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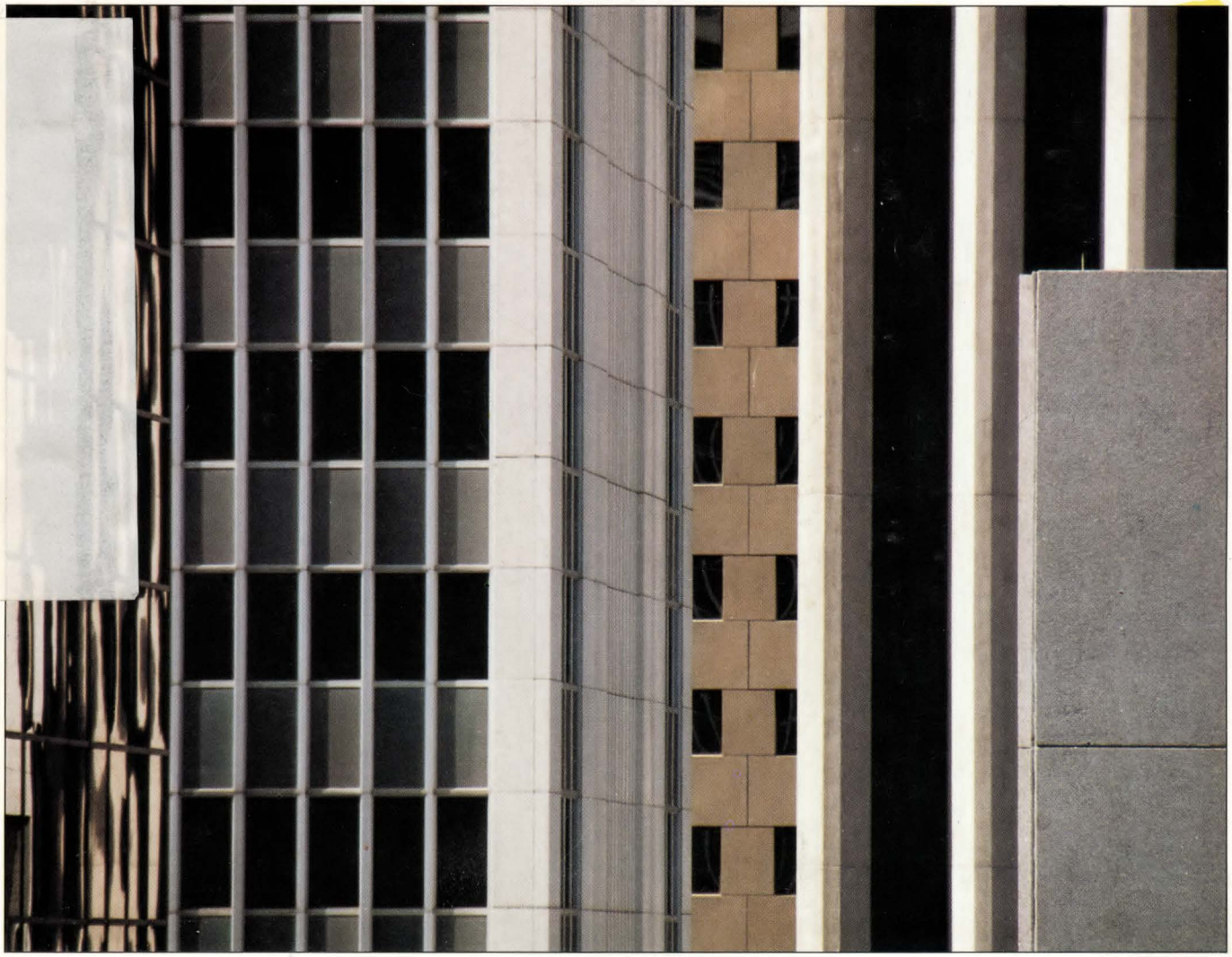

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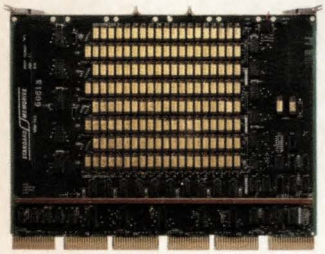
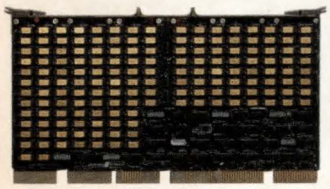


PINCOMM 780SX 1MB or 4MB for VAX-11/780,/785



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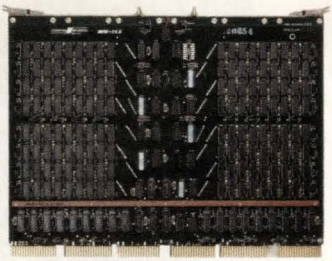
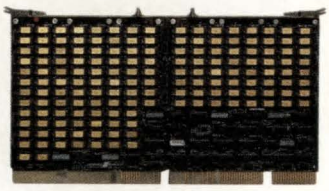
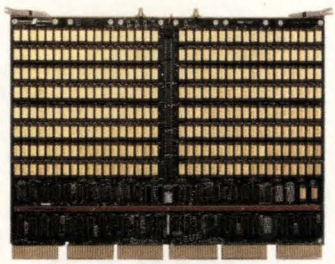


PINCOMM 780S 256KB for VAX-11/780,/785



PINCOMM 730S 1MB for VAX-11/730



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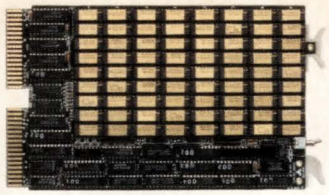

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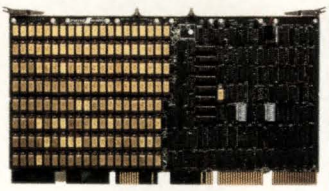
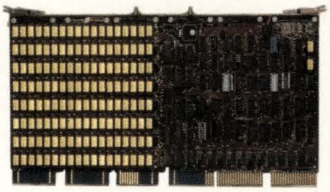
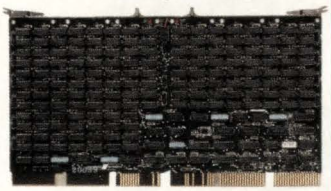


PINCOMM 44S 1MB for PDP-11/44 ECC



PINCOMM 24S 1MB for PDP-11/24 Parity Checking



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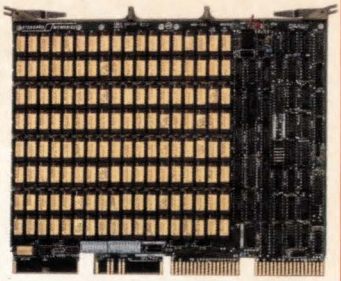
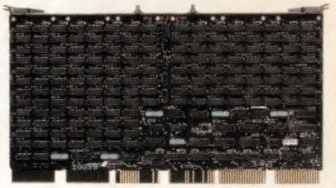
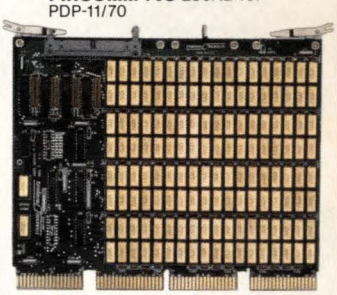


PINCOMM 73S Up to 4MB for PDP-11/73, MicroVAX I...



PINCOMM 70S 256KB for PDP-11/70



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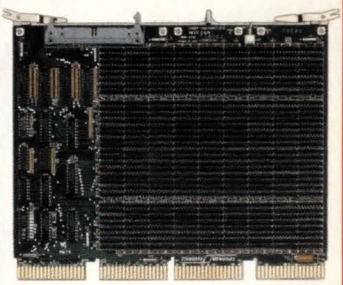

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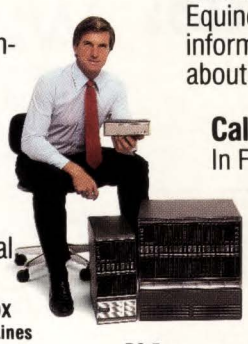

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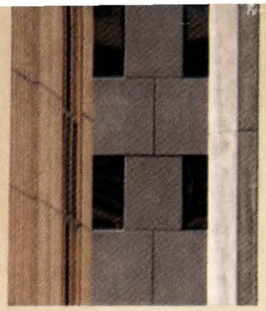

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CONTENTS

FEBRUARY 1987 VOL. 6, NO. 2

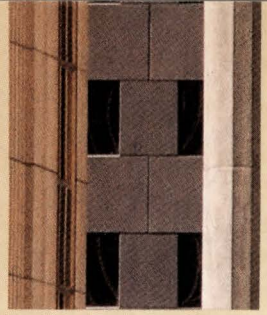
MASS STORAGE

page 30

ARTICLES

ON THE COVER:
Mass Storage. Photography by James A. Cook, Denver, CO.

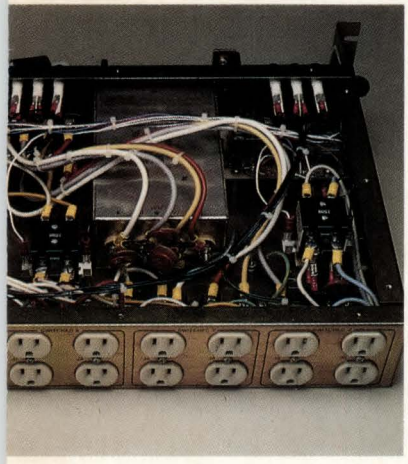
Continued on page 6.



CONTENTS

Continued from page 5

DEPARTMENTS & COLUMNS



page 96

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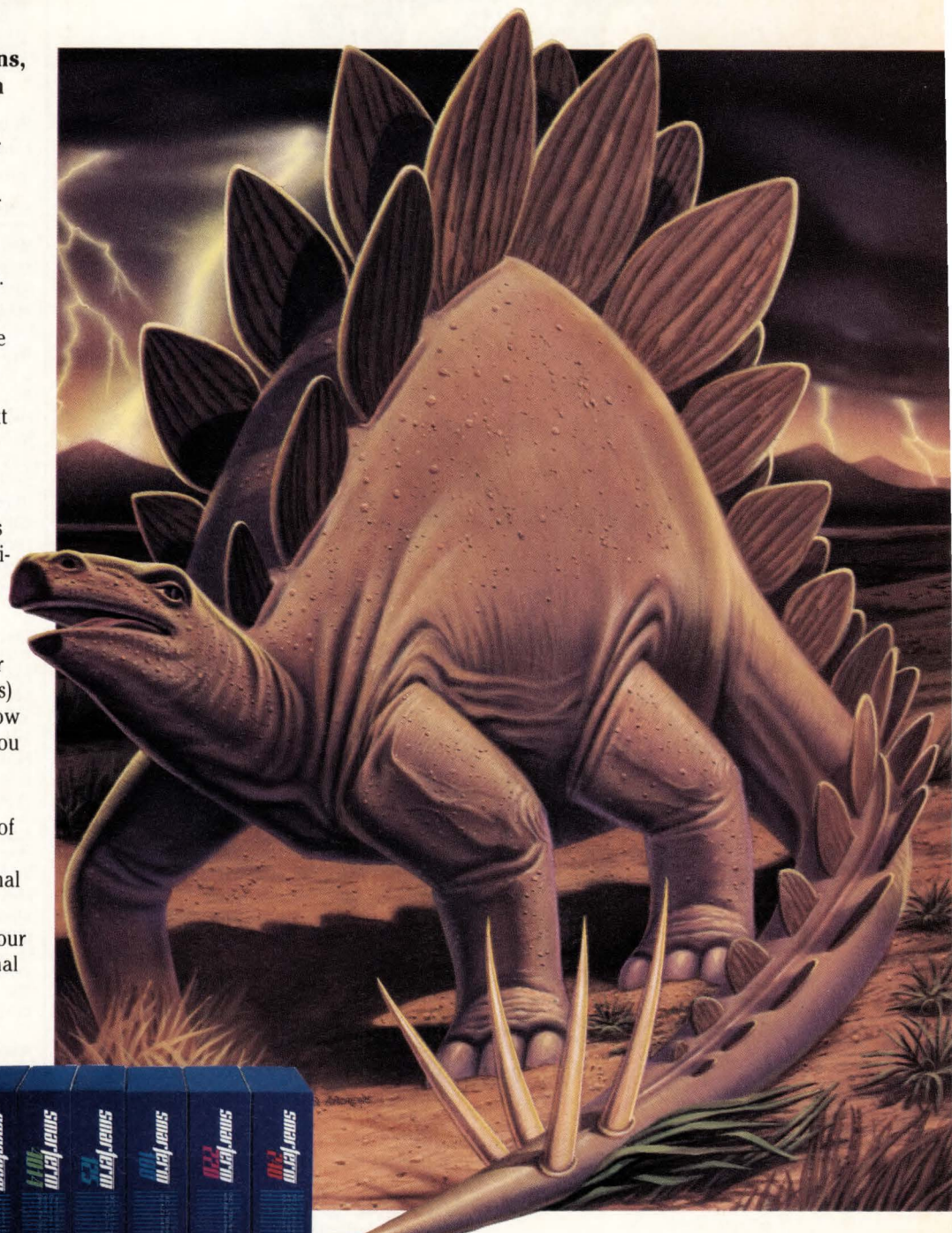

