICROVMS searches for a command procedure named SYS$LOGIN:LOGIN.COM. If found, it will be executed for the user. This procedure is developed by the user.

Small, but powerful, the MICROVAX is a minicomputer that requires organized system management. The tools are all in place for those who will take advantage of them. Use them and be in control, not controlled.

In next month's segment, "Staying in Charge," we will discuss such topics as user management, system security, system management utilities, and control systems.

David W. Bynon is a VAX systems consultant based in Gaithersburg, Maryland.



EDTKEYS.TPU Problem

QUERY:

Scott Goehring: Don Golden's extension to TPU EVE/EDT (*VAX PROFESSIONAL*, Vol. 5, No. 6, June, 1986) looks rather useful; however, every time I start up EDTKEYS, I get the message, "Compilation aborted at line 5383." I've made no changes to the code except to edit out noise from ARIS downloading. Has anyone else had this problem, or know what causes it?

[Addendum] I believe the problem referred to in my previous message was simply a semicolon dropped in transfer. Oh well!

REPLIES:

James J. Ziegelmeyer: Scott, I also have experienced the same problems. I have no idea why it doesn't work. I look forward to a knowledgeable reply. I'm still having compilation problems at line 5383. I find this too much of a coincidence. Could someone tell me what that line looks like, or how I could see each line as it compiles? A listing perhaps? Thanks!

Jeffrey S. Rosenberg: After fixing lines that have been wrapped, an error still remains in the procedure:

" EVE_MOVE_RIGHT
EVE_MOVE_LEFT ENDIF", KP3, "CHAR");

Change your copy to read:

" EVE_MOVE_RIGHT ELSE
EVE_MOVE_LEFT ENDIF", KP3, "CHAR");

Because of internal changes in EVESECINI.TPU, the procedure will not work as provided, on all systems. For use on VMS 4.4 or greater, make the following changes:

Remove the line:
EVE$CLEAR_KEY
(KEY_NAME(COMMA,SHIFT_KEY));

Replace all: EVE$CLEAR_KEY
with: UNDEFINE_KEY

Replace all: EVE$INIT_KEY
with: DEFINE_KEY

Some of the problems with EDTKEYS.TPU are in the file, and not caused by downloading. There's a new version of EDTKEYS.TPU available for downloading, which has had the 10 leading spaces on each line removed, and the problems with continuation lines, broken comments and syntax errors fixed.

The new version also contains instructions on how to change it for use with VMS 4.4 or greater.

Jack Berger: It would appear that you cleaned up too much, since we have downloaded and used it with no problems.

How To Use ARIS

If you are a subscriber to *DEC PROFESSIONAL*, you can call up our VAX and log into ARIS, our **A**utomated **R**eader **I**nformation **S**ervice. In ARIS, you can download programs from our publications, communicate with our editors, request a change of address, find additional information about advertisers, order books and back issues, check the guidelines for submitting articles, access our cumulative index, and take a peak at our editorial calendar for the year.

In addition, ARIS has a message center for communicating with other DEC users. There is no charge beyond that of the call, and many *DEC PRO* readers already are getting some excellent advice. Each month, we will select and publish some of the most interesting queries and replies.

To log in, you'll need your subscriber number (it's on your mailing label). Then, just set your terminal to 7 bits, 1 stop, no space parity, and dial (215) 542-9458. Baud rates: 300 or 1200.

In the near future, we will be including a transfer protocol to assist in downloading programs.

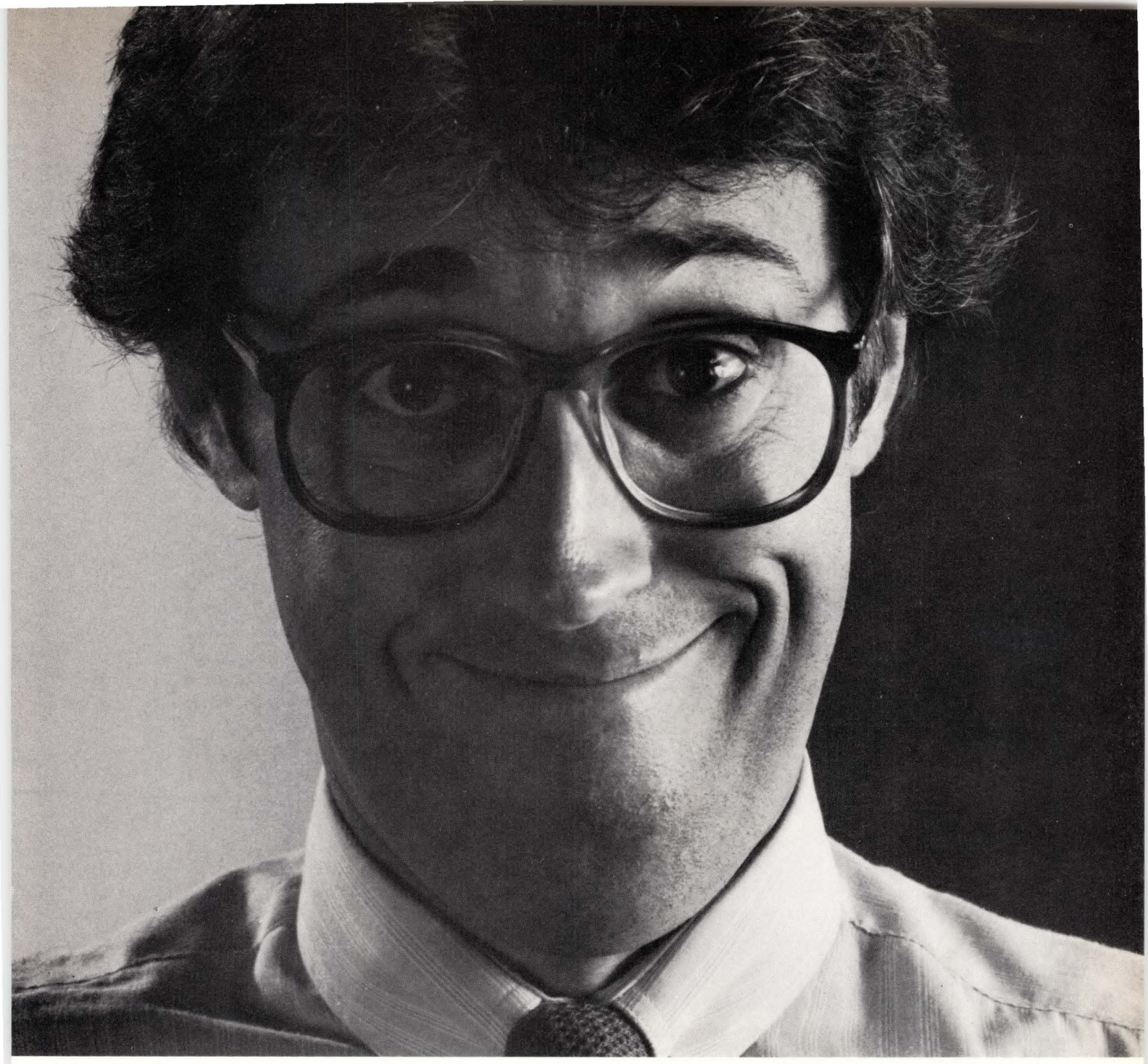
IGES Graphics Standard

QUERY:

David Spaulding: In the July, 1986 issue, there was an article about graphics standards. An IGES standard was referenced, and I'm wondering if anyone can help me obtain a copy?

REPLIES:

Denny McIntyre: I've contacted the technical library where I work in regard



How to cope with all the characters in your office.

A proposal printed this afternoon, complete with diagrams. 2000 personalized letters by tomorrow. A report written on the IBM PC that needs to be edited on the VAX. You need WORD-11 word processing, the fast, easy way to get all your characters under control.

WORD-11 has been designed with your VAX performance in mind. It lets you give your users the features they need. Without sacrificing your other system applications.

WORD-11 has been making life easier in offices all over the world. With high performance list processing, integrated graphic output to laser printers and scientific equations. WORD-11 delivers the performance and features you and your users want.

All backed by the finest service and support in the industry. Complete training. Straight forward installation. Competitive prices based on system size or number of users.

So before you get caught in your next crunch, see how WORD-11 can help you cope with all those characters.

Call us today for a free evaluation copy. **800-843-1317**

714-970-1515, in California

416-225-7788, in Canada

WORD-11

Word processing for the VAX and MicroVAX.

Also available for PDP-11 systems.

Data Processing Design,
1400 N. Brasher, Anaheim, CA 92807

ENTER 328 ON READER CARD

to ordering copies of the IGES Standard. (They had obtained copies of the Standard for our use last November when we were exploring a possible link between two different types of CADD applications that we're running.)

The National Bureau of Standards document number is NBSR 86-3359 (IGES Version 3.0). Our technical library informed me that the National Technical Information Service (NTIS) is the distributer of the standard for NBS. NTIS can be reached at (703) 487-4650, but according to our library, is very hard to get this way; unfortunately, that was the only way they knew. When you reach NTIS, ask for Order Number PB86199759. Our library did not know the cost. Good Luck!

David Noss: The Initial Graphics Exchange Specification (IGES) V3.0 documentation is available from:
Mr. Brad Smith, U.S. Department of Commerce, National Bureau of Standards, Gaithersburg, MD 20899.

The document number is NBSIR 86-3359.

I'm not sure if there's a cost to people who are not members of the IGES committee

In case you're not familiar with IGES, it's a specification for a neutral file specification that allows the transfer of graphical data from one CAD/CAM system data structure to another, while maintaining as much intelligence as possible; e.g. COMPUTERVISION to CADAM. Although the spec is primarily for CAD/CAM, efforts are under way to develop a subset for things like electronic publishing. Unless you have a CAD system that supports IGES, or have your own in-house system and want to develop an IGES processor, this document probably is not for you.

P.S. The SPEC is 523 pages long.

Timothy Neumann: I don't know how much use the IGES Standard is going to be to you. It's pretty specialized to do data transfer between CAD systems, as opposed to generic graphics. It makes no assumptions about how the graphics will be created at the end; it's just concerned with describing a format for moving the data. Because of its focus on CAD databases, there is a lot of overhead concerning the structure of the data that isn't really needed just to convey the information.

I worked for one of the major CAD vendors on its IGES products for a year and a half, and I know I wouldn't want to use it for generic graphic transfer.

VAX Dial-Ups

QUERY:

Errol: I'm looking for a program that

will check to see when a remote location calls my VAX 11/750, and if it is an acceptable number. In other words, the program would have a look-up table of valid remote numbers allowed access to the system. Thanks in advance to anyone who can help!

REPLIES:

Jim Hobbs: I think I understand what you're trying to do, so I'll venture an answer. If someone attempts to log onto your VAX and the SYSPASSWORD password, the USERNAME, and PASSWORD validation, you want to ensure that this person is calling from a specific, predefined phone number. Right?

There have been programs like this on some of the later DECUS tapes (in fact, at one time, the Chicago Field Service offered one at minimal charge ($100). There also are many call-in/call-back modems now, as well as smart terminal switches.

Craig Paul: Sounds as if you need a call-back modem. VMS has no way to detect which number originates a call at a dial-up port. (No one does.) You'd have to have a call-back modem ask the user who he is. It then will hang up and dial that user at a phone number where he's supposed to be.

Patrick Wolfe: I don't think it's possible for a VAX to know the phone number of someone who calls. You might want to add a dial-back system, or try to imitate one on your VAX.

I've used one at another job that had its own modems but responded to a phone call with nothing! You had to enter a special user code, using a touch-tone phone. If your user code was correct, it called you back on another phone line at your home. Thus, you only got in with your own user code.

You might be able to simulate one with an automatic login procedure that prompted for a special user-type code, then, if it was valid, did a SET HOST/DTE/DIAL to call the user at the authorized number. Then you either could ask for a sign-in and password and do something with system services to get him signed-in; or, do another SET HOST/DTE 0 to create a separate process for him on the same machine. Clumsy, but it might work.

M.A.S.: Concerning validating VAX dial-ups, we use a system that validates call-ins via a call-back system. I believe it's called *DEFENDER*. Invalid calls are thrown-out when there is no

number associated with the security code the user types in to call back. Mark.

David Bynon: Errol, sounds as if you need a call-back system. Such systems, known as defenders, allow a user to call and leave a name/password. The defender system then will call the user back at a fixed location. These systems, to my knowledge only are available as commercial products.

Wm. P. Labarre: We are in the process of developing an application for VMS that can provide the security barrier similar to the "silent answer" modems, using a configurable human audible response interface.

Leave a message if you'd like to be notified when it becomes available.

LN03 Font Changing

QUERY:

Michael Cunningham: Recently, I was fortunate enough to acquire an LN03 for use by my school district, along with a U.S. legal font. Since I don't have *DECPAGE*, and, this being the public sector, don't foresee acquiring it soon, is there an easy way to change fonts (escape characters/sequences) without purchasing it? The LN03 is used for *WPS-plus*/VMS as a spooled device.

Thanks.

REPLIES:

Bill Mayhew: There is an escape sequence that will select one of the fonts on the LN03 font cartridge. The sequence is: <ESC>[xx m, where xx is the little number in a circle on the front of the cartridge. (My CG Times is 17; I haven't seen a U.S. legal.) However, all this does is select that font; you still have to activate proportional spacing, and you have to have software that knows how to handle it. (I'm assuming U.S. legal is a proportional spacing font.) All of this is described in considerable detail, though not readily grasped by the novice, in the *LN03 Programmer's Reference Manual*, a copy of which should have come with your printer.