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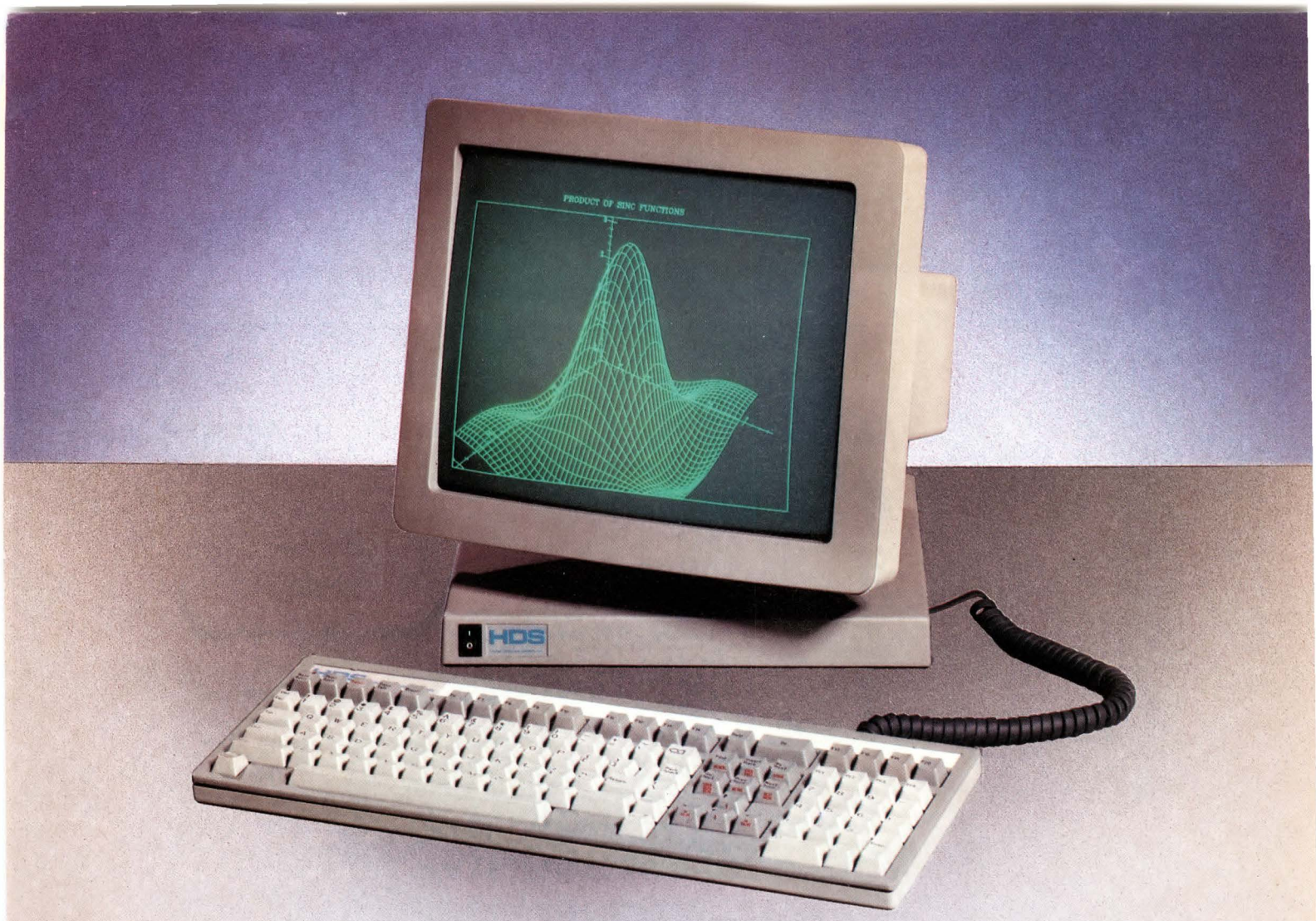

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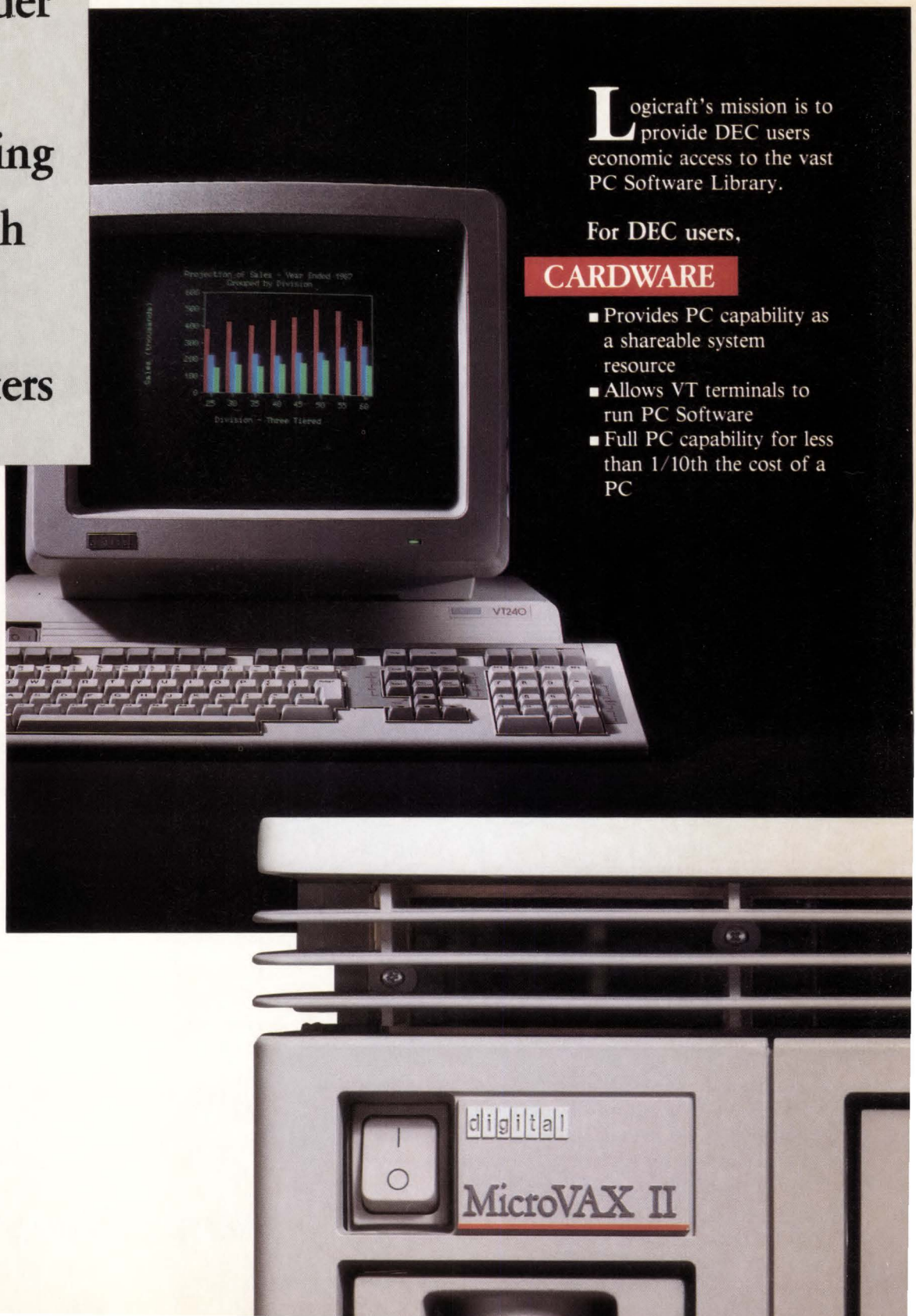

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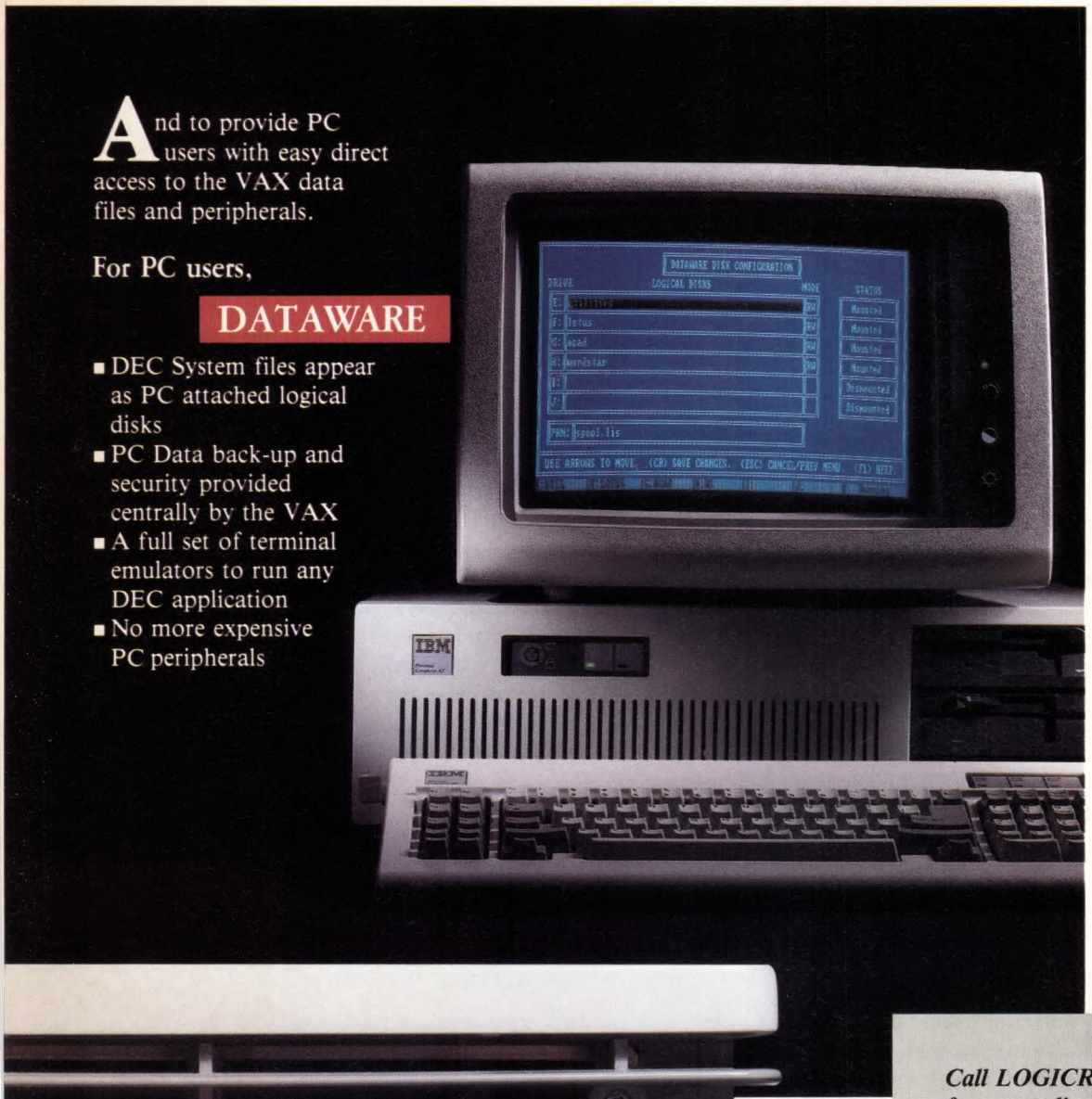

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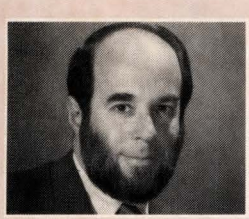

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When You Stop — You Lose

Holding your own just isn't good enough. Satchel Paige noted once, "Don't look back. Someone may be gaining on you." If you aren't moving forward and improving, something is catching up. It may be a competitor or the natural course of events that is moving up on you, but stagnation will bring failure.

The fate of the railroads in the 1920s, 30s and 40s is an example of what happens when you don't keep improving. Stagnation ruined the U.S. rail system. If you think that trains in general don't work, look at the European and Japanese rail systems, which are efficient and successful. If the management of U.S. railroads had envisioned a future with high-speed intercity rail transit connecting to a broad-based commuter system within our cities, you now would be able to move fast and comfortably between many of our major population centers. If President Eisenhower had allocated part of the money spent on our interstate highway system to improving rapid transit in our cities and building rail beds between them, we could've had our roads *and* mass transit. Vision was needed.

Our airline industry is struggling under the weight of many problems. It's now the main mode of long-distance transportation, with buses and trains carrying only a small number of the traveling public. Deregulation has put tremendous economic pressure on the airlines and it is likely that a shakeout will leave few survivors. The Federal Aviation Administration (FAA) has to live under governmental budgetary pressures which result in little or no growth in their capacity and ability to handle air traffic. Airports struggle with the hub airline strategy that daily crowds large numbers of airplanes to key cities at peak periods. Runways and gates can't be built fast enough to satisfy the demand.

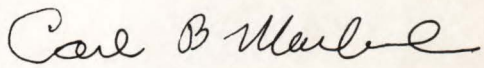
Trains leave large stations from *many* tracks but travel over just one track to their destination, where again they are spread onto many tracks. Airlines leave from a *single* runway, travel over *many* routes to a destination and then land on a *single* runway. Air traffic congestion isn't in the air — it's in those 5:00 p.m. arrivals all trying to land at Boston's Logan Airport's runway nine!

What's being done about it? Not nearly enough. Air traffic control computers are far from state of the art. They're specialized beasts that are expensive to buy, hard to maintain and program, and always behind the power curve. Twelve departures are scheduled for 6:00 p.m. at a single airport knowing that it's an impossible feat.

Soon it will be too late. Like the mythical computer that spends all its time scheduling jobs and leaving no time to run them, the airlines will bog down into the ultimate gridlock. No one will be able to take off or land. How many of your latest flights have been on time? The number is shrinking rapidly.

The airlines and the FAA have embraced computers. In fact, the reason you can get *anywhere* today is due to automation. They must not stand still or the Grim Reaper of gridlock will catch them. Limiting the number of flights is like telling your sales department, "Don't sell any more widgets — our Data Processing Department can't handle it." It's time for the FAA and the airlines to move toward the future with definitive visionary steps — *before* it's too late.

At work, find ways to do things better, faster and more efficiently. Stay ahead of things that always are chasing you. Plan for the future and try to have vision. During his last tenure at Apple Computer Corporation, Steve Jobs was known as the "Corporate Visionary." In many ways our jobs with computers depend on our visionary prowess. We always must be anticipating the future and planning for it.



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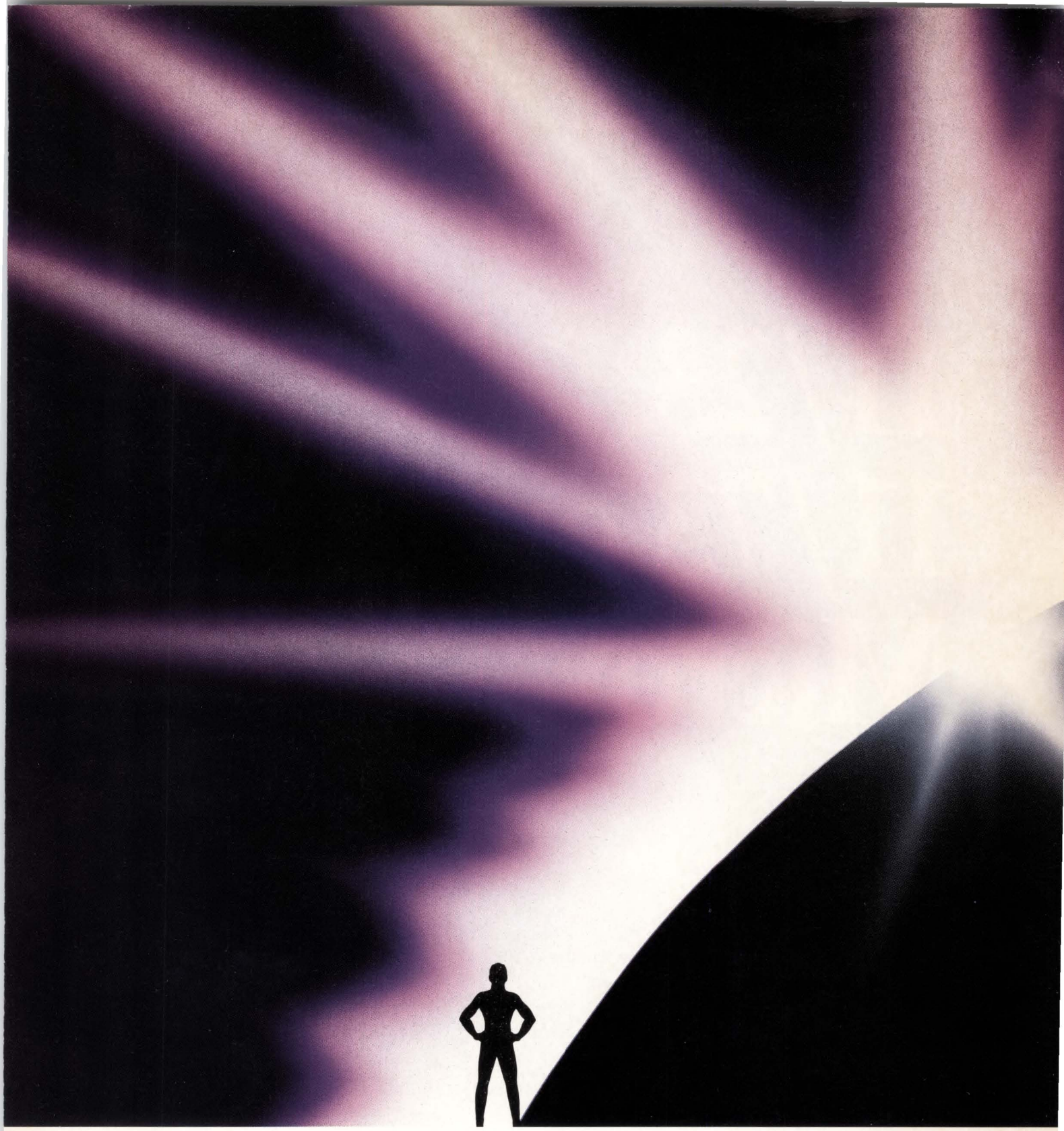

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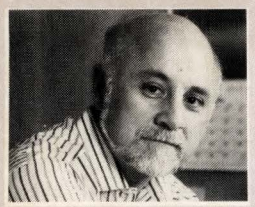

EDITORIAL

Dave Mallery

A Fable

Excerpts from a talk at DEXPO East: We are in the middle of perhaps the most significant period in the history of DEC. It is being written before your eyes. It has all the elements of a Greek Tragedy. We are somewhere in act four.

In the first act, our hero is presented fresh from the battle, victorious. He is clearly in command of the field of lesser kingdoms and is now in a position to conquer his last and biggest enemy, the evil Blue Empire. . . .

In the second act, the hero plans his strategy. He takes the single element that has served him through so many battles, and makes it the key in his plan for the future. His wizards design an industry standard bus that is robust enough for many years of development, fully specified, and easily transferrable to any vendor. Any vendor now can be made into an ally overnight. The products he makes are assured of working correctly (at least, as far as bus interface is concerned).

All is happy in the kingdom because this plan is consonant with all previous strategies. Everyone girds his/her loins for the coming final struggle against the evil Blue Empire. . . .

In the third act, the tragic flaw appears for the first time. The king's counselors get together and conspire among themselves: "If we keep the magic bus to ourselves, we will be able to control the entire battle. We can control the growth of technology in our entire industry, and mimic the evil Blue Empire by selling stale ideas for premium prices." The counselors lure the king into acquiescence because profits are pleasing to behold and the evil is still on the horizon.

In the fourth act, the subjects rise up against the king and demand that he change his edict. All the folk who have carried the heat of the battle for years are enraged and dismayed by the king's seeming intransigence. Prophets rise up in the land and loudly proclaim the coming doom. . . . The subjects bring the king to the courts of the land.

The story stops here. In Greek tragedies the end is inevitable. The fifth act always is the inexorable grinding downfall of the king. What we need now is a little Hollywood.

For the user:

DEC now only sells BI machines (other than the MICROVAX II). If you need a machine with more power than a MICROVAX, that's what you get. In theory, DEC now has ALL your peripheral business in the bag. DEC has stated that the only third-party manufacturers it will license for the BI are those that make something that DEC isn't interested in making YET. Once this becomes airtight, the way is clear to raise prices as high as IBM. Remember, DEC's cost of manufacture is only about eight percent of sales now. IBM has its down to five percent. Pricing is going to be based purely on level of performance.

For the vendors:

If the architecture is closed, the market is closed. There will be a few years of selling Q-bus and UNIBUS boards, but the Grim Reaper will get us all in the end. Meanwhile, a prudent corporate manager will explore other opportunities with vendors possessed of more open minds and buses.

Enter the champion:

In the end, DEC always has faced reality, especially when it is being rubbed all over its nose.

The vendors today are really weak (even though they are so much larger and so numerous). Their only arguments are legal, and their resources are pitiful in the face of DEC's multi-billion-dollar war chest. They are divided and hardly dare talk to each other. A consortium is impossible. SI will sue DEC, DEC will sue Emulex, but there will never be a good class action suit, joined by all of us (or will there?).

The real hero is the customer. He's strong, because he has the gold.

Iron law: DEC only gets money from customers!

Customers do speak with each other and can unite. They can unite under DECUS (what an irony!) and they can unite in other ways. The magazines exist because there is a vast need to know that they can fill.

Now, some customers have more clout than others — I mean the customers with the multimillion-dollar annual procurement budgets. These are the firms that have to take the point. Fortunately, many of them have dealt with third parties for years and have them as integral parts of their plans. They don't like being pushed around, even by DEC. They know all too well the levels of stagnation that will creep in the moment the door slams behind the last third-party vendor.

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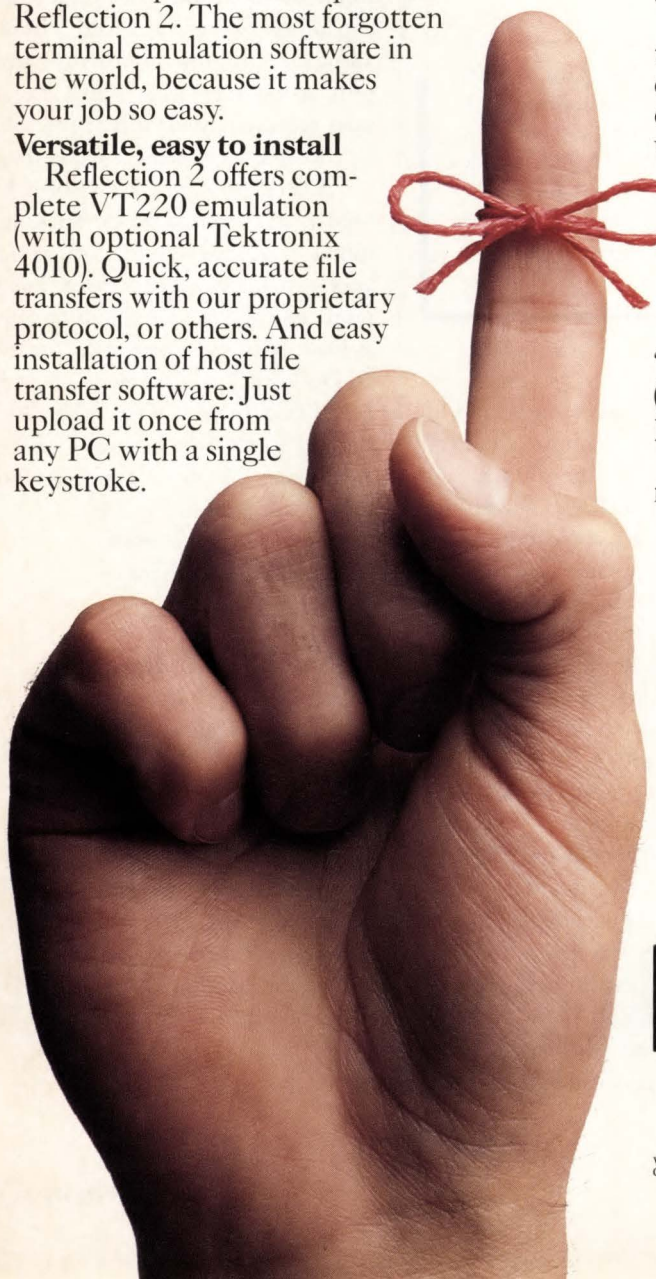

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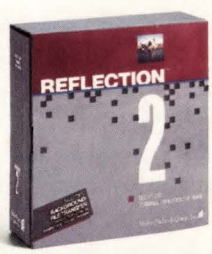
See how forgettable terminal emulation can be. Just remember this name: Reflection 2.

Call (206) 324-0350 to order, for information, or your FREE evaluation copy.



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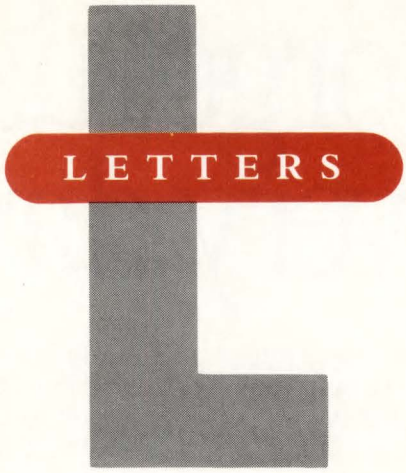

Address letters to the editor to *DEC PROFESSIONAL* magazine, P.O. Box 503, Spring House, PA 19477-0503. Letters should include the writer's full name, address and daytime telephone number. Letters may be edited for purposes of clarity or space.