Timothy Neumann: We have two LN03s we use as shared terminal printers. You will need the *LN03 Programmer Reference Manual* (EK-0LN03-RM-001) to do anything useful. Have fun reading it!

Font files are made available for printing by assigning them an SGR number, and then selecting for printing. (Page 4-17, bottom paragraph.) First, send the DECATFF sequence (4.5.2.2, page 4-21 ff) to the printer. Then, send the SGR sequence (4.5. 2.3, page 4-23) to make it the active font.

All ROM font cartridges are assigned an SGR of 17, 18, or 19. (Page 4-22, underlined.) At the same location on that page is a table listing all the SGR numbers for the built-in fonts as well. I don't know for sure if you have to do the DECATFF sequence with a font cartridge, but you do if you want to use any of the other built-in fonts.

Richard Gilbert: Michael, you can change fonts via an escape sequence. If you know what SGR number the font is assigned to by default, send <ESC>[<SGR_number>m. You really should get a copy of the *Programmers Reference Manual*, for the printer. It's pretty bad as DEC manuals go, but it does give the necessary information on the escape sequences to activate the various features of the printer.

James J. Ziegelmeyer:

Dear LN03 User,

I'm not an expert, but I have used it quite a bit. Changing fonts or anything else on the laser is a fairly simple procedure if you're familiar with embedding escape sequences. Perhaps the easiest way is to use an SGR. Try:

<CSI>15m or (7 bit) <ESC>[15m

This will call up the only other resident font (6.7 point), unless you have additional font cartridges.

ReGIS Files to VAX

QUERY:

Paul N. Sheldon: Any help will be appreciated. I use a VT-240 terminal and would like to capture the graphics output (generated by ReGIS) displayed on the terminal as a file on our VAX system, so that it can be appended to two or three others and sent to our LN03 printer.

We can do this with a microcomputer connected to the printer port to capture the graphics printer dump, followed by a transfer to the VAX. This is cumbersome, however — only one person at a time, etc. — but I believe it should be possible. The situation is complicated by our use of third-party software; for example, *SAS* or *MINITAB* statistical software to generate the graphics. Thanks for whatever help comes along.

Bart Z. Lederman: You can use *DECGraph* to convert a ReGIS file to a SIXEL file for printing. If you don't like that, look at the DECUS newsletter in the DTR section a few months ago for a program by Don Stern that uses the VT125/VT240 to change a ReGIS file to a SIXEL file. It works quite well. Also, if you are writing your own programs, you can use the commands shown in the program to do your own upload of the screen image.

DATATRIEVE Graphics Output

QUERY:

Paul N. Sheldon: Has anyone been successful in defining a *DATATRIEVE* record description for VMS 4.4 accounting files? I'd like to generate some nice graphics output, but a better report generator than the accounting utility is required. I seem to recall that a VMS 3.X record description once was available.

REPLY:

Bart Z. Lederman: No one has a way to read VMS 4.n accounting records. They use a very, very, very strange record layout, where parts of the record depend on definitions given in the packet size of another part of the record, etc. You (and everyone else) will have to beat on DEC to make the accounting file more reasonable or supply a conversion utility, before anything but a rather complicated MACRO or high-level language program will read it.

FROM THE LAB

Taming That Octopus Behind Your Processors

Dave Mallery

As you may know, we use a modular data distribution system here at Professional Press. I always was annoyed at the large extra expense involved in bringing the DH ports into the modular system: We had to buy an expensive connector that bridged from RS-232 to modular; 16 of them in fact, to handle a normal DH distribution panel (in our case, Emulex's CS23 multiplexer). Then, we had to add two eight-channel octopus adaptors to merge the 16 lines into a single 25-pair standard phone cable (the backbone of the modular system). When I stood back and looked at all this, I could see no reason to keep even the distribution panel!

What I needed was to somehow mate the two 50-pin BERG connectors on the DH board directly to the 25-pair phone cables, and thence, to the modular distribution. The solution was deceptively simple: First, standard, off-the-shelf connectors would make the physical transition from BERG to Amphenol; a simple ribbon cable would do the trick.

Next, there was the more complicated matter of changing the wire assignments from Emulex to MOD-TAP. This would be accomplished by a custom "cross-wye" cable. To design it, we struggled with the wire list in the Emulex CS23 documentation (page 7-3). Since both the UNIBUS and Q-bus versions use the same CP-22 distribution panels, the wiring essentially had to be the same. This was a nightmare, since the pin-numbering conventions on the board etch, and the numbers engraved into the connector never seemed to match.

The best way to design such a cable was to take the actual distribution panel we planned to eliminate and, using an ohm meter, track the signals from the first port back to the BERG connector.

> ***". . . have all your ports virtually free of clutter."***

We found they were highly repetitive, and that the next 15 were duck soup.

Armed with this list, you can order the custom cable from MOD TAP or, your favorite custom cable maker. (Note: MOD TAP has a library of these cross-wyes available to mate many devices; unfortunately, they didn't have this one.)

THE ACTUAL INSTALLATION required another step. Since we wanted to maintain the dignity of the back of our "FCC-ized" cabinet, we needed a bulkhead connector. The best bet was to bring the cable through as a BERG, and then do the transition to Amphenol, outside. Bulkhead connectors are rare. Finished metal work with bulkheads attached is even harder to find.

In addition to the other advantages, this method lets you transcend the physical limitations found in the rear of most machines. There just isn't enough room for all the distribution panels you need!

I've been in touch with Emulex and they're checking out this solution. Some of the necessary items are listed in Tables 1-3 of the CP-22 panel documentation book, including both FCC shielded cables and bulkhead connector panels. You can get the bulkhead connectors from Control Cable in Baltimore, (301) 298-4411. They'll make custom pieces if you send them the plates from the rear panel. My contact at the firm was Greg Jones, who also makes the transition cables from BERG to Amphenol.

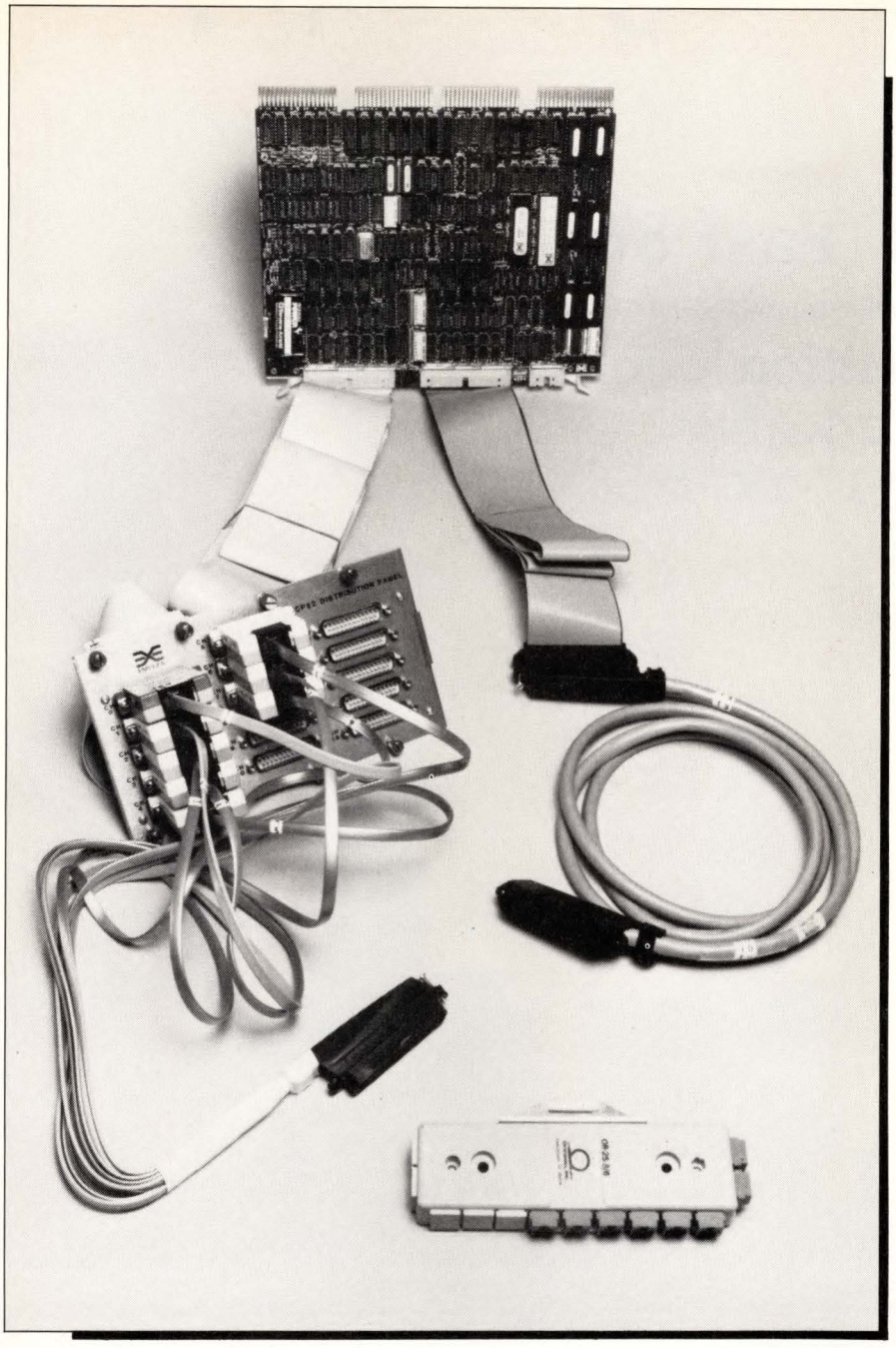
Most manufacturers are shy about shipping any cable that isn't FCC rated. You don't have to be shy; tell them what you want. Bulkhead connector assemblies also are available through DEC Direct from spares; all you need is the part number. (If I ever figure out how to find it, I'll let you know!)

But, I think I hear you say:

"*Why don't they just make a modular distribution panel and simplify all this nonsense?*"

The problem is that there are as many standards for the pin connections of modular jacks as there are permutations of four-, six- or eight-modular pins.

PORTS COMING FROM machines in our computer room go to two different destinations: either directly into our Equinox switch for normal distribution, or onto a patch panel for hard-wired connections to modems or printers. Once the bundle of ports has been converted to the internal MOD-TAP configuration, I either go directly to a patch-panel, or, in the majority of cases, through yet another cross-wye directly into the Equinox. It's a good idea to use both flavors of cross-wye in series, to



Left, the 50-conductor cable leaves the Emulex CS02, and enters a CP22 distribution panel. Eight RS-to-modular connectors later, an eight-way octopus cable brings the signals to the MOD-TAP format cable. Right, the cable exits the CS02, and changes to Amphenol (phone) connectors. The custom cross-wye cable then does the format transition. Either end product could plug into the harmonica below, delivering eight six-wire modular connections.

maintain reconfiguration flexibility.

The correct MOD TAP part number for the cross-wye connector is 36-221-3. This cable will deliver eight six-wire drop ports to a harmonica or patch panel, as though they had come from a CP-22 through eight model 523 connectors (null modem), or, in other words, as though they were normal local drops. If you're going from the patch panel to a modem, the modem needs another null connector on it to balance out the effect and produce a straight-through connection.

There are other models that will produce the opposite (non-null), and a variation that will do four-wire drops rather than the full six-wire for modems. The four-wire version matches the wiring of the 12-connector harmonica and patch panel, rather than that of the eight-connector, six-wire variety.

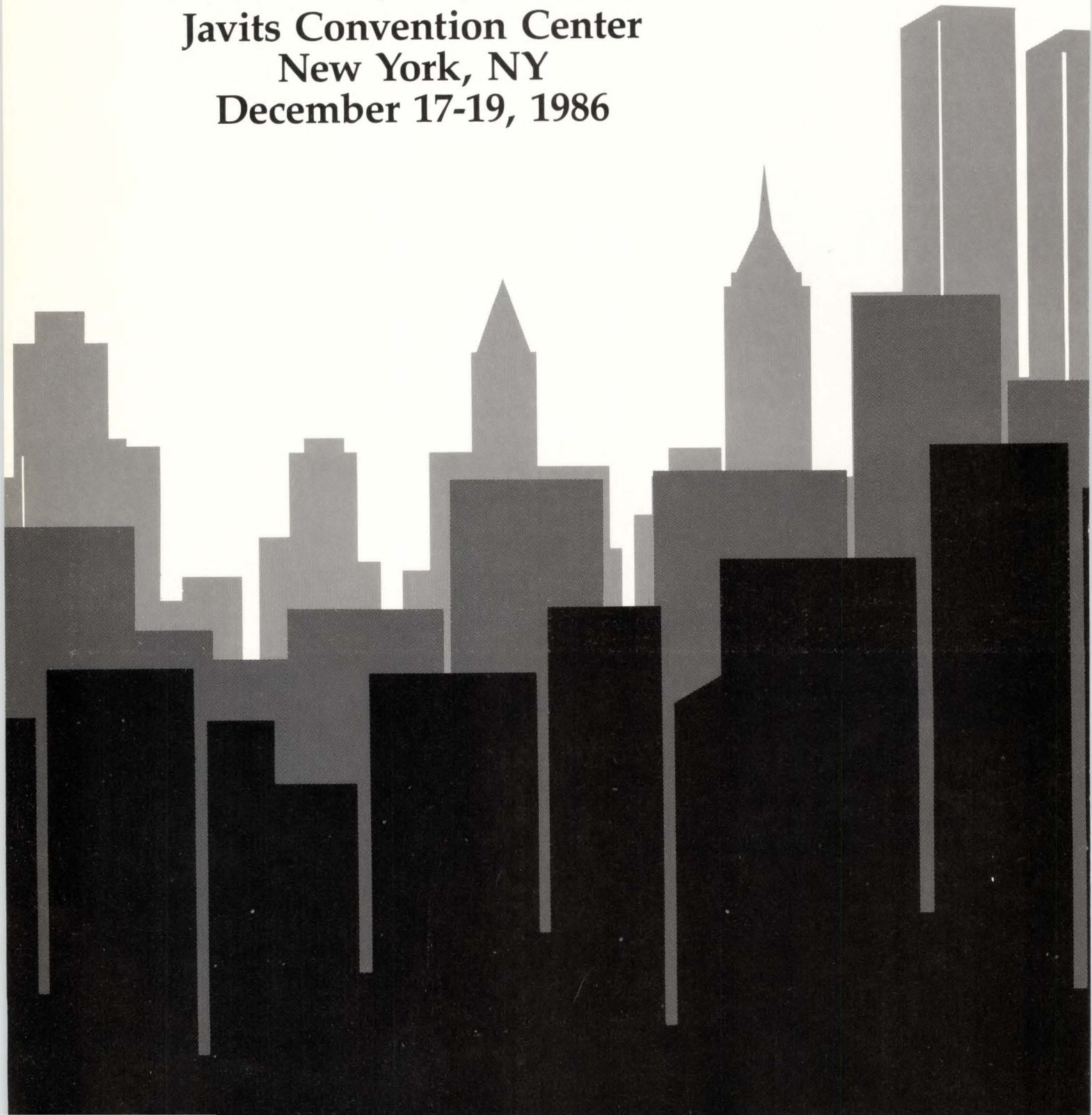
The bottom line? You'll radically clean up the mess behind those processors, and have all your ports virtually free of clutter. And, you also will save a bundle on future port additions.

Bring Your Digital Equipment

DEXPO® East 86

The Eleventh DEC*-Compatible Exposition and Conference

Javits Convention Center
New York, NY
December 17-19, 1986



System Needs to New York

It seems the more products that come on the market, the harder it gets to find the right ones for your Digital Equipment computer.

DEXPO East 86 puts you on the right track for DEC-compatible hardware, software, systems and services, by offering products from 250 leading vendors. Compare for price and performance. See all new technologies for the MicroVAX II*, VAX* 8000 series, and VAXmate PC. Explore thousands of enhancements for every VAX, PDP-11*, and DEC micro.

Conference Provides Management and Technical Solutions

The DEXPO East 86 Conference focuses on leveraging your DEC system for total solutions. Sessions for top executives and technical managers will be led by industry leaders who understand your concerns. Topics include IBM-to-DEC Connectivity; Third-Party Enhancements; VAX Migration; Local Area Networking; PC-to-VAX Integration; Software Strategies and more.

FREE Coupons Save You Hundreds of Dollars

Mail the attached reply card or call toll-free 800-628-8185. We'll send you coupons that can save you hundreds of dollars on new products. You also get a free guide to the latest DEC-compatibles, and money-saving show tickets.

DEXPO East attendees get FREE ADMISSION to the concurrent Microcomputer Graphics Show. Explore the benefits of this fast-moving technology.

Call Toll-Free **800-628-8185**
(8:30 a.m. to 5:30 p.m. Eastern time)
In New Jersey (609) 987-9400

Organized by Expoconsul International Inc., 3 Independence Way, Princeton, NJ 08540.
*Registered trademark of Digital Equipment Corp.

MARKETPLACE

Lucid Extends Common Lisp

Lucid Inc. added extensions to its Common Lisp product for general-purpose computers to provide Lisp programmers with a set of software development tools previously available only on special-purpose Lisp machines.

These tools are designed to facilitate the development of artificial intelligence applications on standard computer hardware. The new capabilities include a window toolkit, with facilities for using a mouse, and for addressing bitmap displays to develop graphically oriented applications; a Lisp-sensitive editor for easier editing; and an object-oriented programming environment for rapid prototyping of complex problems.

Lucid Common Lisp is available from IBM for the IBM RT Personal Computer, from Sun Microsystems as Sun Common Lisp, from Apollo Computer as DOMAIN/CommonLISP, and directly from Lucid for the DEC VAX family of computers.

The Window Tool Kit allows programmers to develop graphically oriented applications. The developer can provide applications with, for example, multiple windows for displaying information, pop-up menus to select options, and the ability to use a mouse to provide input.

The Lisp editor makes program development easier because it is "knowledgeable" about Lisp format and, therefore, helps programmers detect structural errors in their code.

Object-oriented programming allows elements of a program to be defined as objects, each of which has a set of attributes associated with it, and actions that can be performed on it. This approach allows a programmer to try out a problem solution by defining the necessary objects and their characteristics (e.g., their relationship to other objects, and the kinds of actions they can perform) rather than flow-charting all the procedures that would be necessary to solve the problem in another language.

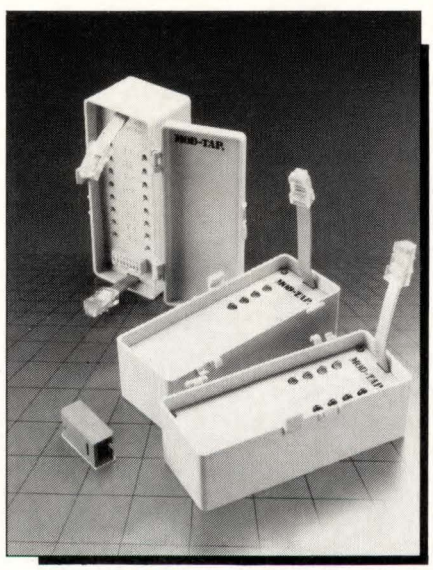
To find out more, contact Lucid, Inc., 707 Laurel St., Menlo Park, CA 94025; (415) 329-8400, Telex: 3791739 LUCID.

Enter 901 on reader card

MOD-TAP Releases New Testers

MOD-TAP System introduced the first two of a complete set of new testers for easy examination and verification of twisted pair wiring used with the MOD-TAP Communications Wiring System.

The MOD-TEST Set is used to test two-four-, six- or eight-wire (1-, 2-, 3- or 4-pair) channels for shorts, opens, and miswires. The Master Unit has one LED associated with each pair. The Remote Unit has two LEDs for each pair. The Green LED indicates normal wiring on the pair; the Red LED indicates reversed wiring. The MOD-TEST Set operates by continuously sequencing through the pairs under test.



The MOD-TEST Set, from MOD-TAP System, is used to test two-, four-, six- or eight-wire channels for shorts, opens and midwires.

The Modular Breakout provides access to any conductors at a modular jack or plug. For more information, contact MOD-TAP System at Ayer Road, P.O. Box 706, Harvard, MA 01451; (617) 456-3500. Telex 951369.

Enter 915 on reader card

Quintus Enhances Prolog Environment

The Quintus Prolog 2.0 Development Environment, from Quintus Computer Systems, Inc., now is available for Sun Workstations and DEC VAX series computers under the UNIX operating system. The new environment features all of the facilities offered in Quintus Prolog Release 1.5 as well as an advanced modules system, garbage collection, and indexing of dynamic clauses.

The Quintus modules system allows a team of programmers to work simultaneously on a large software development project. Modules allow a program to be divided into sections that can be worked on independently and recombined in the final delivery system.

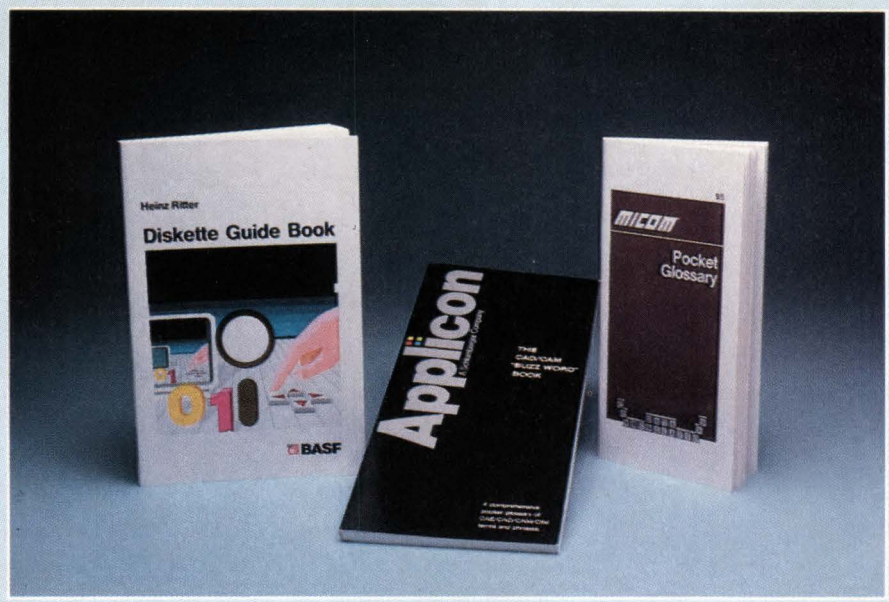
Garbage collection extends the range of applications that can be implemented in Prolog by automatically reclaiming space used in intermediate computational steps. Indexing of dynamic clauses means that asserted code can be accessed with the same high efficiency as compiled clauses.

Additional information may be obtained from Quintus Computer Systems, Inc., 1310 Villa St., Mountain View, CA 94041; (415) 965-7700.

Enter 902 on reader card

Saturn-Calc Features Calc Command Language

JPY Associates' new version of the Saturn-Calc spreadsheet for VAX and PDP-11 users features Calc Command Language (CCL). CCL permits users to front end spreadsheets



Glossaries Offer Quick Reference

With the help of pocket glossaries, professionals can keep information at their fingertips and use the quick reference guides to help communicate more effectively with the ever-changing language of the computer industry.

Pictured here are MICOM's *Data Communications Glossary*, Applicon's *CAD/CAM "Buzz Word" Book*, and BASF's *Diskette Guide Book*.

For more information on these reference books, contact MICOM Systems at 4100 Los Angeles Ave., P.O. Box 8100, Simi Valley, CA 93062-8100; (800) MICOMUS; Applicon at 4251 Plymouth Road, Ann Arbor, MI 48106; (313) 995-6000; and BASF at 6700 Ludwigshafen/Rhein, West Germany.

with their own programs to control data entry and spreadsheet operations.

CCL makes it possible to hide the spreadsheet from the operator, who interacts with the running CCL program. In this way, data can be loaded from user-friendly menus and forms directly onto the spreadsheet.

Users need no programming background to understand the structure and rules of CCL. It has the power of a true programming language with constructs such as REPEAT/UNTIL, IF/THEN/ELSE, etc.

A single CCL file can access as many different spreadsheets as required, transfer data among them and perform calculations on any data it handles.

Other enhanced features include string handling functions, user-defined functions, business functions and several new commands.

For further details, contact Dr. John Yardley or Keith Pegler at JPY Associates Limited, 138 High St., New Malden, Surrey, England KT3 4EP; (01) 949-1088.

Enter 903 on reader card

Code Blue Links Rainbow To PC-DOS

Intersecting Concepts' new Code Blue is a software conversion program that instantly transforms a DEC Rainbow 100's MS-DOS operating system into an IBM's PC-DOS.

With Code Blue, Rainbow users have access to the vast IBM PC library without sacrificing Rainbow compatibility. Rainbow users can use popular non-graphics IBM PC programs such as dBASE II, Multimate, Norton Utilities, RBASE: 5000, Turbo PASCAL and XTREE.

To execute IBM PC programs, Rainbow users simply type "CB" and then the name of the program to be run. The Rainbow's MS-DOS operating system then loads Code Blue, which in turn loads the IBM PC program and runs it.

Code Blue requires MS-DOS version 2.05 or later. Minimum program requirements are 256K of RAM. Code Blue is not copy protected and retails for $99.95.

For additional product information, contact Intersecting Concepts, 4573 Heatherglen Court, Moorpark, CA 93021; (805) 529-5073.

Enter 904 on reader card

Chrislin Introduces MicroVAX II Compatible System

Chrislin Industries, Inc. introduced a cost-effective MicroVAX II compatible computer system. The CI-MVAX-120-16FT uses the DEC CPU and is enhanced with Chrislin hardware. The system permits upward expandability and reliability with added performance features.

Each system is available with a high-capacity 120-MB formatted winchester. An optional 300-MB formatted winchester is offered for customers with larger storage requirements. Each winchester supports MSCP with the DU driver. The system is packaged with dual RX50 5¼-inch floppies (800 KB) and a 60-MB ¼-inch cartridge tape and controller.

The system is packaged with any Chrislin MicroVAX II compatible memory. Special memory features include Error Correction and a full.16 MB in a single system package.

The MICRO-11 operates under existing system software and diagnostics without alterations or modifications. The emulations permit software transparent operation under ULTRIX and MicroVMS.

The system is housed in the Chrislin BP854V enclosure. The chassis includes a 40-amp power supply with a 4X8 backplane. Each system is available as a rackmount or tabletop unit.

As with all Chrislin products, the CI-MICRO-11 computer system is constructed of pre-aged, pre-tested components, and is tested at a complete system level. All systems are burned in for 48 hours for added reliability.