CAN'T RESIST

I can't resist correcting Carl Marbach's statement on page 86 of the December issue that TTY 33 was the only supported terminal on the first DEC computers. Actually, it came a couple of years later than the first PDP-1s, which included a Soroban conversion of what I think was a Big Blue typewriter.

Tim Hart
Lexington, Massachusetts

PRO 350 PLUNGE

I hear all the uproar over DEC's new marketing strategy for both hardware and software. I view DEC's "new" attitude as a logical next step. I'm actually surprised it took Ken Olsen this long to implement this plan.

Just look at how DEC foisted the PRO 350 on a trusting, but unsuspecting, customer base. With much fanfare, DEC introduced the "PC for the Professional." Even though the price gave many pause for second thoughts, DEC's history of support, compatibility and long-lived product lines caused others like myself to purchase the "desktop PDP."

In short order, DEC recovered its engineering investment to produce the PRO 350 and promptly relegated it to the status of retarded step-child.

What little software is available is overpriced, fraught with bugs, and at best, a poor attempt to mimic counterparts for the "BLUE" line of PCs.

For example, *PROSE* (even the *PLUS* version) is a poor excuse for a word processing program. Slow, limited functionality and inconsistencies in operation are its prominent characteristics. SYNERGY was the follow-on to the all but fraudulent APPLICATIONS STARTER KIT. Although bugs were fixed and functionality added, its price still is twice that of better products written for the MS-DOS environment.

As for third-party add-ons, they are virtually non-existent. To my knowledge the engineering data on the unique PRO 350/380 I/O bus was never released. This, coupled with the limited marketing base, resulted in a no-go decision by third-party vendors to develop peripheral add-ons for a reasonable cost as has been done for the PDP ad VAX lines. The cost to upgrade my PRO 350 10-MB hard disk is five times that of a comparable upgrade for an IBM or clone. Don't even think about a cartridge tape backup capability. When I asked about an allowance for my 10-MB disk toward purchasing the larger drive, the DEC sales representative scoffed and told me to "use it as an expensive paperweight."

Every PRO 350 I know of is being used as an oversized power-sucking terminal to a larger system, or as a not-very-capable word processor. The final word on the PRO 350 dilemma appears as Dave Mallery's suggestion for "What To Do With That Old PRO 350" in *DEC PROFESSIONAL*, December 1986. I suggest Ken Olsen has one-upped IBM in this one: The most expensive power supply successfully marketed.

James E. Wojciehowski
Ridgecrest, California

FOND LOOKS BACK

Regarding Carl Marbach's "A Fond Look Back" at early terminals, on page 86 of the December *DEC PROFESSIONAL*:

1. The first "terminals" on Digital computers, if by "terminal" you mean a device connected to the system remotely via communication lines, were indeed the Model 33 teletypes. However, the console device on the PDP-1

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

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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.

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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.

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preceded them. This was an IBM electric typewriter modified by Soroban to connect to the system. With the "Expensive Typewriter" program it gave a rudimentary form of word processing with letter quality print output.
2. The first CRT on Digital computers was the Type 30 Precision CRT Display, also on the PDP-1. This 16-inch unit plotted 1024 by 1024 pixels from the software viewpoint, though the screen resolution really was just 512 by 512 pixels. It had no alphanumeric capability. It could plot at the rate of 20,000 points per second. Since it also had no internal memory, points had to be refreshed before the phosphor trace decayed. It was totally useless for applications that involved a lot of alphanumeric data, but was good for simple graphics. A light pen let users identify locations to the system: an interrupt took place after a pixel was intensified if the light pen was pointing at that pixel.

My first paid programming job, in 1963, was as a junior systems programmer on a PDP-1. One of my assignments was to write an alphanumeric display routine for the point-addressed CRT. We used a five-by-seven dot matrix with the bits stored in two 18-bit PDP-1 words. Mr. Marbach's "fond look back" certainly brought back some fond memories. Keep up the good work!

Efrem G. Mallach
Needham, Massachusetts

HIDDEN JDB2

I am writing in the hope that one of your RSTS-knowledgeable readers can help me find my JDB2 (Second Job Data Block). Digital, in the process of updating RSTS to version 9.2, hid all the JDB2s somewhere, and left no (documented) pointers. Admittedly, the information was, even previously, marked "Unsupported. Use at your own risk." But some items about a jobs context (e.g., Saved Privilege Mask, Default RTS, or exit status) don't seem to be available via SYS( ) calls. Is there anyone out there with an answer?

Mike Rechtman
Kibbuz Tzor'a, Israel

Michael Mayfield of Newport, WA, replies: In RSTS V9.2, the JDB2 was replaced with a new structure called the JCR (Job Control Region). The JCR is described in the KERNEL.MAC file provided with RSTS V9.2.

This new structure was moved to an unmapped portion of the monitor and no longer is available using PEEK sequences. It only is available using the .XPEEK monitor call or by mapping with a dynamic region in MACRO.

Fixed location 1030(8) in the monitor contains the offset plus 140000(8) within the JCR area to the beginning of the current job's JCR. Location 1032(8) contains the address of the base of the JCR area, divided by 100(8). Using this information, some or all of the contents of the JCR area, or a specific JCR, can be mapped using a dynamic region or copied using the .XPEEK system call.

The May 1986 issue of the RSTS newsletter contains a program submitted by Brian Nelson of the University of Toledo called DYNPRI. This program is a good example of accesses to the JCR area. Brian has DYNPRI available on his in-house system for downloading with KERMIT.

To get DYNPRI, call (419) 537-4401 or (419) 537-4411. When online, press two RETURNs for autobaud. At the "Enter Class" prompt type: VX785A. Next, press two RETURNs again to autobaud on the VAX system. Log into account KERMIT with password KERMIT. You'll be in a captive menu. Once you start the VMS KERMIT server you can type:
Kermit-11> GET RSTS_FILES: DYN.MAC

If you don't have dialout capability or need help using MACRO, feel free to contact me at (509)447-5631.

NEEDS HELP

I enjoyed Eliezer May's article on the VT200 series. Why can't I find any documentation about what format the VT241 uses when it dumps a graphics screen on hitting Shift/Print Screen? I would like to write a program to convert the information for different printers, including color. Does anyone out there have any answers?

Wendel Dean Renner
Indianapolis, Indiana

Readers?

BACK ISSUES

I just received issues of *DEC PROFESSIONAL* from January through November 1986. This weekend was spent reading all of the issues. I would like to thank you. As usual I found important articles that relate to some of the problems in my installation and will help me immensely. I hope that I never miss another issue.

Eliezer May Mazkeret
Batya, Israel

CATCHING UP

We at Users Incorporated could not agree more with Publisher Carl Marbach's "It's Time to Catch Up" (Vol. 5, No. 12, page 12). Digital has haughtily turned against, and is squeezing, its OEM channel. Its increased margins on OEM business is being used to finance its new direct sales initiative. While it will take some time, most OEMs believe this strategy will slow, and eventually reverse, Digital's gain on IBM. Gains in Digital's direct sales will be offset by lost OEM volume.

We have been continuously letting Digital know our thoughts, but it seems to be falling upon deaf ears. It seems stubbornly committed to to its new "marketing strategy."

Grudges are building up in the OEM community which will be exorcised when the timing is right.

Joseph F. Sermarini
Valley Forge, Pennsylvania

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Direct Connection To VAXBI Bus

TU81-Plus Support Extended To MICROVAX II

Support for DEC's high-density TU81-Plus tape subsystem has been extended to include MICROVAX II computers. This extension allows the full range of systems, from the MICROVAX II to large VAX 8800 systems, to use the resources of this enhanced performance tape subsystem. The TU81-Plus unit is the first tape subsystem to offer direct connection to the VAXBI bus. It also is supported on UNIBUS-based PDP-11 minicomputers.

The TU81-Plus unit is designed for applications involving sustained input/output such as disk backup, data archiving, data interchange, or recording data from high-speed test equipment. It uses a 256-KB cache buffer to boost performance significantly and replaces DEC's TU81 tape subsystem. The cache buffer can be switched on or off on software command, avoiding the risk of lost data inherent in traditional cache designs. With industry-standard recording at 6250 and 1600 bpi densities and a fast streaming speed of 75 inches per second, the new subsystem is suitable for mid-range DEC systems with high-capacity disks.

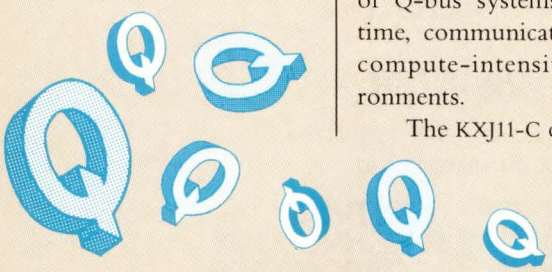
For highest density recording, the TU81-Plus unit uses Group Coded Recording (GCR). It can read and write tapes for data interchange with other GCR and Phase Encoding (PE) tape systems. The subsystem uses standard 2,400-foot reels and is supported by VMS and ULTRIX operating systems, as well as by major PDP-11 operating systems.

Priced at $25,500 for MICROVAX II computers and $27,500 for VAXBI-based systems, the TU81-Plus unit is available for all supported systems immediately, complete with tape drive, controller, cabinet and cables. Field-installable kits to upgrade TU81 subsystems to TU81-Plus units are priced at $3,000 and also are available immediately.

New Peripheral Processor Enhances Q-bus System Performance

Features J-11 16-Bit Microprocessor

A new, single-board peripheral processor for Q-bus computer systems with as much as two times the performance of its predecessor was announced recently by DEC. The KXJ11-C general-purpose peripheral processor is designed to enhance the performance of Q-bus systems in real-time, communications, and compute-intensive environments.



The KXJ11-C device can act as a real-time processor, coprocessor, or I/O processor. As a real-time processor for laboratory and CIM applications, it provides predictable, real-time response to interrupt signals for data collection from multiple sources, CPU power for data reduction and preprocessing, sufficient onboard memory for temporary storage, and direct memory access (DMA) and shared-memory data transfer mechanisms for easy host access to data.

As a coprocessor for high-speed calculation and mathematical modeling, the KXJ11-C product features DEC's high-performance J-11 16-bit microprocessor with floating point capability and 512 KB of memory for working space. The host system selectively can assign tasks to the KXJ11-C coprocessor to offload the main CPU and speed execution of compute-intensive tasks.

As an I/O processor, the KXJ11-C is designed to offload and simplify communications by handling specific protocols such as those for CCITT X.25 packet-

switching networks. For data transfer tasks, the KXJ11-C module contains a two-channel DMA controller and two fully programmable synchronous/asynchronous serial line units, a 20-bit parallel programmable port, and an asynchronous serial console port.

In addition to the 512 KB of dual-ported, dynamic random-access memory (RAM), the KXJ11-C module contains 64 KB of programmable read-only memory (PROM), of which 48 KB are for user software and 16K are for firmware. Software support is provided by the MicroPower/PASCAL set of application tools and programming language; toolkits are available for the arbiter CPU under RSX-11M, RSX-11M-PLUS, MicroRSX, and RT-11 operating systems. Additional software support is planned.

Price for the KXJ11-C peripheral processor is $3,500. Quantity discounts are available.

New VAX Configurations Have 16-MB Memory Arrays

Quadruples Previous Capacity

New VAX computer system configurations that incorporate new memory boards of quadruple the previous capacity are available now. The new configurations incorporate new high-density (16-MB) memory arrays. The arrays expand the capacity of the VAX 8500 and VAX 8550 systems to 80 MB and the VAX 8700 and 8800 systems to 128 MB.

With the availability of the new memory boards, DEC has increased the standard memory content of the VAX 8550 system to 32 MB from the current 20, at no increase in price. A new, lower-cost 16-MB standard-memory configuration entry-level VAX 8500 system using the new boards also is available. The new boards also will be standard equipment on VAX 8700 and VAX 8800 systems. The new memory arrays require no change in the size of the existing VAXBI system cabinets.

DEC also announced the availability of individual 16-MB memory array boards. The boards can be used to expand new and existing medium- to high-end VAXBI-bus-based systems. Customers with the current 4-MB memory boards are eligible for a trade-in credit each toward the new 16-MB boards.

The new VAX 8550 system with 32-MB capacity is priced from $364,000; the new VAX 8500 16-MB configuration, from $252,000. Both are available immediately. Individual 16-MB memory array boards are priced at $32,000 and are available immediately.

DECmate III Plus Provides Increased Speed

Hard-Disk Version Offers All WP Features

DEC's new DECmate III Plus, a hard-disk version of the DECmate III floppy-based word processing system, provides increased speed and convenience for administrative workers, managers and other professionals who handle large amounts of text, but who also need full communications to tie into office applications such as DEC's ALL-IN-1 Office and Information System.