For further information on Chrislin products, contact Edward Ross, National Sales manager, at Chrislin Industries, Inc., 31352 Via Colinas #101, Westlake Village, CA 91362; (818) 991-2254.

Enter 939 on reader card

Too many people have been led to believe only DEC™ is experienced enough to service their computers.

For years, you've believed that only DEC has the expertise to service your computer. But that's just not true.

Because at Control Data, we've been in the computer maintenance business for over 25 years. And we fix everything from PCs to mainframes, even mixed peripherals.

So before you're led into signing another one of their service contracts, call us instead. **1-800-828-8001, ext. 58A**. In Minnesota, 612-921-4400, ext. 58A.

CONTROL DATA

ENTER 237 ON READER CARD

PRAXA Issues New Brochure

PRAXA Systems, Unitronix Corporation, issued a new four-page, color brochure, entitled *PRAXA Turnkey Solutions*. PRAXA Systems offers advanced manufacturing, financial and distribution software packages supported by DEC's VAX computers.

For more information and a free copy of the brochure, contact PRAXA Systems, Unitronix Corp. at 26 Springdale Road, Cherry Hill, NJ 08003; (609) 424-3693 or (800) 257-7482.

Enter 905 on reader card

Systemetrics Announces Intelligent Monitor

Systemetrics, Inc. released the first of a new generation of intelligent computer monitoring systems. Known as SENTRY/VMS, the new product brings computer automation to the task of system monitoring in a network environment.

SENTRY/VMS is a comprehensive system manager's aide for VAX/VMS computer systems. The system manager can define levels of performance that are considered normal to his particular site. It continuously will monitor the operation of the specified systems and provide notification or take corrective action when out-of-limit conditions are encountered. It is capable of monitoring the computer's physical environment, the VAX hardware environment, VMS system performance, system security, and the DECnet network environment.

SENTRY/VMS is available for any VAX or MicroVAX computer running DECnet and VMS version 4.2 or later. It's compatible with any DECnet configuration, including clusters, Ethernet, x.25 and CI Bus. The list price is between $3,000 and $9,000 per node, depending on the number of nodes monitored. The analog subsystem for monitoring the physical environment is priced separately at $6,000.

For more information, contact Systemetrics, Inc. at 36 Washington Street, Wellesley Hills, MA 02181; (617) 431-7555.

Enter 907 on reader card

Rainbow Users Save With PhraseStar

Adept Computer Solutions, Inc.'s PhraseStar saves Rainbow users time and money. Power, casual, and clerical users can benefit from added commands, extended matrix and laser printer support, format styles, macros, and a codeless command interface.

The program adds a no-code way to invoke WordStar's commands and 70 new commands that include restore deleted text, automated memo and envelope production, libraries for key-text, swap-text between files, commands by sentence, paragraph, print marked blocks, and reformat options.

For WordStar 3.3 and Pro., the price is $69.95 for a single user with multiuser/LAN pricing available. It requires 64K RAM, one floppy drive and CP/M-80. It will be available for Rainbow MS-DOS if sufficient interest is shown (128K RAM, one floppy drive).

For more information, contact Adept Computer Solutions, Inc. at 5900 Sepulveda Boulevard, Suite 550, Van Nuys, CA 91411; (818) 501-4798.

Enter 908 on reader card

PLOTTIE Provides Instant Graphics

A program that adds graphics capabilities to complex scientific programs now is available

from Clarly Scientific, Inc.

Called PLOTTIE, the program is a general-purpose graphics post-processor that can plot data from scientific and financial application programs within minutes after being installed. There's no need to make expensive software changes, or engage in time-consuming programming using graphics libraries.

PLOTTIE is command-file controlled, and doesn't require any programming, subroutine calling, compiling or linking. It reads numeric data in column or row format from ASCII files as well as binary data files. Plotting is controlled by commands in a command file that size, label, document, window and format the plot.

Typical scientific plots include functions, scatter plots, two-dimensional scalar fields (contour maps), and vector fields. Axes can be linear or logarithmic; titles and legends on the graph have adjustable character size and justification; and windowing is self-ranging or user defined.

PLOTTIE is available for VAX/VMS. For further information, contact Clarly Scientific, Inc. at 215-4 Lake Shore Rd., Brighton, MA 02135; (617) 782-1137.

Enter 909 on reader card

FAME Offers New Trial Package

FAME Software Corporation, a subsidiary of Citicorp, moved its FAME software package from a perpetual license purchase to an annual leasing arrangement, renewable annually. In addition, FAME is offering a three-month trial package program for $3,000.

The cost of the annual lease, which includes all maintenance and regular updates as they become available, varies depending on the size of the system used. The price ranges from $7,000 per year on a MicroVAX I minicomputer to $42,000 per year for an IBM-3090 Sierra. The annual leasing fee applies for as long as the company wishes to use the software.

FAME software (Forecasting, Analysis, and Modeling Environment) is user-oriented, integrated analysis and applications generator that can be run on a wide variety of mini- and mainframe computers. It allows several analysts to explore data simultaneously, build models, calculate ratios, and report and graph results. It can provide direct links into existing databases.

Examples of FAME applications suitable for a three-month trial package program are proving a budget and control system within the division of a corporation, and division-level financial consolidation and reporting, budgeting, or product line forecasting.

For further information, contact Perry Stein, product marketing manager, FAME Software Corporation, 6869 Marshall Road, Dexter, MI 48130; (313) 426-2730.

Enter 906 on reader card

Seven Vendors Offer Interpress Language

Seven more vendors of publishing and font products made the Interpress page and document description language from the Xerox Corporation available with their products.

Interpress is a device-independent page and document description language that provides a generic, standard interface capable of linking together different kinds of computers with a variety of output devices.

The seven companies are Allied Linotype, Bitstream Corporation, Compugraphic Corporation, Intran Corporation, Textset, Inc., URW, and VLS, Inc.

Xerox has implemented the language on eight of its printers and on more than 20

different workstations and software programs, including its 6085 Viewpoint software series, its Documenter desktop publishing product, and the XPS 700 family of products for electronic publishing. Documentation for the Interpress standard is available for $50 from Pam Cance, Xerox Corp., 2100 Geng Road, Palo Alto, CA 94303; (415) 496-6511.

Enter 910 on reader card

Wheat Growers Gain Information Service

AgriData Resources, Inc., has been selected to provide the National Association of Wheat Growers (NAWG) and the National Association of Wheat Growers Foundation (NAWGF) with electronic communications and information services.

AgriData will host NAWG's private database, WheatNet, which consists of legislative updates, organizational news and industry information. AgriData will serve as the electric communications link between NAWG and NAWGF, the national office in Washington, D.C., and more than 300 association leaders throughout the country.

Wheat growers can gain access to WheatNet and will communicate electronically via AgriData's electronic mail system, Star-Gram, MCI paper mail, and telex to state and national offices. The industry associate members who subscribe to WheatNet will have directories to growers' homes for supplying new product information, sales information and production news.

In turn, AgriData will make available to network users NAWG's database on wheat production, news, new products, disease, insect warnings and trade issues.

Users can gain access from any computer using a modem.

For more information, contact AgriData Resources, Inc. at 330 E. Kilbourn Avenue, Milwaukee, WI 53202; (414) 278-7676. Telex (910) 262-3360. FAX (414) 273-5580.

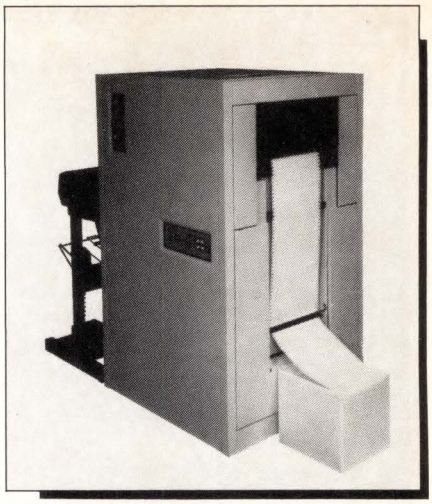
Enter 911 on reader card

Miltope Introduces Printing For A Penny

Miltope Business Products recently introduced the Model 3801 and Series 75 Non-Impact Printing Systems. The 90-page-per-minute 3801 and 75-page-per-minute Series 75 feature nonimpact printing at a monthly operating cost of less than one cent per page, depending on volume.

The 3801 and Series 75 provide standard parallel interface for on-line operation with popular mini- and mainframe computers.

Either printer can be configured as a HASP workstation. This utility provides a generalized communication package that



Miltope Business Products' Model 3801 Non-Impact Printing System.

enables direct interconnect to major networks and mainframes that support a HASP protocol.

The 3801 prints 90 pages per minute on office-sized 8.5 x 11-inch continuous tractor feed fan-fold paper. The Series 75 provides 75-page-per-minute output on plain 8.5 x 11-inch cut sheet paper. Using standard 20-pound paper, the Series 75 provides an input capacity of 1,500 sheets.

For more information, contact Miltope Business Products, Inc. at 1770 Walt Whitman Road, Melville, NY 11747; (516) 420-0200. Telex 510-221-1803.

Enter 912 on reader card

GENC81 Eases System Development

GENC81, EDPC's generator of COBOL code for use with DEC's COBOL-81 or VAX-COBOL, produces a bug-free, commented COBOL source file that can be compiled for screen maintenance of files or tables.

GENC81 was developed to ease the burden of system development by automating the process of creating a set of programs to build and maintain indexed files, such as customers, tables, products and schedules. It's designed for use by programmers and assumes at least a minimal knowledge of COBOL and the ability to use some form of text editor.

GENC81 (including source and .OBJ for subprograms used) is available for $1,980. For more information, contact EDPC at 1010 South Weinbach Avenue, Evansville, IN 47714; (812) 479-6951.

Enter 913 on reade card

6500 Tops Juki LQ Printer Line

With the introduction of the 6500, Juki released its fastest LQ Printer. The Juki 6500 has a maximum print speed of 60 characters per second (50 cps Shannon Text) and offers 10/12/15 pitch and proportional spacing. The Juki 6500 comes standard with a 3K buffer memory (expandable to 15K), which permits the user to employ his computer for other purposes while the Juki is printing.

Like the Juki 6100, 6200 and 6300 printers, the new Juki 6500 provides print features such as superscript, subscript, underlining, bold-face, shadow printing and graphics capability.

The Juki 6500 uses bidirectional carriage motion, and is equipped with both a standard Centronics parallel interface and a standard RS-232C serial interface. Featuring a 16-inch platen, the machine weighs 37 pounds. Its maximum power consumption is 80 W, and its power supply is voltage-selection switch-changeable for 115-, 220- and 240-volt usage. Copy capability is one original plus five copies.

The suggested retail price for the 6500 is $1,395.

For more information, contact Juki at 20437 S. Western Avenue, Torrance, CA 90501; (800) 325-6134 or (800) 435-6315 (California).

Enter 916 on reader card

ZIM Available For VAX/VMS

Zanthe Information Inc.'s ZIM, its 4th Generation Language/DBMS, was ported to run on the VAX/VMS. Pricing for the VAX/VMS version starts at $700 (runtime) and $3,500 (development tools) for the MicroVAX II system.

For more information, contact Don Pare at Zanthe Information, Inc., 1200—38 Antares Drive, Nepean, ON K2E 7V2; (800) 267-9972 or (613) 727-1397.

Enter 914 on reader card

Systems Designers Validates Ada Compiler

Systems Designers Software, Inc. released the first validated MIL-STD 1750A Ada cross-

compiler in the marketplace. 1750A Ada Plus is an integrated set of software tools for the cross development embedded systems in Ada using host-target technology.

Systems Designers recently signed an agreement with DEC to share its Ada technologies and jointly build a family of Ada cross-compilers, XD-Ada, based on VAX Ada compiler and System Designers host-target cross-compiler technology.
For more information, contact Systems Designers Software, Inc. at 444 Washington Street, Suite 407, Woburn, MA 01801; (617) 935-8009. Telex 5101002943. FAX 617 935 3070.

Enter 917 on reader card

PROBSOLV Comes Up With 'NIFTY GADGET'

PROBSOLV's NIFTY GADGET, model DCB, is a multipurpose printer adaptor and accessory that combines a 64-KB print buffer with two inputs (one serial and one parallel) and two outputs (one serial and one parallel). Up to two computers can share up to two printers simultaneously.

Automatic protocol conversion allows the many varieties of parallel PC printers now available to be used with DEC computers, or a PC to be used with a DEC printer, or printers to be shared between PCs and DEC computers. In addition, spooled output can be paused for single-sheet feed, and the buffer can be reprinted for multiple copies without tying up the computer.
For more information, contact PROBSOLV at RD 1, Box 193, Huntington, VT 05462; (802) 434-3825.

Enter 918 on reader card

VuSoft Introduces Switch-It/FLX

VuSoft, Inc.'s new Switch-It/FLX allows a DEC Rainbow user to do a high-speed file transfer to and from a VAX or a PDP-11 using XMODEM or Kermit protocols. Switch-It/FLX is designed to work either in standalone mode or with VuSoft's Switch-It/Desk desktop manager.

Switch-It/FLX consists of small utility programs that can be started from the MS-DOS command prompts. These commands can be put in a batch file to create a script to log into a host account, send and receive files and then log off automatically. Switch-It/FLX can program the communication sport, wait for a specified period of time or dial a modem. It has English-like commands to create script files.

A simple VT100 terminal emulation utility is included with the package for interactive communications with the host computer.

Switch-It/FLX can transfer ASCII or binary files error free at a speed of 19,200 baud if the host system supports it. Switch-It/FLX and Switch-It/Desk cost $59 and $125.
To find out more, contact VuSoft, Inc., 248 Tower Road, Lincoln, MA 01773; (617) 259-0686.

Enter 920 on reader card

Virtual Ships Real Time Executive

Virtual Systems has begun shipping of its APEX/86 real time executive for Intel's iAPX86 (8086, 8088, 80186, and 80188) family of microprocessors. APEX/86 was developed specifically for developers who use the Intel microprocessor in real-time process control, data acquisition, and data communication environments.

The APEX/86 package allows iAPX86-based embedded applications to be implemented by system engineers working in either the IBM PC or DEC VAX/PDP-11 development environments. APEX/86 offers a building block approach for the construction of real-time embedded applications that are capable of providing rapid response times and high data throughput rates during periods of intense real-time activity.

APEX/86 is offered and supported by Virtual for use in the IBM PC (MS-DOS) as well as the VAX and PDP-11 (VMS, RT-11, RSX-11M, and UNIX/ULTRIX) programming environments.

Licenses for the APEX/86 development kit are available for $2400. Run-time licenses for APEX/86 — when it is used within an embedded application — are $100 per copy, with discounts of up to 40 percent available based on quantity. The executable program, which forms the nucleus of APEX/86, known as the kernel, is available in binary form as an .OBJ file on standard 5¼-inch diskettes, or as a silicon software component delivered in read-only memory (ROM).

For additional information, contact Virtual at 1500 Newell Avenue, Walnut Creek, CA 94596; (415) 935-4944.

Enter 924 on reader card

Software Program Links IBM With DEC

VenturCom, Inc.'s VENIX E-NET 205, a software program that serves as the foundation for fully distributed application processing and communication in a multiple-vendor environment, allows IBM PC/XTs, PC/ATs and compatibles running VenturCom's VENIX System V operating system to be linked to VAX computers and other hardware connected via an Ethernet local area network using the TCP/IP protocol.

VENIX E-NET uses Excelan, Inc.'s EXOS 205 Intelligent Ethernet Controller to provide TCP/IP protocol services to the host system. This combination of VENIX E-NET and EXOS 205 architectures increases networking throughput and application-processing capabilities by downloading CPU-intensive protocol-processing functions to the EXOS controller, freeing the CPU for application processing.

Available immediately, VENIX E-NET supports all IBM PC/XTs, PC/ATs and compatibles running VENIX System V. The program carries a suggested retail price of $595, which includes two months of telephone support.

Further information is available by contacting VenturCom, Inc., 215 First Street, Cambridge, MA 02142; (617) 661-1230.

Enter 921 on reader card

Scicon Launches New Product Range

Scicon has extended its IBM to DEC VAX interconnect product range to MicroVAX hardware with the release of three new software products.

The products are the MicroVMS Filelink, MicroVM Filelink and MicroXT 32. Performance ranges from 100,000 to 200,000 bytes per second and prices are from £ 30,000 to £ 46,000.

Scicon offers MVS and VM Filelink, XT32 and Sperry Filelink products.

For more information, contact Scicon Limited, Wavendon Tower, Wavendon, Milton Keynes MK17 8LX; or telephone 0908-585858.

Enter 923 on reader card

Phar Lap Releases Software Package

Phar Lap Software, Inc.'s new release of its 386/ASM software package, an assembler/

linker for the Intel 80386 microprocessor, runs on IBM PC, VAX, and UNIX host computer systems. Software developers can use 386/ASM to create applications for the 80386 on these host systems.

The 386/ASM package includes the 80386 assembler, the 80386 linker, a comprehensive user's manual, and examples of 80386 assembly language programs. The IBM PC version is priced at $495 and the VAX version at $4,995. All versions of 386ASM can be purchased directly from Phar Lap Software or from OASYS.
Find out more by contacting Phar Lap Software, Inc., 60 Aberdeen Avenue, Cambridge, MA 02138; (617) 661-1510.

Enter 922 on reader card

Webster's MUX Emulates Two DHV11s

Webster Computer Corporation's new dual height 16-channel asynchronous multiplexer emulates two eight-channel DHV11 boards and incorporates the introduction of a line time clock and CSR. The new MUX is called the WQDHV. Features include DLV11 emulation switch for optional console connection, passive distribution (data leads only), full 16-line modem control (active distribution), 600,000 baud aggregate throughput, and block mode DMA.

An on-board switch setting allows the WQDHV to emulate the DEC standard DL console at 177560. This function borrows the last DHV line, which then appears to the DH software as a disconnected line. Two further switches provide four modes of operation for the on-board line time clock (clamped, 50 Hz, 60 Hz, disabled).

The new board is compatible with all DEC operating systems, all current Q-bus enhancements including block mode DMA. It is priced at $1,375 for quantity one with competitive discounts for bulk orders.
To obtain further information, contact Webster Computer Corporation, 1037 N. Fair Oaks Avenue, Sunnyvale, CA 94089-2183; (408) 745-0660.

Enter 926 on reader card

C-Series Offers Two Models

System Industries (SI) introduced a family of Digital Storage Architecture (DSA) compatible disk drives for use with DEC computers. The first in the C-Series are models 9751C and 9761C, which are transparent to DEC operating systems and are 100 percent compatible with DEC HSC50, UDA50, KDA50 and KDB50 disk controllers.

The 9751C 10½-inch Winchester disk drive offers an 18 ms seek time and 1.0 MBps data transfer rate. The formatted capacity of the 9751C is 360 MB. The 9761C is a 10½-inch Winchester disk drive that offers 18 ms seek time, a data transfer rate of 2.5 MBps and a formatted capacity of 522 MB.

In addition, both drives offer dual channel options for access from two different controllers, a single SMD interface, and the ability to mount four drives in a cabinet.

Four 9761C drives in a cabinet are priced at $58,000. Four 9751Cs are priced at $48,000.

System Industries is located at 1855 Barber Lane, P.O. Box 789, Milpitas, CA 95035; (408) 942-1212.

Enter 925 on reader card

Joiner Releases New Jnet Version

Joiner Associates' new VAX/VMS Jnet V3.0 is networking software for VAX/VMS to IBM/VM communications.

It permits file transfer, electronic mail exchange, and interactive communication on a peer-to-peer basis. It emulates IBM's RSCS networking protocol, allowing VAX systems to become full routing members of IBM store-and-forward networks.

The new Version 3.0 release contains a number of important improvements, including a shared router that conserves memory

LEX HAS IT ALL

Word Processing, List Processing, Typesetting and much more...

FULLY FEATURED

LEX is the most complete, integrated and advanced software for office applications you can find anywhere. From its easy to use editor, its powerful database, technical character sets and spectacular LEXET desktop typesetting . . . LEX can handle it all.

ONE STEP BEYOND

We make perfect even better. By offering you additional features including on-line tutors, on-screen calculator, spelling checker and world wide electronic mail.

LEX is available on a wide range of VAXes, and popular mini and micro computers.

OUR REPUTATION

We are proud of LEX and are committed to maintaining its position as the leader in office automation software.

Find out why major corporations around the world choose LEX . . .
The software that has it all.

Insist on LEX . . .

Call now for a free demonstration or literature. (617) 443-5106

EEC SYSTEMS, INC.
Millbrook Park
327/E. Boston Post Road
Sudbury, MA 01776

ENTER 125 ON READER CARD

and eases network maintenance; a network monitor utility that shows network traffic, the configuration of links and servers, and CPU utilization; improved network printer capabilities; and additional support for VAXclusters.

Jnet runs under VMS Version 4 and is priced by VAX model; license fees range from $6,000 to $19,500.

For additional information, contact LaVonne M. Hanson, Jnet sales manager, Joiner Associates, Inc., 3800 Regent Street, P.O. Box 5445, Madison, WI 53705-0445; (608) 238-8637; Telex 650 110-6813.

Enter 928 on reader card

Logica, Sky Computers Sign Agreement

Under an agreement with Logica, Sky Computers will resell Vista-IPS software licenses in conjunction with the Sky WARRIOR Array Processor.

Vista-IPS is designed for use on DEC's VAXstation II/GPX high-performance color workstation and provides an environment for image processing research and development. Tailored closely to the WARRIOR and VAXstation II/GPX, this new version of Vista-IPS will offer users a comprehensive workstation for sophisticated imaging work at the microsystem level.

Under the terms of the agreement, Logica adapted its MicroVMS version of Vista-IPS to fully use the Sky WARRIOR vector subroutine library for both floating point and fixed point (integer) operations. It use the Sky Bulk Memory option to load images into memory and operate on them directly.

Additional information is available from Logica, Inc., 666 Third Avenue, New York, NY 10017; (212) 599-0828, Telex: 238539.

Enter 927 on reader card

DEX Integrates DEC Into Office

The Document Exchange (DEX) from Systems Compatibility Corporation (SCC) integrates DEC's minicomputer into the office automation environment by offering a way for the VAX mini to use documents created on the IBM PC and standalone word processors. VAX users now have access to editable documents regardless of what word processing software was used when the documents were created.

DEX is a VAX utility in module form that maintains the function and format codes (e.g., underlining, centering, headers and footers, etc.) when converting documents created on different word processing software. Modules are available for DEC WPS, WordStar, MultiMate, DisplayWrite II and III (DCA/RFT), WordPerfect, Samna Word, WordMARC, MicroSoft Word, Volkswriter and Wang PC word processing software.

There is a module to interpret ASCII files and re-insert stripped out word processing function and format codes, enabling the use of ASCII files generated by any word processing product, electronic mail services, modem transfers, or any source capable of generating a straight ASCII file.

DEX modules, which include the conversion controller, will be available for the entire VAX/VMS family, MicroVAX to VAXcluster. SCC offers an interface into DEC's ALL-IN-1 environment. Additional interface software is planned, and SCC will offer contract software development to write the interface software to user specification.

Pricing for DEX is based on the specific VAX processor. Pricing ranges from $1,000 to $3,000 per module. Cluster pricing is determined by the largest VAX in cluster plus 50 percent of cost for each of the other processors in the cluster. The ALL-IN-1 interface is $500 per system.

Complete information on The Document Exchange is available from Systems Compatibility Corporation, One East Wacker Drive, Chicago, IL 60601; (312) 329-0070.

Enter 929 on reader card

In over 100 installations on five continents . . .

RSTS System Managers will sleep tonight.

LOCK-11

provides them with:

- Comprehensive access control
(150 machine years without a verified breach)

- Powerful system management tools
(that don't degrade the system they manage)

VERSION 9 NOW READY

Now distributed and supported by

ON TRACK SYSTEMS

P.O. Box 184
Spring House, PA 19477
215-542-7910

RSTS SECURITY

'against all enemies, foreign and domestic'

LOCK-11

IT'S 2:28 AM

Some kid with a MODEM just figured out that you have 1.100.DEMO.

LOTS OF LUCK!

LOCK-11

IT'S 3:15 PM MONDAY

Tired of writing depreciation journals in 3.5.GL. Your third assistant bookkeeper just discovered the joys of 4.0.PAY.

He's on his way from the bank to the airport.

LOTS OF LUCK!

LOCK-11

IT'S 2:28 AM

The kid with his auto-dial MODEM just found your "new" dial-in number 555-0112 on the 112th try. He's in and you are out!

LOTS OF LUCK!

LOCK-11

IT'S 5:30 PM FRIDAY

Your FORMER programmer just went home.

He dialed into a non-priv account,let himself in through a back door ([1,82]xTSK(232)).

He is now linking the bottom of [1,2] to the top with ODT. He is planning a couple of custom monitor patches.

He is not mad anymore.

LOTS OF LUCK!

LOCK-11

Explorer Interfaced With DEC Systems

Texas Instruments' new communications software packages allow users of the TI Explorer symbolic processing workstation to interface Explorer systems into IBM and DEC computer systems. Explorer SNA Communications and Communications Interface to DECnet make expert systems and other artificial intelligence applications attractive to users because they directly access databases and programs that already exist on mainframes and superminicomputers.

Communications Interface to DECnet is a software toolkit installable on Explorer systems that allows DECnet communication with DEC hosts over an Ethernet local area network. As Phase IV implementation of Digital Network Architecture (DNA), it is fully integrated into the Explorer environment. No additional hardware is required for either the Explorer system or the DECnet host.

Comm Interface to DECnet provides Explorer users with several capabilities. It supplies virtual terminal capabilities to allow the Explorer to serve as a terminal connected to another host through the C-Term communications protocol.

Comm Interface to DECnet allows file transfers to be initiated from either the Explorer system or the DECnet host system. This capability is integrated into the file system to provide transparent file access.

Interprocess communications is supported across the network. This allows Explorer users to write applications that take full advantage of the capabilities of the DEC host and the Explorer system. It can be used in conjunction with other Explorer-supported communication protocols, including Chaosnet and TCP/IP.

TI's list price for Comm Interface to DECnet is $2,500 per copy, or $12,500 for a site license. Shipments are planned to begin in the first quarter of 1987.

More information is available from Texas Instruments, Inc., Data Systems Group, P.O. Box 809063, H-878, Dallas, TX 75380-9063; (800) 527-3500.

Enter 930 on reader card

DILOG Unveils Tape Controller

Distributed Logic Corporation (DILOG) released the DQ302 cartridge tape controller, which allows users to interconnect any QIC-02 compatible ¼-inch tape drive to Q-bus computers made by DEC.