The DECmate III Plus system is a complementary member of the DECmate family, offering the complete word processing features of the DECmate III, including professional "Gold Key" word processing.

In addition, floppy diskettes are compatible throughout the DECmate family, allowing users who have DECmate II, III and III Plus word processors to change diskettes directly from one system to another.

The DECmate III Plus system comes complete with preinstalled 20-MB hard disk drive, single floppy drive, monitor, keyboard, Master Menu software and DEC's full word processing software. It is priced at $4,695.

The DECmate III Plus, Digital's hard-disk version of the DECmate III word processing system.

DEC Announces VAX DEC/MAP

Runs Parallel With DECnet On VAX/VMS

The new VAX DEC/MAP, an integrated set of networking products based on the Manufacturing Automation Protocol (MAP) version 2.1 specification, enables all 13 models of the VAX 11/700 and VAX 8000 systems to

communicate with computer systems and automation equipment from other vendors that also support the MAP specification.

The MAP specification is based on the ISO/OSI reference model. Used with the appropriate hardware, VAX DEC/MAP implements a seven-layer MAP system, running on VMS.

DEC's goal was to build MAP products so they would complement its existing DECnet products. This complementary approach or coexistence enables customers to run VAX DEC/MAP and proprietary DECnet products concurrently on the same VAX computer over the same broadband cable.

Principal markets for VAX DEC/MAP include large-scale manufacturers in the transportation, aerospace, heavy equipment, metal processing, food processing, and chemical industries.

VAX DEC/MAP is part of DEC's strategy of evolving its DNA to ISO/OSI standards. DEC has introduced several other ISO/OSI-compatible products, including VAX OSI Transport Service (VOTS), VAX OSI Application Kernel (OSAK), X.400 gateway, X.25 packet switching network, and IEEE 802.3 local area network. The company has stated that it will deliver future ISO/OSI products as mature standards emerge.

VAX DEC/MAP consists of a VMS software package with four application layer interfaces and network management utilities, a communications controller, and cabling. VAX DEC/MAP products range in price from $12,000 to $16,500.

A MAPserver/Plus Token Interface Module (TIM) modem from Concord Communications, Inc., is a hardware prerequisite.

VIA, Business Committee For The Arts Present Awards

DEC Honored Twice

The Videotex Industry Association (VIA) and the Business Committee for the Arts have presented awards to DEC for outstanding achievement in 1986.

The VIA presented the annual Outstanding Achievement award for DEC's pioneering efforts in helping businesses use videotex to access and distribute information easily. DEC is the leading provider of videotex systems based on its VAX VTX software for corporate and business-to-business applications.

VAX VTX works with ALL-IN-1, DEC's integrated office and information systems. When running VAX VTX with ALL-IN-1, a single desktop terminal or workstation has access to an "electronic bookshelf" of videotex information through ALL-IN-1's main menu.

The Business Committee for the Arts has selected DEC as one of 10 recipients of the Return Business in the Arts Award for "having one of the finest art support programs in America." In 1985, DEC was selected as a First Time Business in the Arts Award recipient.

The Business in the Arts Awards, co-sponsored by *Forbes Magazine*, are presented annually by the Business Committee for the Arts, Incorporated, as part of its mandate to encourage new and increased business support for the arts.

The award to DEC was based on the company's support of cultural institutions, including the Tampa Bay Performing Arts Center; the Orange County Performing Arts Center; the Children's Museum, Boston; and the Children's Discovery Museum, Acton, Massachusetts.

Joint Marketing Agreements Signed

Execucom Systems, ESCA Corporation, Landis & Gyr, Systems Control Sign With DEC

Execucom Systems Corporation, Austin, Texas, has signed a joint marketing agreement with DEC. Three major suppliers of computerized energy management control systems also have signed marketing agreements: ESCA Corporation, Bellevue, Washington; Landis & Gyr, San Jose, California; and Systems Control, Palo Alto, California.

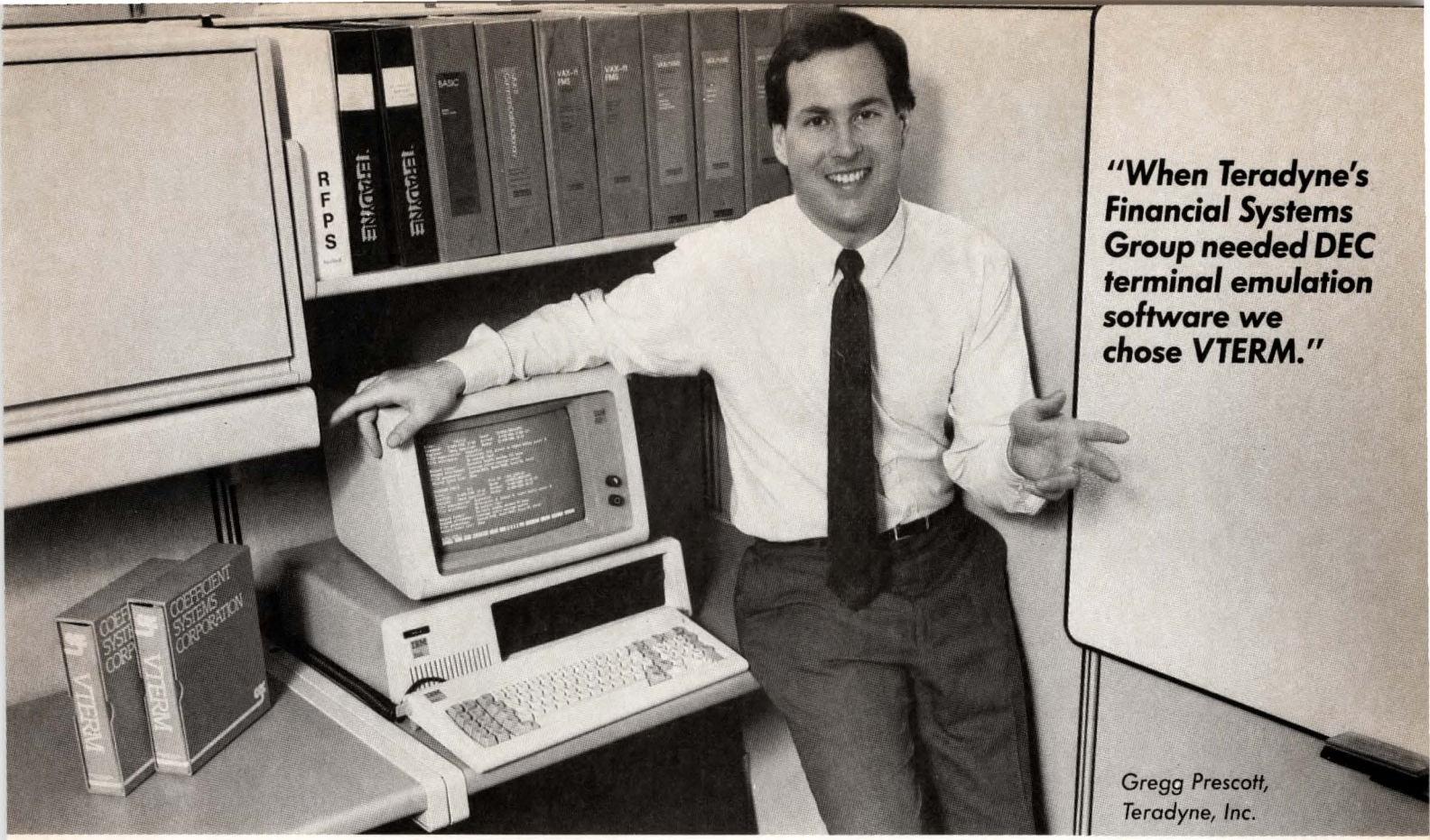
The Execucom agreement establishes a working relationship to promote customer recognition of the benefits of Execucom's financial planning/decision support software and DEC's systems through a cooperative marketing program throughout the United States.

A major aspect of the agreement will focus on both companies offering business productivity tools to Corporate Information Centers and in providing departments of Fortune 1000 organizations with financial analysis solutions.

Execucom's principal products currently include IFPS/Plus and IFPS/Personal, among the first Decision Support software products to offer a nonprocedural modeling language on mainframe, mini- and microcomputers, and Impressionist, a new business presentation graphics software product.

System Cooperative Marketing Program agreements with ESCA, Landis & Gyr and Systems Control enables DEC to ensure delivery of Digital-based solutions to the electric utilities industry.

ESCA Corporation holds the high-end price band ($10 million and up)



VTERM/220 Quality makes all other DEC terminal emulators obsolete

Over 35,000 VTERM users, like Teradyne's Financial Systems Group, recognize the importance of critically evaluating a DEC terminal emulator. Demanding professionals require high quality, reliable DEC terminal emulation. After painstaking evaluation, Teradyne's Gregg Prescott said, "With VTERM's speed, ease of use, hot key and host control of file transfer, we can build systems around VTERM utilizing distributed PC applications."

Coefficient's VT100 terminal emulator, introduced in 1981, was the first in the industry. Our thorough attention to detail at every stage of the design, development and testing process has won us more satisfied users than all our competition combined. Now, a new more powerful VTERM supports VT220 terminal emulation. Powerful features include:

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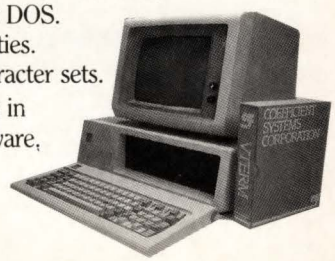

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Rocky Mountain DECUS Planned For March

RMVLUG To Host Regional Conference

The Rocky Mountain VAX Local Users Group (RMVLUG) will host a DECUS Regional Conference at the foot of the Rockies at the Denver Sheraton Tech Center in Denver, Colorado, March 5-6.

Because the RMVLUG is composed almost exclusively of VAX/VMS users, the mini-DECUS will dedicate all technical sessions to material on VAX/VMS systems in single node, networked, and cluster configurations. A preliminary Sessions-at-a-Glance Map is shown at right.

Thursday, March 5, sessions are scheduled from 9:00 a.m. to 5:30 p.m., with a lunch break. Thursday evening panel discussions will run from 7:30 to 9:30 p.m. The VMS Q & A and the Network Q & A will feature major personalities from DEC and time for questions, answers, war stories and magic. Friday, March 6, sessions will run from 9:00 a.m. to 4:30 p.m. to accommodate return flights or a drive to the mountains for skiing before the traffic jams begin.

DEC will provide a major exhibit with demos of the latest products to accompany the conference. Shuttle service will be provided every 15 minutes between the exhibit area and the conference site.

The Denver Sheraton Tech Center is located 15 minutes from the Denver airport. The Sheraton offers free shuttle service to and from the airport and is making single rooms available for $65 per night.

The committee has information on winter ski packages through the Keystone Resort, a three-area complex (Keystone, Copper Mountain and Arapahoe Basin), located 90 minutes from Denver. Early registration is advised.

For a registration kit or additional information, contact any of the committee members.

THURSDAY

	VMS-1	NETWORKS	BUSINESS APPLICATIONS	PROGRAMMING & TOOLS	DBMS
9:00 — 10:00	NEW PRODUCTS UPDATE	NETWORK UPDATE	VIA OVERVIEW	FDL TUTORIAL	DBMS OVERVIEW
10:00 — 11:00	VMS UPDATE	DECNET OVERVIEW	OA/ ALL-IN-ONE	TPU TUTORIAL	SELECTING A DBMS
11:00 — 12:00	DEC ENGINEERING DIRECTIONS	SNA INTERCONNECT	ALL-IN-ONE PERFORMANCE	DEBUG TUTORIAL	IMPLEMENTING DBMS- A CASE STUDY
1:30 — 2:30	WHAT'S NEW WITH CLUSTERS	PLANNING A LAN	FMS/TDMS TUTORIAL	SMG TUTORIAL	MONITORING DBMS PERFORMANCE
2:30 — 3:30	SITE MANAGEMENT PLANNING	NETWORK MANAGEMENT	VAX-PC SPREADSHEETS	USING AST'S & SETIMR	4TH GENERATION LANGUAGES
3:30 — 4:30	SYSTEMS MANAGEMENT	USING T1 LINKS	DISTRIBUTED PROCESSING IN THE OFFICE	DISTRIBUTED LOCK MANAGER	RALLY/TEAM DATA & COBOL GENERATOR
4:30 — 5:30	DISASTER PLANNING/ RECOVERY	PSI UPDATE	-OPEN-	DEVICE CONTROL LIBRARIES	SQL TUTORIAL
7:30 — 9:30	VMS TECHNICAL Q&A	NETWORK TECHNICAL Q&A			DATABASE MANAGEMENT PANEL