The new controller interfaces with one 90-inch-per-second streaming cartridge tape drive using the QIC-02 industry standard interface and the QIC-24 recording format. The DQ302's logic permits accommodation of older QIC-02 drives that implement the QIC-11 data recording format. The DQ302 is fully compatible with DEC's TSV05 software driver and has a number of features that make it functional for LSI-11, 11/2, 11/23, MicroPDP-11 and MicroVAX system users.

The new controller contains logic to support the TSV05 bootstrap protocol, which means that using available DEC utilities, bootable back-up tapes can be generated to provide a convenient on-site method for recovery from catastrophic disk failures.

Because it is compatible with the TSV05 packet protocol, the DQ302 can emulate the TSV05 subsystem within the constraints of the streaming drive. It operates with the basic utilities in DEC's RT-11, RSTS, RSX-11M and VMS operating systems.

The new Model DQ302 ¼-inch cartridge tape controller is available for immediate deliveries. It is list priced at $1,300. For further information on the Model DQ302, contact Dennis Edwards, vice president of sales, DILOG, 1555 S. Sinclair Street, Anaheim, CA 92806; (714) 937-5700.

Enter 931 on reader card

ACES 200 Minimizes Processing Time

The new ACES 200 Aperture Card Entry System by SCAN-GRAPHICS is an input device for systems digitally storing and retrieving graphic data. It features advanced image enhancing, adaptive thresholding and image data compression capabilities, and can be used as a standalone or front-end turnkey data capture system. With its open architecture, it can be linked to a variety of storage and retrieval systems.

The system scans reduced drawings sized A through E in accordance with MIL-STD-804B and microfilmed on aperture cards. It can scan an E sized document with user-selectable resolution of 200 dpi at an average rate of six cards per minute, 360 cards per hour. The input hopper with a 600-card capacity allows the scanner to run a batch of cards unattended.

ACES 200 scans through projection of the aperture card image onto light-sensitive cells. Data captured from the scanned image is digitized for storage or modification. The system interfaces with a variety of host computers including VAX/VMS.

To learn more, contact SCAN-GRAPHICS, Inc., 700 Abbott Drive, Broomall, PA 19008-4373; (215) 328-1040, Telex: 83-4722.

Enter 934 on reader card

MINX Available On MicroVAX II

MINX Software, Inc. introduced the MINX Information System on the MicroVAX II. The system consists of a fully integrated line of comprehensive manufacturing and financial control modules. The product is designed to assist management in the supervision of marketing, engineering, materials, production control and finance.

The MINX Information System consists of 13 modules covering the following areas — accounts payable, accounts receivable, general ledger, cost accounting, inventory management, material requirements planning, purchasing, shop floor control, bill of materials and order management.

There is an electronic spreadsheet and report writer that allows you to analyze information stored in the files that make up the system.

The system requires minimal data processing experience and contains features such as extensive hardware compatibility, password protection, on-line help at each prompt, easy installation, complete inventory and financial audit trails, continuous real-time updates to the general ledger and on-line database inquiry capabilities. Fill-in-the-blanks data entry, embedded database searches and user definable procedures are all standard features in the system.

The modules are integrated using a common database, thus eliminating the need to enter and store the same information several times. Each module is written in C.

Hardware requirements for the system are a minimum of 140 MB for disk storage and at least 2 MB of main memory. The system is available in incremental licenses for four, six, eight and 10 users. Additional users in excess of the 10-user license can be added in increments of 10.

To find out more, MINX Software, Inc. is located at 4966 El Camino Real, Suite 108, Los Altos, CA 94022; (415) 969-6528.

Enter 932 on reader card

Why buy PCs?

Give your DEC terminal CARDWARE.

If you are a DEC system user, chances are you've been looking at the advantages of supplementing its functions by adding a PC. The hundreds of software packages available promise an easier and more efficient worklife. CARDWARE can bring these packages to your fingertips at your current terminal without adding to your desk the clutter and expense of an additional computing device.

How? CARDWARE is a plug in module which attaches to a DEC UNIBUS or Q-BUS. Each unit has its own microprocessor and dedicated memory, so the host is never burdened while you are running your **IBM PC compatible application**. This provides the user with **better than PC performance,** combined with:

- shared use of high-performance system disks, printers, etc.
- effective multi-user file management and data sharing
- simple data exchange between PC and DEC files
- use of your current DEC-supplied utilities to manage data backup files, enforce security, and provide accountability

Each CARDWARE processor can be accessed by any terminal connected to your system - **all users can run PC software by sharing a few CARDWARE processors.** When you are not using your terminal in the PC mode you can access the DEC system in the usual way.

Hundreds of installations in government, finance, and aerospace have found the LOGICRAFT answer. Integrate useful PC software, such as Lotus 1-2-3, into DEC systems environment with CARDWARE - **faster and more flexible than owning PCs, and less costly as well!**

If you want a demo of this amazing system you can dial into our DEC system for a free trial. We have a number of PC packages you can try out. Your terminal will love it. Just call one of our sales representatives at (603) 880-0300, in California call (213) 458-3161 or telex 70 3961 for information.

We'll keep that clutter off your desk.

We take DEC computing personally.

LOGICRAFT

410 Amherst Street Nashua, NH 03063

ENTER 99 ON READER CARD

DEC VT240 running LOTUS 1-2-3

Graphics Board Shows 16 Million Colors

Peritek's new color graphics board for DEC computers can create images 24 planes deep with an independent alphanumeric overlay. The VCX-Q/U board displays any of 224 or 16 million different colors at any moment, giving the user immediate access to all hues discernible to the human eye. The board is a quad-height size configurable for either Q-bus or UNIBUS computers.

Principal applications are sophisticated imaging, process control, simulation, and presentation graphics, areas in which the board can solve many problems at far lower cost than before.

The graphics display consists of 512 x 512 pixels. The color of each pixel is determined by eight bits each for red, green, and blue. Each eight-bit set is generated by an independent frame buffer and look-up table, permitting maximum flexibility in color selection.

The independent memory-mapped alphanumeric overlay consists of 50 lines x 80 characters. The user has a choice of 64 character colors and 64 background colors, all independent of graphics colors. The character set is stored in RAM and is user-programmable.

Software available includes test routines, initialization routines, and a micro-level subroutine library for C and FORTRAN. Delivery is 45 days ARO. Price is $5,895. For more information, contact Peritek Corporation, 5550 Redwood Road, Oakland, CA 94619; (415) 531-6500.

Enter 933 on reader card

Vectart Supports Laser Printers

Among the new features of the Vectart Version 2 interactive graphic software, from Prosperity Systems, are support for several new terminals and output devices including the QMS Lasergrafix, Talaris, and the AST TurboLaser laser printers.

Vectart Version 2 now runs under IBM VM/CMS and VAX/VMS. Images created with IBM and VAX versions are fully compatible. This provides an integrated graphics capability that includes software, hardware, and operating systems.

Vectart is multiuser graphic software that is host and device independent. The complete software is available for under $10,000. Vectart can serve more than 20 interactive users simultaneously.

Vectart combines both command menus, and the image being created, on the same screen. Commands may be picked and images drawn using any input device including a tablet, mouse, and keyboard. The status of each command option is displayed during the drawing process. The user knows at a glance how all the graphic attributes are set. On-screen helps are available for all commands. For more information contact Prosperity Systems at 175 Pinestone, Irvine, CA 92714; (714) 552-6313.

Enter 935 on reader card

DEC Systems Are Secure With New Covers

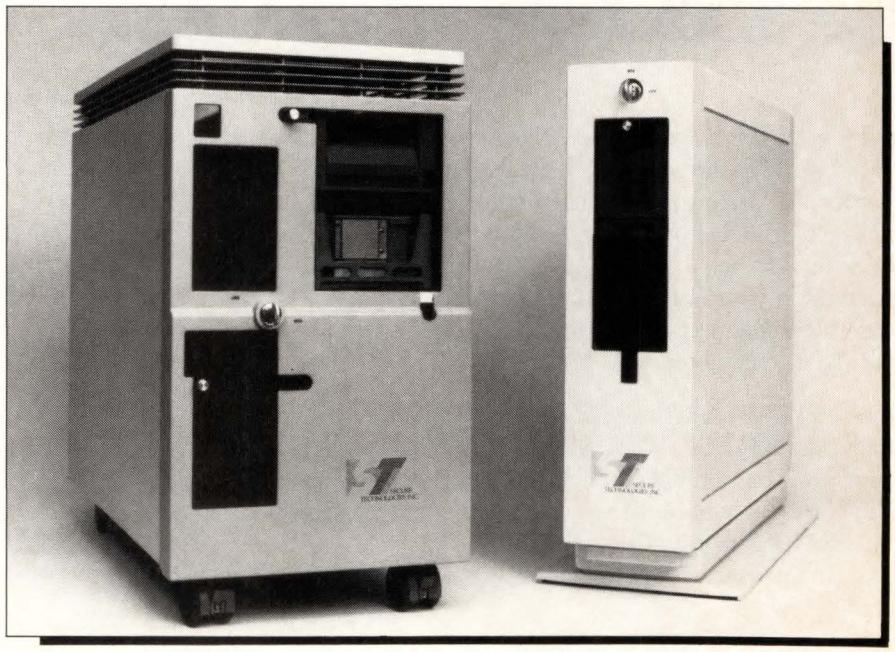
Secure Technologies, Inc.'s new security products for MicroVAX and MicroPDP-11 systems are retrofitted front and rear panels designed to secure access to DEC's BA23 pedestal and BA123 world box cabinets.

The front covers incorporate sliding, transparent, unbreakable Lexan windows that lock shut to prevent unauthorized access to system controls, disk and tape drives, and options. The windows are hidden when open to provide unobstructed access. While locked to the chassis, Secure Covers allow independent window operation. A single key controls all functions.

The locking rear covers prevent unauthorized switching or removal of system and option boards, and secures access to the halt and control break toggle switch. Casings are constructed of 18-gauge steel for maximum strength.

For more information, contact Secure Technologies, Inc., 297 High Street, Dedham, MA 02026; (617) 326-7979.

Enter 919 on reader card



Secure Technologies, Inc.'s new models for the MicroVAX and MicroPDP-11 systems are retrofitted front and rear panels designed to secure to DEC's BA23 pedestal and BA123 world box cabinets.

Multiplex Links PC Applications To VAXmate

New Multiplex networking software by Network Innovations Corporation links Lotus 1-2-3, dBASE and other PC applications on DEC's new VAXmate personal computer to databases and data files on VAX superminicomputer systems.

Unveiled in conjunction with DEC's VAXmate announcement, Multiplex provides an application connection between all leading PC applications and the VAX Information Architecture. Multiplex automatically handles all database inquiry, data reformatting and data communications tasks, so that the VAXmate user does not need to understand VAX commands, query languages or data formats. As a result, VAXmate users easily can incorporate data from VAX applications into PC programs such a Lotus 1-2-3, dBASE, WordStar and others.

First customer shipments of Multiplex will begin this month, and distribution plans for the software will be announced at that time.

Learn more by contacting Network Innovations Corporation, 20863 Stevens Creek Boulevard, Cupertino, CA 95014; (408) 257-6800.

Enter 938 on reader card

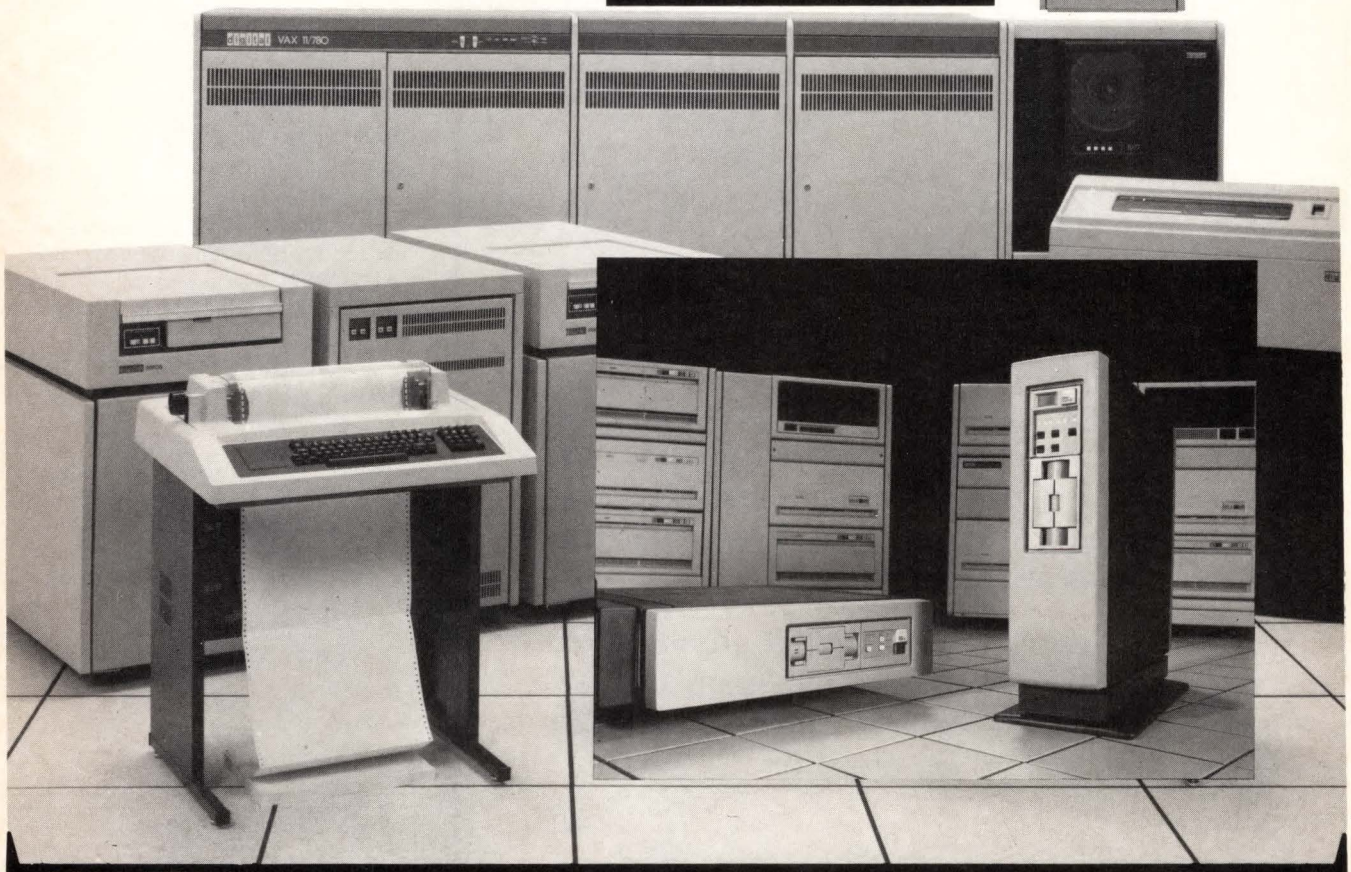
UNITRONIX distributes DIGITAL computers

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

Powerful systems using these CPUs . . . tailored to your needs

Micro 11	MICROVAX I
PDP-11/23+	VAX 11/725
PDP-11/24	VAX 11/730
PDP-11/44	VAX 11/750
PDP-11/73	VAX 11/782

COMPLETE DATA SYSTEMS with Unitronix-developed standard, customized and custom applications software