FRIDAY

	VMS-2	NETWORKS	VMS-3	PROGRAMMING & TOOLS	VMS-4
9:00 — 10:00	PERFORMANCE MANAGEMENT	NEW LAN FUTURES	UNDERSTANDING CONSOLE MEDIA	VAX SOFTWARE DEVELOPMENT TOOLS	MEET THE TSC
10:00 — 11:00	CAPACITY PLANNING	NETWORK FUTURES	CLUSTER CONSOLE OVERVIEW	MMS/CMS TUTORIAL	VMI CALLBACK AND VMSINSTAL
11:00 — 12:00	MEMORY UPGRADES FOR YOUR VAX	CAMPUS NETWORKING	USENET AND VMS	CDD TUTORIAL	PTY PSEUDO DRIVER DRIVER
1:30 — 2:30	CONFIGURING HSC DISKS	PC NETWORKS	UNIX EMULATORS FOR VMS	ADA TUTORIAL	ACL MGMT ON FILES AND DIRS
2:30 — 3:30	VOLUME SHADOWING	DECNET DOS	BATCH/MANAGING PRINT OVERVIEW	BACKUP ADA PROJECTS	METHODOLOGY
3:30 — 4:30	CLUSTER PERFORMANCE	MICROVAX WORKSTATIONS	SHARED AND SHAREABLE IMAGES	AI: A CASE STUDY	RMS & DISK TUNING

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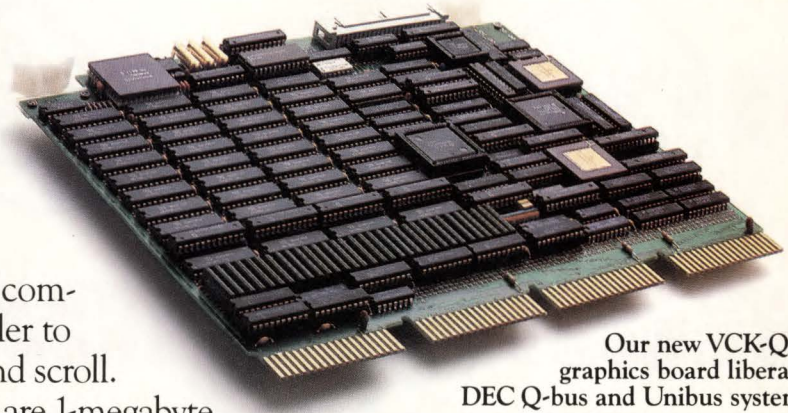

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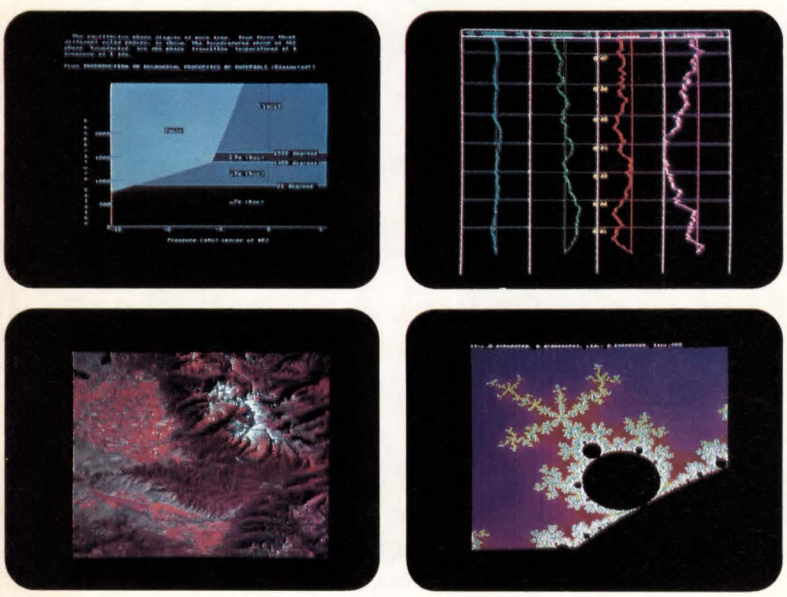

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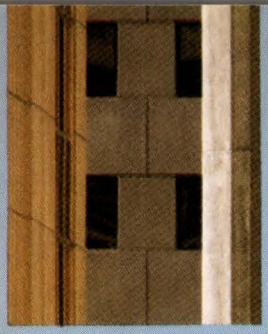


MASS STORAGE

OPTICAL STORAGE

By Ron Levine

This Revolutionary Technology Will Match The Invention Of The Micro In Shaking The Foundation Of The Computer Industry.

Over the last 20 years or more, basic computer technology advanced by leaps and bounds in capability, speed, capacity, and reliability, as the cost of computers continued to decrease drastically. We witnessed the power of the "old" mainframes become available first on the mini and then on the micro, with new and ingenious software computerizing applications never imagined at the start of the automatic data processing revolution.

The one system component that hasn't kept pace with the computer technology evolution is mass storage. In fact, data storage and retrieval methods remain a stumbling block to automating some applications. Sure, we advanced from magnetic tape to hard disk to diskette and to Winchester disk, and made ongoing improvements, but the basic technology remains unchanged. Data is stored in magnetic fields on each media, a system that has worked well but also has limitations preventing widespread use of computers in many occupations and work environments.

This finally has changed. Now enters a completely new technology for mass storage and retrieval — one that provides a tremendous increase in capability, capacity, and reliability, and all at a cost per storage byte much cheaper than conventional methods. This new technology is optical storage. Even in its early stages, it's making a noticeable impact on the whole computer industry. By the 1990s optical storage techniques probably will completely change the manner in which data is entered, stored, and retrieved in automated systems.

Optical storage provides a means of recording/retrieving video and audio data with word data. The high-density recording capability of optical devices provides media capacity never before dreamed of, and it is a stable, rugged medium.

Optical storage devices record data on a thin film by burning microscopic holes in the film with a laser. Data then is read by a laser device in much the same way paper tape readers interpret information by the presence or absence of a hole. Two types of optical recording media currently are in use: prerecorded and writeable.

Prerecorded optical storage is read-only; that is, data can be read but not altered. It's ideal for distribution of large informational databases that don't have to be updated constantly, and for archival purposes. Most systems of this type have employed the 4.7-inch compact disk read only memory (CD ROM) disk and drive.

Writeable optical media is the most promising form of optical storage technology. Called Write Once Read Many (WORM) disks, these devices enable one-time writing and unlimited reading of data. This data can't be overwritten or erased, but can be updated by writing the new information elsewhere on the disk and linking it via software to the original file. WORM media are available in 5.25-, 8-, 12- and 14-inch disks.

Neither CD ROM nor WORM currently is erasable. It may be at least two years before

erasable optical storage devices are ready to be marketed, providing the same read and write capabilities as magnetic media.

Optical Disk Advantages

Optical storage technology has significant advantages over magnetic methods. The most talked about is superior data handling and recording capability. Text, audio, video, and images may be mixed at input, then stored and retrieved together for display or printing.

Another important property of the optical disk is huge storage capacity. The currently available 12-inch optical platter can store more than two gigabytes (equal to approximately 100,000 letter-sized pages of text or four standard file cabinets). This capacity is equivalent to over 60 2,400-foot mag tapes or seven eight-inch disks. A five-inch optical disk can store the same amount of data as 1,000 floppy disks. Imagine the on-line storage possibilities of having so much data on one disk.

Perhaps the most progressive feature of the new optical disk is its indestructability. Compare an optical disk's expected media life of 10 to 15 years to the average three- to five-year life of magnetic media. Recorded data on the optical disk also is more stable. The disk is sealed in a cartridge (plastic or glass) protecting it from damage. It can be dropped, handled freely and, of course, these disks don't need to be kept away from magnetic fields. Like fragile magnetic disks, optical disks are removable and can be locked up for data security. And they don't stretch with time as is the tendency with making optical disks more reliable for long-term storage and archival purposes. For these reasons, optical data storage eliminates the need for backups.

Optical media also can be transported easily. Data and image recording is non-

magnetic; therefore, it can be carried through X-ray and other scanning devices safely without loss of data. This is an important factor if frequent traveling and/or shipping between sites is required. All this at less cost than magnetic storage. A typical 5.25-inch optical disk has five times the storage capacity of a 5.25-inch disk. Therefore, assuming an equal price, the cost per bit of storage is five times greater on the magnetic device. At a cost of only pennies per MB (as opposed to an approximate $10 per MB for hard disk storage), its the lowest costing storage available today.

The many advantages of CD ROM don't come without some corresponding disadvantages. Important differences exist between magnetic and optical storage which must be dealt with when integrating an optical device into your system. Some of the more obvious are the write-once limitation of the media, file locating, access methods, storage capacity that exceeds many operating system addressing capabilities, and the way data sectoring and error handling is performed.

Currently, once data is recorded on an optical disk, it is permanent. It can't be erased or overwritten or altered. When it's necessary to update data, only two methods are practical: either rewrite the entire file or rewrite "parts" of the file.

Rewriting the entire file in another location on the disk in itself isn't a problem with optical media because disk space is plentiful and cheap (formatting is an average 16,000 tracks per inch). This is an ideal solution for small files as it's extremely easy to implement. But, this method of updating breaks down when large files are involved (a 200-MB file can't be rewritten on a 300-MB disk). Rewriting only the affected parts of the file is the practical solution.

This sector rewrite is performed using pointers implanted in each disk sector when the original data is written. This pointer field is used only when a replacement sector is created. The original sector's pointer field contains the address of the new, revised sector, and when a disk read is performed, the system first checks the pointer field of the original sector to decide if there's changed data elsewhere before a read operation begins. If the pointer field has an address depicted, the disk retrieves the data from that address instead of from the original sector. Since all sectors have pointer fields embedded, new revised sectors always can be retrieved.

This type of rewrite is space effective and also fairly simple to implement. Its biggest disadvantage is that, if frequent updates are performed, a long line of sector "links" will result, degrading the disk's access time performance. But an added advantage of this pointer system is that an audit trail for tracing all data changes is built-in.

File Directory Rewrites

Another challenge facing programmers using optical disks is how to update the unalterable file directory, since it still points to the original file location. Various methods are being used to attack this problem.

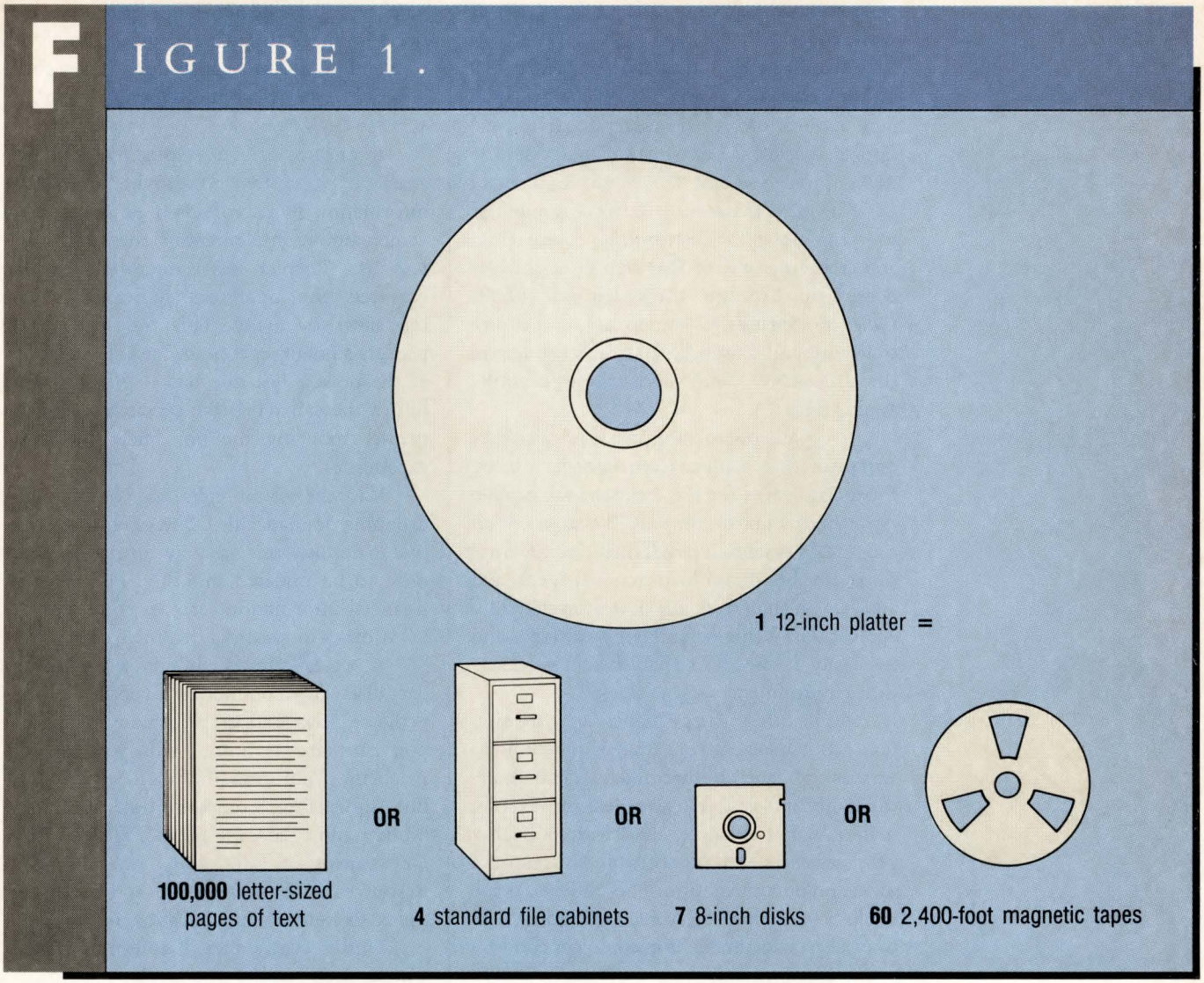
One method is to combine magnetic and optical media. Keep the directory on a magnetic disk and the files on the optical disk. The biggest drawbacks here are that an additional drive is required just for the directory data, and if the magnetic disk is damaged or destroyed, the data files also are lost and data security compromised.