CALL TODAY . . .
FOR LATEST PRICING, DELIVERY . . . AND LEASE OR RENTAL INFO (201) 231-9400

UNITRONIX CORPORATION

AUTHORIZED digital® COMPUTER DISTRIBUTOR

50 County Line Road • Somerville, NJ 08876 • (201) 231-9400 • TELEX: 833184

ENTER 65 ON READER CARD

Viewlogic Supports VAXmate

Viewlogic Systems Inc., designer and manufacturer of Workview, a series of integrated desktop CAE workstation software, is one of the first computer-aided engineering (CAE) software suppliers to support the VAXmate personal computer.

Workview, running on the VAXmate, uses VAXmate's built-in Ethernet hardware and software capabilities to the DEC VAX machine so that the VAX acts as a compute and file server.

Workview version 2.0 permits networking to both IBM PCs an VAXmates through its open architecture. This migration to the VAXmate personal computer is done without changes to the structure of the system.

Viewlogic offers four versions of Workview. Priced between $4,500 and $13,000, Workview runs on industry-standard IBM PC hardware and compatibles and the VAXmate with a minimum of 512K RAM memory.

To find out more, contact Viewlogic Systems, Inc. 33 Boston Post Road West, Marlboro, MA 01752; (617) 480-0881.

Enter 936 on reader card

MDBS Announces VAXmate Products

Micro Data Base Systems, Inc. (MDBS) recently announced the availability of its software products, GURU, KnowledgeMan/2 and MDBS III to run on the VAXmate.

GURU's expert system environment consists of familiar software development tools with reasoning capability.

KnowledgeMan/2 is a relational data manager which includes key tools for analysis and presentation of data.

MDBS III is a high-end database management system primarily used by professional developers in applications involving complex data structure, large volumes of data or high performance requirements.

For more information, contact Micro Data Base Systems, Inc., P.O. Box 248, Lafayette, IN 47902; (317) 463-2581. ■

Enter 937 on reader card

CLEARANCE

- ABLE DH/DM and distribution panel
- ABLE ENABLE and CACHE
- 1 Mb 11/44 style memory
- pair MICOM MUX's (4-way)
- PRO-350 floor stands (2)
- NEC 7710
- Assorted 8-way Timeplex MUX
- Assorted RACAL VADIC triple (rack mount)
- Assorted 4+8 slot UNIBUS backplanes

Call KEVIN at (215) 542-7910

DEC PRO's Used Equipment classifieds give you more value for your equipment dollar.

Many buyers look at used equipment first because they know that performance is the real issue. In *DEC PRO*'s **Used Equipment** classifieds, you'll reap the benefits of a rapidly changing DEC marketplace by getting the proven power and performance you want **NOW** — at the price you want to pay **NOW**!

Don't be a victim of *vaporware*. Go for the goods with a proven track record. Go for them in *DEC PRO*'s **Used Equipment** classifieds!

Look for us in the *DEC PROFESSIONAL*, and online in our **ARIS** electronic bulletin board (215) 542-9458.

★ ★ ★ ★ ★

Advertisers: If you want to reach the largest number of computer professionals working in the DEC environment, call:

Mary Browarek at (215) 542-7008.

CLEARANCE

- 1 Mb 11/40 with 16-line MUX, ABLE ENABLE and CACHE SI 6100 and 160 Mb Fuji — $7500

Call KEVIN at (215) 542-7910

To be sure you're making the best deal buying, selling or trading new or used DEC equipment.

Call us last.

Your Super-Market for DEC Equipment

Industrial Computer offers an extensive line of DEC and DEC compatible equipment including the following items now in stock.

11C23RE	RH780AA	DZ11DP
11E23RE	CDC-9762	RM80
11/780 (2)	SYSTEMS IND. 9700	RP07AA
FP780	SYSTEMS IND. 9400	RK05J
LA120DA	UDA50A	CYPHER F880
DW780	RL02A	RA80
RM05AA	VT131	R80
TU77FB (MASTER)	11/70 SPARES KIT (KB11B)	11/44 CA
BA11KE	VT220A	KT24
DD11DK	VT241	M9312
DD11CK	VT101	RH70
CR11-A CARD READER	RM03	RX02
H9602HA	DMF32LP	TU78AB
FP785		TU77AF
		P600

DEC, VAX, PDP-11 are registered trade marks of Digital Equipment Corp.

Tel (617) 356-7500 • TELEX 4998307/INDCO • FAX (617) 356-9855

43 Mitchell Road Ipswich, MA 01938-1219

Industrial Computer Products

A division of Industrial Semiconductors, Inc.

Rates: 1 time: $475 — 3 times: $430
6 times: $390 — 12 times: $350

Size: 1/9 page — 2¼″ × 3″

Camera ready mechanical required.

Typesetting and composition available.

For more information call Mary Browarek at (215) 542-7008.

PRO/350, 512K, 10Mb, LA100, TOOL KIT, FORTRAN 77, PASCAL, BASIC PLUS 2, DATACOMM, DATABASE, etc., etc.
$3750, negotiable.
Day (201) 225-6734. Evening (201) 549-0779

DATA ACQUISITION COMPLETE SYSTEMS, SOFTWARE, AND CONSULTING FOR VAX AND PDP-11. ADC sampling rates up to 1 MHz., DAC settling time 50 nsec., opto-electrically isolated. Easily linked to C, FORTRAN, Pascal, or BASIC. Full support available, including: installation, data acquisition education, maintenance, turn-key systems, on-site or remote. Worldwide references available. CONCEPT 2000 INC., 1908 Airport Parkway, S. Burlington, VT 05401.
(802) 863-8088.

VTKERMIT — VT102 EMULATOR for IBM PC $25.00. PSYCH Solutions Assoc. Inc., P.O. Box 10262, Baltimore, MD 21234.

IBM SOFTWARE — $10 PER DISK
2,000 current titles! Instant access! Call toll-free 1-800-663-8844 to place a VISA, MasterCard, or C.O.D. order for super-fast air courier delivery. "If it's IBM, we've got it." Call for free catalog. SOFTSAVE.

IN STOCK **TK50's.** RX50's (available in 14 colors). Immediate delivery for both items. MPU, Inc., 312-225-5754.

C LANGUAGE CONSULTING AND EDUCATION by noted *DEC PROFESSIONAL* columnist. Also other languages and packages on RSX, VMS, RSTS and MS-DOS, including DBMS and DECnet. Applications experience includes real-time, process control, engineering, scientific and commercial systems. Rex Jaeschke. (703) 860-0091.

NOW AVAILABLE
Your company can now obtain an authoritative, unbiased, third party evaluation of: DM from Information Dimensions, subsidiary of Battelle (also marketed as IM/DM from CDC); DMRS from Intergraph; and Applicon DBMS from Schlumberger. The reports are written by Dr. Gordon C. Everest, internationally recognized expert on database management systems. Cost is $95 each for DM (IM/DM) and DMRS (prepaid); and $45 for Applicon (prepaid). GEMS Education & Management Services, P.O. Box 13182, Dept. D,
Roseville, MN 55113, USA.

DIBOL CONSULTING AND PROGRAMMING. Conversion between operating systems, MCBA packages, performance enhancements, telephone support—you name it. Benefit from the knowledge that comes from programming with DIBOL since its inception. EHAA Systems Inc. (301) 530-0166 anytime.

CDS 2400 B.P.S. DIAL MODEM with Synch/Asynch front panel select—$450. With error correction—$795. Joe Hardman, Data Comm Essentials, P.O. Box 98, Chelmsford, MA 01824. (617) 957-1641.

VAX system upgrades and installations. Manufacturer guaranteed and eligible for maintenance. Call (617) 653-5703 for immediate savings. Associated Systems Co.

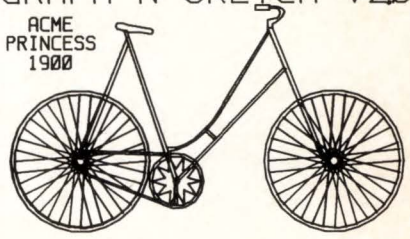
GOVERNMENT BOOKS & MORE!
Send for your free copy.
New Catalog
P.O. Box 37000, Washington, D.C. 20013

VAX
SYSTEMS & OPTIONS
C. D. SMITH & ASSOCIATES, INC.
12605 E. Freeway, Suite 318 • Houston, TX 77015
(713) 451-3112

VAX TO MICROVAX DATA TRANSFER
9-TRK MAGTAPE
-TO-
RX50 OR TK50
UAP
(714) 259-1012
TUSTIN, CA.

DEC PDP-11*
SYSTEMS &
PERIPHERALS
BUY & SELL
THE One-Stop EXCHANGE!
• CPUS • TERMINALS
• DISC DRIVES • PRINTERS
• INTERFACES, ETC.
dce™ DIGITAL COMPUTER EXCHANGE INC
27773 Industrial Blvd., Hayward, CA. 94545
*Registered trademarks of Digital Equipment Corp.
Call (415) 887-3100

GRAPH'N SKETCH V2Ø



USER-RAIN-WARE
PO BOX 160 $115 & $2 S/H
WOBURN, MA 01801 VISA M/C
MOST VERSATILE RAINBOW GRAPHICS
CAD-GRAPHS-CHARTS-PROGRAMABLE

D-M-DRIVER
Disk in Memory
for Micro/RSX,* 11M (+) & P/OS*
Call 415-420-9579
Proto Systems
1238 Josephine St. Berkeley, CA 94703
*TM of Digital Equipment Corp

Buy • Sell • Trade
IBM • DG • DEC
(305) 392-2005
thomas business systems, inc.
4301 Oak Cr. Unit 11
Boca Raton, FL 33431

Out of disk space?
Use PACK-11 for RT-11/TSX+
PACK compresses any file (including binary and logical disks) to reduce storage requirements. Text and source files are typically compressed 30%, binary files up to 80%.
- Increases effective on-line storage
- Lowers data transmission costs
- Reduce archive storage costs

Demo: $45 Complete: $145
Specify RX01, RX02, RX50, 1600bpi tape
Other media available
For orders or additional information:
MLK Software Services
Ste. 104, 177 N. Dean St., Englewood, NJ 07631
201-567-9204

The Intelligent Way to boost System Performanc by 50%—or More!

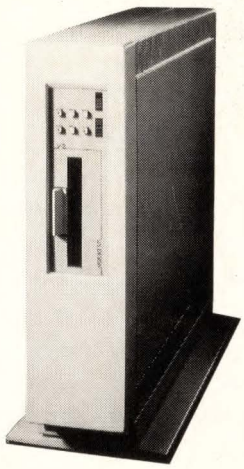
Data access in 10 milliseconds or less. Adaptive caching technology that actually anticipates information-flow needs. SCSI and ESDI interfacing for state-of-the-art host-to-peripherals communication. U.S. Design offers a range of intelligent products that give you all of these important high-performance features. The result? You get maximum capability from your system—without major capital expense.

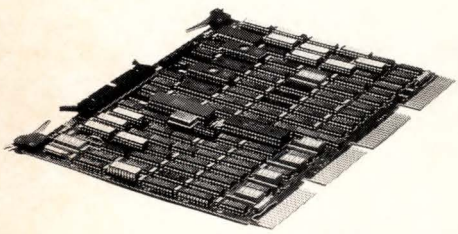
See us at COMDEX, Booth #404

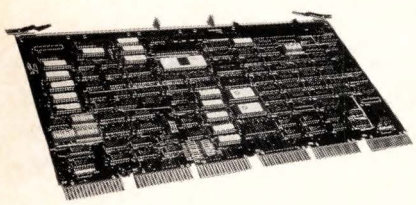
THE VIP™ SERIES OF MASS-STORAGE SUBSYSTEMS

The U.S. Design VIP (Virtual Information Processor) sets the standard for fast-access data storage in a 5.25-inch EIA rack or pedestal enclosure.

- High-capacity storage on up to four 5.25-inch hard disk drives.
- U.S. Design's aggressive "cluster cache" memory-storage system for unprecedented data-access speeds.
- Exclusive user-configurable partitioning to any size from 140 to 1520 (unformatted) Mbyte of disk.
- On/off-line data file back-up on 100 Mbyte of streaming tape.
- Available for all DEC* systems—and now for IBM PC-XT-AT*







1108 Q-BUS* AND 1158 UNIBUS* HOST ADAPTERS

These MSCP*-compatible SCSI host adapters provide complete support for both magnetic disk drives and the new write-once-read-many optical disk systems.

- MSCP compatibility for easy integration with DEC host systems.
- Support for all major optical equipment manufacturers on one controller.
- Archival utility packages for optical host adapters, for use with DEC RSX11M+ and VMS-based systems.
- VOS (Virtual Optical Storage) provides magnetic file emulation for optical disk systems.

CALL (301) 577-2880

For more information about these pioneering, high-performance products, contact Bob Wilson at U.S. Design today. Find out why it's smart business to follow the leader in intelligent disk-controller design.

*Registered trademarks of Digital Equipment Corporation and International Business Machines

ENTER 317 ON READER CARD

USDC

U.S. DESIGN CORPORATION
5100 Philadelphia Way
Lanham, Maryland 20706
(301) 577-2880 • (800) 368-2811
TWX 710-826-0417
FAX 301-731-1682

ADVERTISERS INDEX

Sales Offices

Territory	Manager	Telephone
National Sales Manager	Jeffrey Berman	(215) 542-7008
Northeast	Cynthia Davis	(617) 861-1994
Mid-Atlantic	Connie Mahon	(215) 542-7008
Southeast and Midwest	Peter Senft	(215) 542-7008
Northern CA, OR and WA	A. G. Germano	(408) 988-0740
Southern CA (San Diego area)	Kathy Buckley	(619) 581-1831
Southern CA and Southwest	Terry Buckley	(714) 756-1798
	Greg Cruse	(714) 756-1798
International	Helen Marbach	(215) 542-7008

More information about many of these advertisers is available electronically on our Automated Reader Information Service (ARIS). Dial (215) 542-9458.

The Silent 700™ Data Terminal Series from Texas Instruments.

It pays to get good connections.

TI's line of portable data terminals leads the market in keeping people connected to their operations no matter where they are, or where they're going.

For 15 years, whether you've needed to keep in touch with satellite offices, supply your field sales force with communications tools, access a remote data base or eliminate telephone tag, TI has always had the right data terminals for the job. They're easy to operate. Rugged. Self-contained. Lightweight. Affordable. And quiet.

The TravelMate™ Portable Terminal.

The latest addition to the Silent 700 Series brings the convenience of both a desktop display and printer to a portable terminal. The TravelMate comes with built-in editing capability, and an easy-to-read, pop-up LCD display so you can see what's happening before you transmit, or as you receive. Its printer control key allows you to print selectively on its quiet printer. Of course, all the communications capabilities are built-in, and you can choose a 300 or 300/1200 baud internal modem. There's even a model designed for direct connection to your computer.

Programmed to do your business.

Personalized Application Cartridges are what make TI terminals customizable. They can be programmed with features and functions that satisfy your specific communications, data entry and retrieval needs. Application-specific cartridges can be developed for remote sales automation, data base inquiry, or electronic mail, to name a few.

For more information on TI's family of Silent 700 Series Portable Data Terminals, call toll-free **1-800-527-3500.**

TEXAS INSTRUMENTS

*Please consult with your participating TI reseller for specific emulation characteristics.

BACK END

John C. Dvorak

What Computer Do You Drive?

Computers are reflections of their owners: Big, gray, faceless corporations own big, gray, faceless computers, programmed to do big, gray, faceless things. Development houses with strange and weird programmers (with convoluted minds) use a VAX and UNIX. Big-bomb-oriented operations like the Department of Defense, use big-bomb Crays.

With personal computers, the reflection is even more intriguing, since owners reflect their tastes in a variety of ways; the computer being just one. In fact, it's easier to tell what kind of computer people own than it is to guess their astrological sign: just look at their car.

For example, a person who owns a Volvo or Saab, surely owns a Macintosh. This person thinks Meryl Streep is the world's greatest actress. These are the ultimate yuppies, with the ultimate yuppie computer. Look for them to wear Reebok tennis shoes and eat Dove ice cream bars.

The BMW owner, like the Saab owner, is also a yuppie, but with a somewhat shifted mentality. After all, what kind of person wants to drive around in what essentially is a sports car designed to look like a sedan? Computer: the Compaq portable — essentially a full-blown IBM, designed to seem portable — until you try to lug one around. Every BMW owner I know owns a Compaq. Owners of cars like the Mercury XR4Ti will own a Compaq clone like the AMQUTE.

What about the IBM PC? The PC owner drives a practical no-risk car. That means an American full-sized or mid-sized car, or a Honda Accord. If they want to live dangerously, there's an old Model A in the garage. "A collectors item," they tell you.

Most Japanese-car owners, like those with Toyotas, have Apples, but not all. Japanese-car owners who absolutely have to have PC compatibility, usually end up with an AT&T 6300 or any one of a dozen Tandys.

The purchaser of a car selected by *Consumer Reports* as the best (most often a Toyota or Datsun of some sort), usually will own the computer selected by *Consumer Reports* as the best — a Leading Edge Model D. They also own strange 35mm cameras like the Miranda.

The sports car nut who drives a Porsche, usually has a souped-up IBM PC AT, or a faster-than-fast AT clone. If they've modified the Porsche, they'll have modified the AT:

Yeah man, I got a 120-Megabyte super-fast hard disk!

Real car enthusiasts who own Ferraris, will have a Sun or Apollo workstation and won't even read this discussion. If the car is an obscure sports car like a Bizzarini, then the guy (no females allowed in a Bizzarini) might own a Symbolics LISP workstation. When not spending hours upon hours talking about LISP, he'll tell you how great his Bizzarini is.

Let's not forget the DEC Rainbow. If Rainbow owners make a lot of money, they own a Lancia. If not, they drive an AMC Javelin. Either way they'll bitch and moan about both the computer and the car.

Look for the Hyundai or Yugo owner to also own a Commodore 64 (in the closet). The owner of the Isuzu Impulse or any other such weird-looking Japanese machine will own an Atari 800. "Better graphics than an Apple," they'll always tell you.

Owners of an MG Midget or Triumph Spitfire seem attracted to the PCjr. Those people never want to go all the way to a real sports car *or* a real computer.

If you have a Bronco or Blazer, or a VW van, you might find a Northstar computer languishing somewhere in the house. For years these people have been wondering if they should get an IBM compatible.

If I saw a guy with a mint condition 1952 Woody (actually, any Woody will do), I'd find he used a 68000-based Sage computer running the UCSD-p system.

There also are personalities who like to jump on the bandwagon: Find the owner of an electric car and I'll show you the owner of an Osborne 1.

Some alliances are foreign all around: Citroen owners will have any French computer they can get their hands on. The Rover owner will have an Apricot.

If you own an AMC Matador, a Plymouth Duster or Datsun Honeybee, you probably don't own a computer and never will.

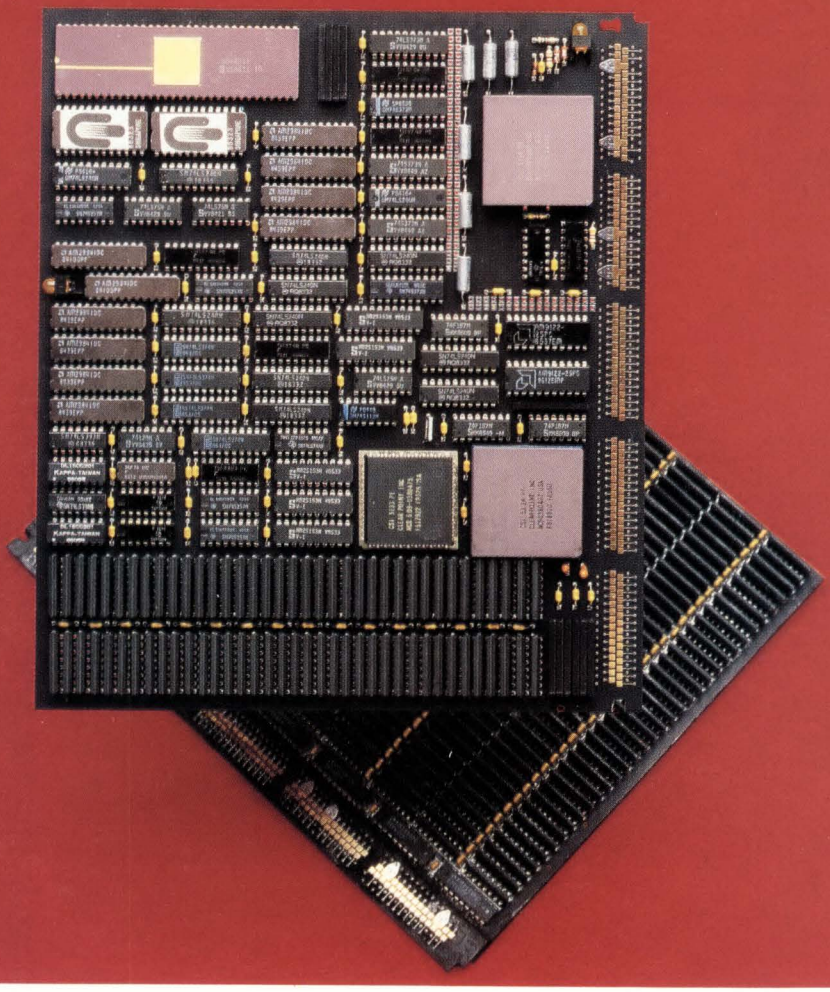
Tercel owners have a borrowed computer. Owners of an AMC Pacer never can remember what computer it is they have.

The owner of a Lamborghini Countach will own a GRiD, but not know how it works.

Finally, look for the owners of the true pocket computers made by Sharp or HP to be driving a VW bug with bumper stickers that say:
I'd rather be Programming,
Save the Whales, and
Mondale-Ferarro.

So, what car did you say you own?

VAXBI-Compatible Memory
32 MB in 5 Slots with Maximum Performance



Clearpoint, of course.

Clearpoint delivers the first 100% VAXBI-compatible memory system for the VAX 8200 and 8300. The VBIRAM memory subsystem combines the power of 8 MB arrays and the added performance of 64-bit cacheing. The memory has on-board single bit error correction and double bit error detection, incorporating the Clearpoint EDC chip set. The subsystem has an on-board processor which includes self-verify diagnostics on power-on.

Totally unique, the Clearpoint VBIRAM memory subsystem is organized as a controller and arrays, offering upgradability to higher density arrays with minimum cost.

The memory controller is designed to support up to 96 MB in 4 slots.

Clearpoint technology brings the advanced features of megabit DRAMs, ZIP packaging and 64-bit error correction codes to the VAXBI customer base. And saves you dollars in the process.

Write or call for information on VBIRAM and for our new designer literature package including:

- ☐ **Clearpoint's 80-page Designers Guide to Add-in Memory**
- ☐ **The 20-page Add-in Memory Catalog and Selection Guide**

CLEARPOINT INC.

99 South Street • Hopkinton, MA 01748

U.S.A. 1-800-CLEARPT
Telex: 298281 CLEARPOINT UR
Massachusetts 617-435-5395/435-2301
Europe Steptrade, Ltd. (Netherlands)
Telex: 71080 ACT H NL Tel: (31) 23-256073
Asia EPRO Ltd. (Hong Kong)
Telex: 51853 JUNWI HX Tel: 3-7213300

ENTER 100 ON READER CARD

If my VAXBI Compatible memory serves me right, it must be Clearpoint.

National Semiconductor Corporation

"Ed, hold up on that DEC-compatible memory order till we check out the supplier."

"Relax, it's National."

At National we're an open book. We're the biggest independent producer of DEC-compatible memory products in the business. That's a complete line.

Anything you need, any time you need it.

And because we're big enough to keep production high, we keep our prices low.

Another thing. Every National memory board's guaranteed a full five years.

And maybe most important of all: Ask our customers what they think of us. We believe you'll like what you hear. After all, we've got *your* reputation to live up to as well as our own.

National Semiconductor

A sampling. There's much more.

VAX 11/725, 11/730, 11/750, 11/780, 11/785, 8600/8650	
• NS865-16 (16 mb)	• NS789 (4 mb)
• NS789 (1 mb)	• NS753 (1 mb)
VAX Memory Upgrade Kits 11/750, 11/780	
MICRO VAX I	
• NS23C (¼-1 mb)	• NS23S (1-4 mb)
• NS23D (2 mb)	
MICRO VAX II	
• NS630 (1-4 mb)	• NS638 (8 mb)
Q-BUS PDP 11/23, 11/23+, 11/73, MICRO PDP 11, 11/53	
• NS23C (¼-1 mb)	• NS23S (1-4 mb)
• NS23D (2 mb)	
UNIBUS PDP 11/24, 11/34, 11/44, 11/45	
• NS11U (1 mb)	

Phone 800-538-8510 In CA 800-345-4006

DEC, VAX, PDP, LSI, UNIBUS, Q-BUS and MICRO VAX are trademarks of Digital Equipment Corporation

ENTER 73 ON READER CARD