Another method for altering file directories on optical media calls for emulating a standard disk operating system. Each time a file is changed, the entire directory is rewritten, as if it were new. This is timely and requires the use of a lot of disk space — but it gets the job done.

The most efficient solution, although the most complex to implement, is to create many small subdirectories and each time a file is updated to rewrite one of these subdirectories (and the pointer to it). This method saves both disk space and the time required to rewrite the entire directory.

Another challenge with optical disks is that they write to a specific physical location. Most sophisticated operating systems in use today cannot handle this. New operating system techniques must be used to address this property of optical media.

Other modifications to current operating systems and support software needed to use the optical disks include expanding the com-



mand set to support optical media file opens, closes, reads and writes. Disk memory addressability also must be expanded to use the multigigabyte storage capacity. Also the error-handling technique on optical storage devices is far more complex than on magnetic media. The software must be able to interface with the more stringent hardware requirements.

Optical media is a very different animal from magnetic media, and integrating this new technology with existing hardware and software requires modifying present day systems. It's expected that in the initial stages of the optical industry, most hardware and software will be provided to the user by the optical drive vendors.

The optical vendors have learned some lessons from the media "wars." Development of formatting standards will alleviate the non-compatibility problems that plague mag media. The *Yellow Book,* developed by Philips and Sony, two leading CD ROM developers, establishes a physical format standard. The High Sierra Group's proposed logical file format standard has the backing of most major vendors of CD ROM. This enables CD ROM companies to concentrate their resources on developing product, rather than fighting each other. Another "standard," based on a modified SCSI interface, is being promoted as the optical interface for the minicomputer market.

When these standards are adopted, users can be confident that a CD ROM drive, a disk

and a computer, all from different sources, will work together.

Thanks to the optical disk, new endeavors now are open to automation. To explore these new applications it's necessary to divide the optical world into two main categories: CD ROM application and WORM environments.

CD ROM is the most intriguing method to come along for distributing, referencing, and archiving of data. Rob Van Eijk, of Laser Magnetic Storage International (LMS), Colorado Springs, Colorado, (a joint venture of Philips and Control Data, and a pioneer in the CD ROM field) cites these example applications.

A typical microcomputer user calculates cost projections with an electronic spreadsheet. Financial results for the company are broken down line by line for the past 12 quarters. With a CD ROM system, internal financial information can be distributed to managers and analysts on an optical disk. It is protected fully against data being scrambled or altered, and it's easily accessed for analysis in a workstation environment.

While other storage media can store only text, CD ROM can record images and audio as well as text (and all intermixed). This unique capability makes CD ROMs ideal for training materials. For example, a software publisher provides users with the software disk, tutorial disk, and documentation. This entire package could be combined on one CD ROM disk. The tutorial and documentation could contain verbal instructions and images within the text to facilitate learning the software.

Artificial intelligence software with its huge memory requirements is another area to benefit from CD ROM drives. Distribution of diagnostic software, educational programs, and sophisticated application software are prime candidates for optical disk technology.

In the CAD/CAM/CAE fields, CD ROMs can be used as a "visual" catalog to expedite the graphic designing process. For example, a circuit designer could look up every conceivable component (already in graphic form) that makes up a circuit through such a catalog.

CD ROM is a more cost-effective means of storing records than paper, microfilm, or other storage mediums. Government, medical, legal, and financial industries are typical large database users that depend on systems with tremendous storage capabilities. They could benefit greatly from optical storage technology such as CD ROMs.

In one scenario, a hospital has turned to a CD ROM system to provide immediate information in its role as a poison control center. Before implementing the optical system, the hospital used microfiche, which required the operators to check cross-references manually. This time-consuming process sometimes took so long that workers at the poison hot line had to hang up and return the call when the research was done, greatly reducing the hot line's life-saving capabilities.

With the cost of replicating compact disks dropping dramatically, CD ROMs can be effective in applications where information needs only to be updated monthly. For instance, financial information services could use CD ROM disks to send data to their clients.

As a total reference library, a single compact disk can accommodate an entire encyclopedia set, text and graphics combined. And you can take it home with you. Dialog, Anaheim, California, the world's largest online information company, has produced a bibliographic database sponsored by the U.S. Department of Education, consisting of a Resources in Education file and a Current Index to Journals in Education file.

Until recently, there has been no feasible way to electronically intermingle information produced on text or data processing systems, handwritten documents and signatures, preprinted documents, graphs, and computer-generated data/graphics into a central archive. WORM technology makes this type of storage possible. Scanners digitally capture pages for recording on a WORM disk for later viewing and retrieval. A hardcopy of the documents can be produced by a laser or image printer.

The first applications of WORM probably will involve permanent record keeping for personnel departments, student records at schools and colleges, accounting trails, film images, legal, and government data files. WORM technology is perfect for these permanent record applications since it's nonerasable and has an expected data/media life of 10 to 15 years.

David Martin of LMS International says

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Laser Magnetic Storage
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Colorado Springs, CO 80907
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(615) 966-9200
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(303) 449-4157
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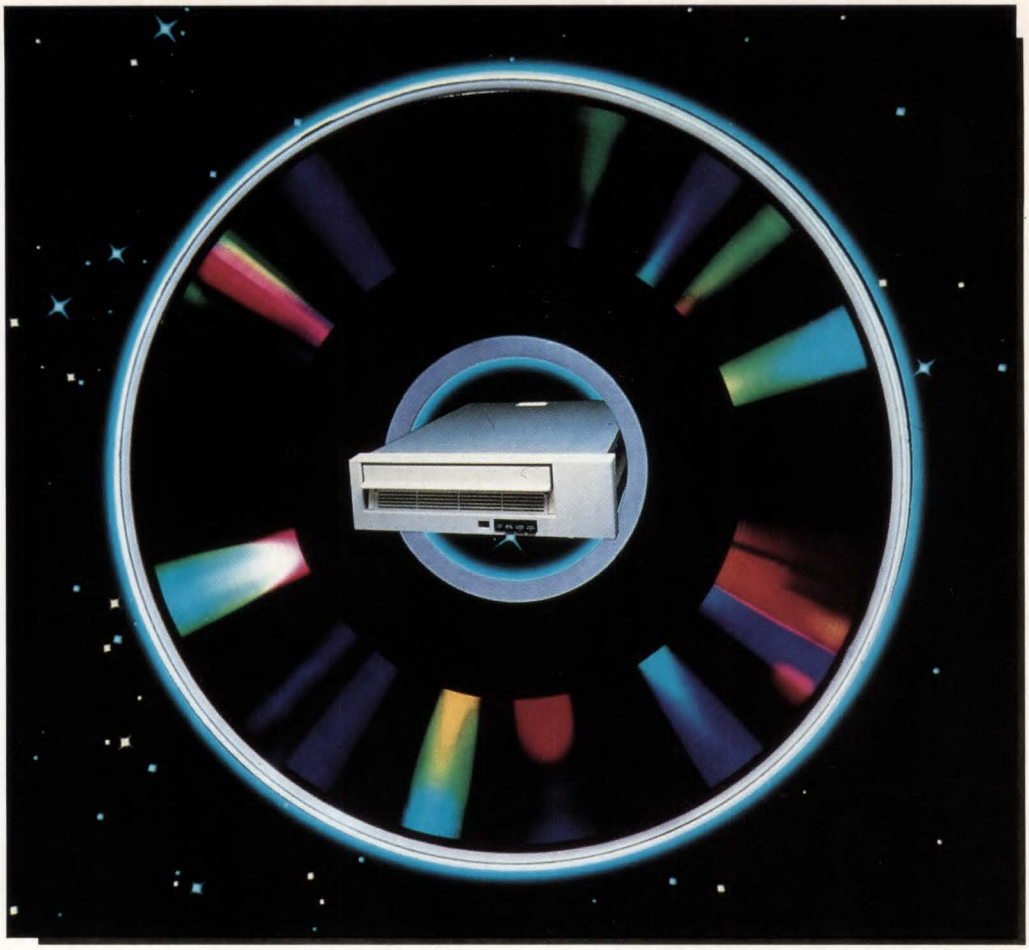

WORM optical technology will be used in banks for payment documents and customer documents; in insurance firms for policies, customer files, and reference documents; in medical facilities for patient records and diagnostic images; and in manufacturing facilities for engineering drawings and vendor/customer records.

Additional applications of WORM devices include publishing and research (for document storage and delivery) and in government for tax forms, social security records, land registry data, personnel files, libraries, patent files, and payment records. Legal, architectural firms, and public utilities can use WORM systems for reference documents, payment documents, engineering work, and case histories.

LMS International has worked with several manufacturers to implement WORM systems that eliminate the need to develop host-specific WORM device drivers. For example, they have used a MICROVAX as an intelligent controller between a DEC mainframe and a WORM device, and have coupled a WORM disk directly to a MICROVAX system.

A MICROVAX used as a controller must have the minimum configuration for the operating system, as well as an RS-232C interface, an SCSI card for the laser driver, mass storage for optical disk storage and retrieval and a laser file allocation table, and for mainframe-to-WORM links through the MICROVAX, a DECnet emulation adapter.

Optical Storage Market

Optotech, Inc., a Colorado Springs, Colorado, WORM disk vendor divides the optical storage market into the following major categories.

Imaging

In any application where digitized images must be intermixed with text, optical technology is

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TEXAS INSTRUMENTS

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*Please consult with your participating TI reseller for specific emulation characteristics.

especially attractive. For example, in the medical profession, electronic scanning systems, such as a computer-aided tomography (CAT) scanner, are used in diagnosis and treatment of patients. These images, together with X-rays, medical charts, and doctor handwritten notes and observations become part of a permanent patient record. With optical technology it all can be stored together. This record must be updated each time a patient is treated, but it's critical that the record not be altered, and reliable retrieval of the information be possible over the long term. WORM disks meet all of these requirements.

As a backup device, WORM disks have many advantages over current magnetic tape drives. Due to the write-once nature of the media, accurate audit trails are ensured. WORM disks permit direct file access and the disk can be carried to different sites to back up data from many users on numerous computers (remember, it's small and portable with great storage capacity). Instead of copying entire files at each site, as would be required with magnetic tape, a file comparison allows the user to copy only the changed information since the last backup.

On-Line Mass Storage

With their ultra large storage capacity, WORM disks make it possible to store all programs on-line and still have plenty of room for user data. An optical file server has ample storage space for large databases, CAD libraries and documents, central files, and user data.

Databases

Unlike CD ROM disks, WORM disks permit the user to create custom databases and update them as information changes. For example, a large insurance company may use a WORM drive at a central office to record and update policy holder files and periodically transfer this information to its branches. With a disk cartridge, databases are distributed easily to remote branches by mail. Primary requirements in this type of operation include high capacity, security, and portability. CD ROMs do not meet these needs because updatability with an audit trail is essential.

Combining Markets

One Optotech OEM, Lasodyne Corporation, Tustin, California, produces a turnkey system that targets the document imaging, on-line mass storage, and distributed database markets. Using a WORM drive, laser scanner, laser printer, and their own proprietary software on a standalone system, they've developed the first multiuser microcomputer-based system capable of combining data and image processing at one workstation. The ability to operate in a true multiuser environment without the need for an Local Area Network (LAN) is a significant breakthrough, resulting in a large cost reduction when purchasing these types of systems.

Lasodyne's indexed data and imaging system has a capacity of up to 300 million record files (it uses a 5.25-inch optical disk). Any file can be accessed in two seconds or less. Combined image and data manipulation provides for efficient parts identification and ordering.

One example of Lasodyne's optical system's use would be as an on-line parts catalog. Each page of all parts catalogs handled by a distributor could be input via the laser scanner into the system. The WORM disk stores the data that can be updated as new parts and new catalogs become available. The sophisticated software allows the data to be "looked up" (retrieved) by a number of methods including part number, item description, or graphic images. And the disk can be copied and distributed to all distributor dealers.

Finally, an alternative to magnetic media has arrived for those who want to take advantage of this new and promising technology. In each of the applications described, optical (CD ROM or WORM) storage is the preferred solution because of its high capacity, reliability, security, stability, and low cost per stored byte — all critical factors in any mass storage environment.

Huge rooms filled with filing cabinets and racks of backup tapes and disks along with the annoying precautions that must be taken with all magnetic storage are part of the past. The invention of optical mass storage has proved very timely. The world is ready for it now.

Ron Levine is a free-lance writer and consultant based in Anaheim, California.

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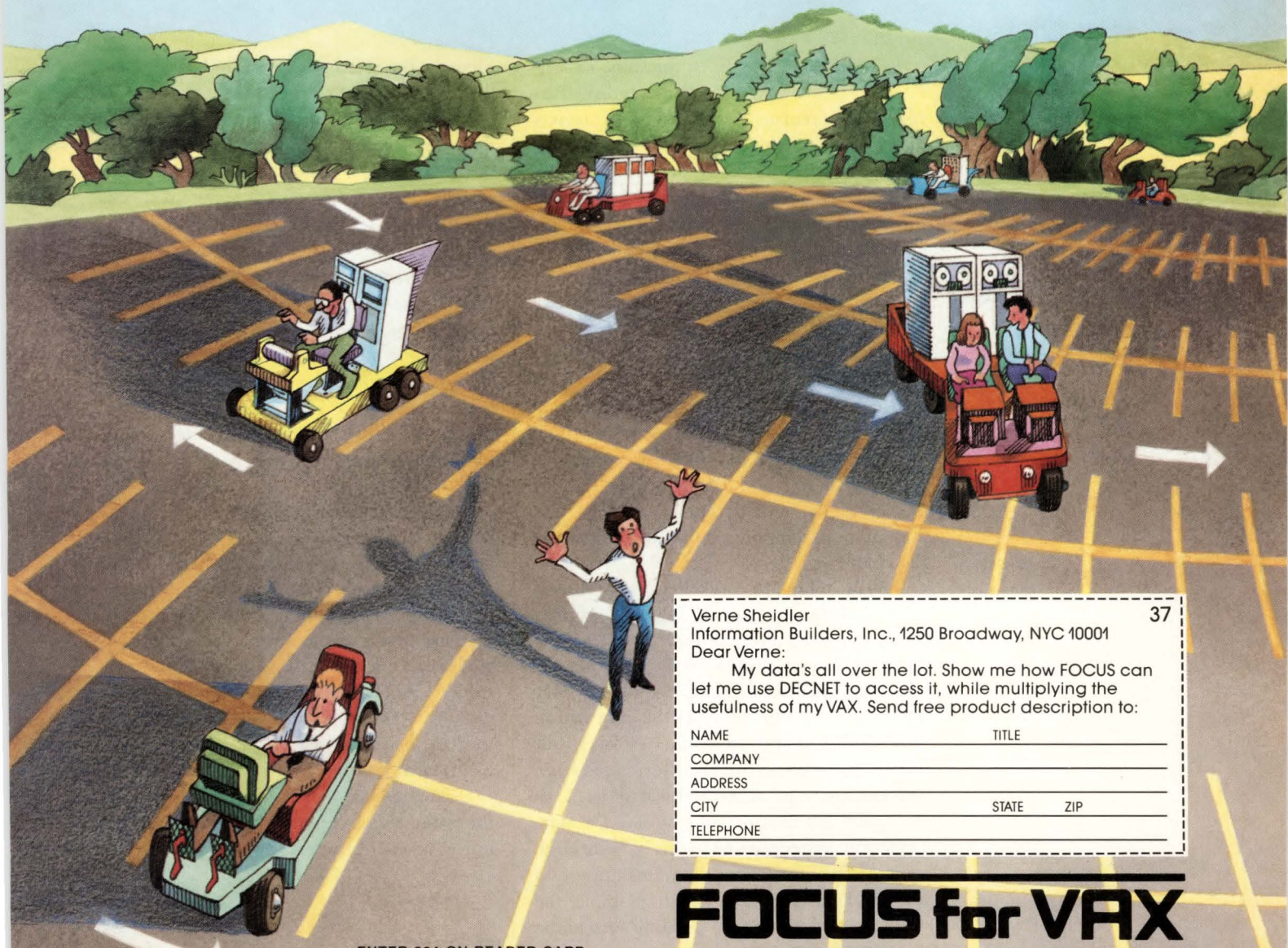

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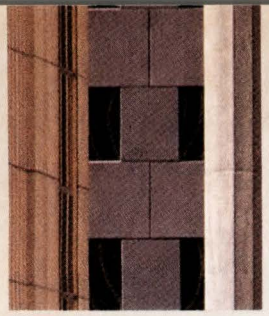


MASS STORAGE

MAGNETIC DISK TECHNOLOGY

By Charles Connell

A Back-To-Basics Look At The Development Of Disk Storage Systems.

Even for some experienced users, disk storage systems remain "black boxes" — devices that allow for inputs and outputs in some vague way that we really don't understand. Most of us know that some disk drives hold more data than others, that the disk spins around, that our information somehow is stored in magnetic particles on the disk surface, and that disk storage seems to work pretty well (most of the time). How all this occurs, however, can be something of a mystery.

There are five major components in a magnetic disk storage system: an application program that stores or retrieves information, the operating system, the disk controller, the disk drive, and the disk itself. Disk I/O proceeds as a chain of events, with each of these components forming one step in the chain.

Disk storage begins when a user directs an application program, such as a word processor, to store information; for example, a memo. The user supplies a filename that he wants attached to the information for later retrieval. The program breaks the information into smaller units, often lines of text, but usually it can go no further. Most application programs have no access to the disk itself, so they must ask the operating system for help. Operating systems provide this help through a set of subroutines that programs can use to store and retrieve files. In our example, the word processor tells the operating system the filename the user has chosen, and passes each line of the memo to the system.

Operating systems accept storage requests from application programs and perform a lot of processing on them. If there is a security system in place, the operating system checks to see if the user is allowed to store information. If the disk is becoming full, the operating system verifies that there is room for the new file. The system then repackages the data into larger units, called disk blocks, with which it and the operating system work.

At this point, the operating system also reaches the end of its power. It doesn't have direct access to the disk, either, so it must pass the request to the next layer, the disk controller.

Controllers accept blocks of data and the requests to store them, from the operating system. They usually reside in the computer cabinet itself, even if the disk drive is separate. (The cables seen running from computers to external drives are really between the controller and the disk drive.) Central to the controller's function is communication with the disk drive. Controllers take the storage request from the operating system, and direct the drive to perform the operations to carry it out.

The disk drive makes up the next step in the chain. Its job is to hold a disk; an arm that moves in and out across the disk; and a device

One of the major factors in a disk's overall performance isn't its raw read/write speed, but rather how intelligently it handles simultaneous requests from multiple users.

mounted on the end of the arm to read and write data, the read/write head. The drive rotates the disk and moves the arm in and out, so the head can read or write any part of the disk surface. The drive's function is to accept and execute commands from the controller to the arm and read/write head.

The final step is the disk. In many ways, it's the simplest part of the technology. A magnetic disk is a piece of plastic or aluminum coated with metallic particles. When a magnetic charge (from the head) is passed over the disk surface, the particles beneath it line up and stay in that arrangement after the head moves on. By turning the charge on and off as the head moves, some areas of the disk are magnetized while other areas are not. Later, by passing a coil of wire (also on the head) over the disk, the drive can detect what areas of the disk surface had been magnetized earlier. This scheme is used to record a sequence of bits, storing any data the user wants. A magnetized area represents a *1*, a nonmagnetized area is a *0*. In our example, the disk stores the ASCII codes for the characters in the memo.

Reading from a disk is the mirror image of this process. The application program passes "read" requests to the operating system, which repackages them into requests for disk blocks, which then are received and executed by the controller and disk drive. The data that's read is passed back up the same chain.

Seek Optimization

Governing virtually everything the drive does, from head movement to reading and writing, the controller is the most fascinating part of the disk I/O process. Controllers communicate with the operating system, receiving commands to store and retrieve blocks of data. In carrying out these operations, controllers have a lot to say about how quickly disk operations occur.

One of the major factors in a disk's overall performance isn't its raw read/write speed, but rather how intelligently it handles simultaneous requests from multiple users. Consider this example: The read/write head is near the inside of the disk. The controller receives a request to read a block of data located near the outer edge. Just after this, another read request reaches the controller, this one for a block close to the head. What should the controller do? If it services the requests in the order they arrive, it would move the head to the outside edge of the disk, read that block, then move back to where it was, requiring of two relatively long movements. However, if it looks over all the requests, the controller will see that it's better to take care of the near request first, then the farther one.

The method a controller uses to handle multiple requests is known as its "seek algorithm." Designing a good seek algorithm isn't easy. Taking a twist on the above example, suppose that the controller satisfies the nearer request first, then receives another nearby request. Should it again pass up the first user, or decide that he's been waiting long enough?

Two popular seek algorithms are "elevator" and "nearest with fairness count." An elevator algorithm moves the head from the inside of the disk to the outside, then back again. Requests from the operating system are serviced if they are in the direction that the head is already moving. This eliminates many changes of head direction, which take time. No user is ever left waiting for too long, since the

head is guaranteed to get back to every area.

The nearest with fairness algorithm looks over all requests received and always takes care of the one closest to the head. Whenever an old request is passed over, however, its fairness count is decremented, starting from a value defined by the system manager. When any fairness count reaches zero, that request is handled immediately.

Caching

So far, we've assumed that the drive must read one block of data each time the controller receives a request for one block. In fact, this isn't true.

When reading data, people very often read it from beginning to end. When a company prints mailing labels, it usually prints them all, from A to Z. At the operating system level, this means that when an operating system requests a certain disk block, there is a high probability that it soon will request the next block in the file.

Modern controllers recognize that operating systems are likely to ask for sequential blocks of data and anticipate this by performing "read-ahead" and "caching." Read-ahead occurs when a controller receives a request for a block of data and reads that block, but also goes ahead and reads the next few blocks from the disk as well. The controller sends the requested block back to the operating system and saves the others in a private memory, the cache. This allows the controller to respond to requests for the next few blocks very quickly — it doesn't have to read the disk at all. Reading from cache often is 10 times faster than reading from disk.

The percentage of requests that the controller can satisfy from cache is known as the "hit rate." An application that asks for sequential blocks of data, with an intelligent disk controller, can have a hit rate of 90 percent or more. Caching also can be used during write operations to hold several blocks of data in the controller for a while, before writing them all at once. Both read and write caching are other examples of the fact that the read/write speed of a disk drive may not be the most significant factor in overall disk I/O

Magnetic Storage: The End of An Era

Magnetic data storage first appeared in 1951, in the form of magnetic tape used as a storage medium for UNIVAC I. Magnetic tape monopolized the field for approximately the next 10 years until the appearance of removable disk packs, drums, and fixed (Winchester) disks, in the early to mid 1960s. The lubricated surface of the Winchester disk allowed the lightweight head to rest on the disk during start and stop procedures, therefore greatly reducing the then common head crash problems. The fixed nature of the disk also permitted closer tolerances, hence increased storage capacity, and consistent performance.

The popularity of these systems grew throughout the 1960s and 70s as business and scientific users required more rapid data retrieval than magnetic tape could offer. During the late 1970s, the technology was exploited further, toward fixed disks with capacities up to 600 MB per drive.

Floppy disks began to appear in the 1970s and primarily offered a low-cost alternative for personal and small business computer users.

The optical disk was introduced by the early 1980s, developed from videodisk technology. The most sophisticated optical disks can store up to 4 billion bytes, significantly more than the highest capacity magnetic units. By the late 1980s, expect to see erasable optical disks to permit the recording of new information over previously stored data. When that happens, the eulogies for magnetic disk storage finally may be written.

—Bruce Feldman

performance — how smart the controller is may have more effect.

Disk Shadowing

While we've seen that an intelligent controller can improve the overall performance of a disk drive, there's another important factor — data security. When banks pay interest on their savings accounts, they may run the program at night when other processing is light. Whether the program takes one or four hours to finish is of little concern. What really matters is whether the savings account records are still there in the morning.

One way to decrease the likelihood of data being lost is to keep it in more than one place. Any disk drive is subject to failure, but by storing data on two drives, or three, it is very unlikely that the data will be lost. This duplication is called "disk shadowing."

Disk shadowing does just what its name implies. It sets up a group of disks, the shadow set, which performs the same storage operations simultaneously. Whenever anything is written to one, it is written to all, providing significant data security. Barring a catastrophe in the computer room, it's nearly impossible for data to be lost.

The cost of shadowing is in the extra disk drives. An unexpected benefit in shadowing, however, is that read operations occur more quickly. Shadowing is handled primarily by the controller that has the shadow set plugged into it (most controllers can control more than one drive). When a read request comes in, the controller looks for the drive in the shadow set that has its head closest to the data. Reading from that drive improves the speed of the read operation.

Interface Standards

Another aspect of magnetic disk technology is interface standards. There are hardware connections both inside the computer where the controller plugs into the computer's input/output circuitry (I/O bus), and on the other side of the controller where the cables from the disk drive(s) plug in. Each of these interfaces varies by manufacturer and can be complicated by the fact that there may be more than one vendor involved in a given computer system. In addition, there is a lack of standards for these interfaces, creating further confusion for someone trying to put together a working system.

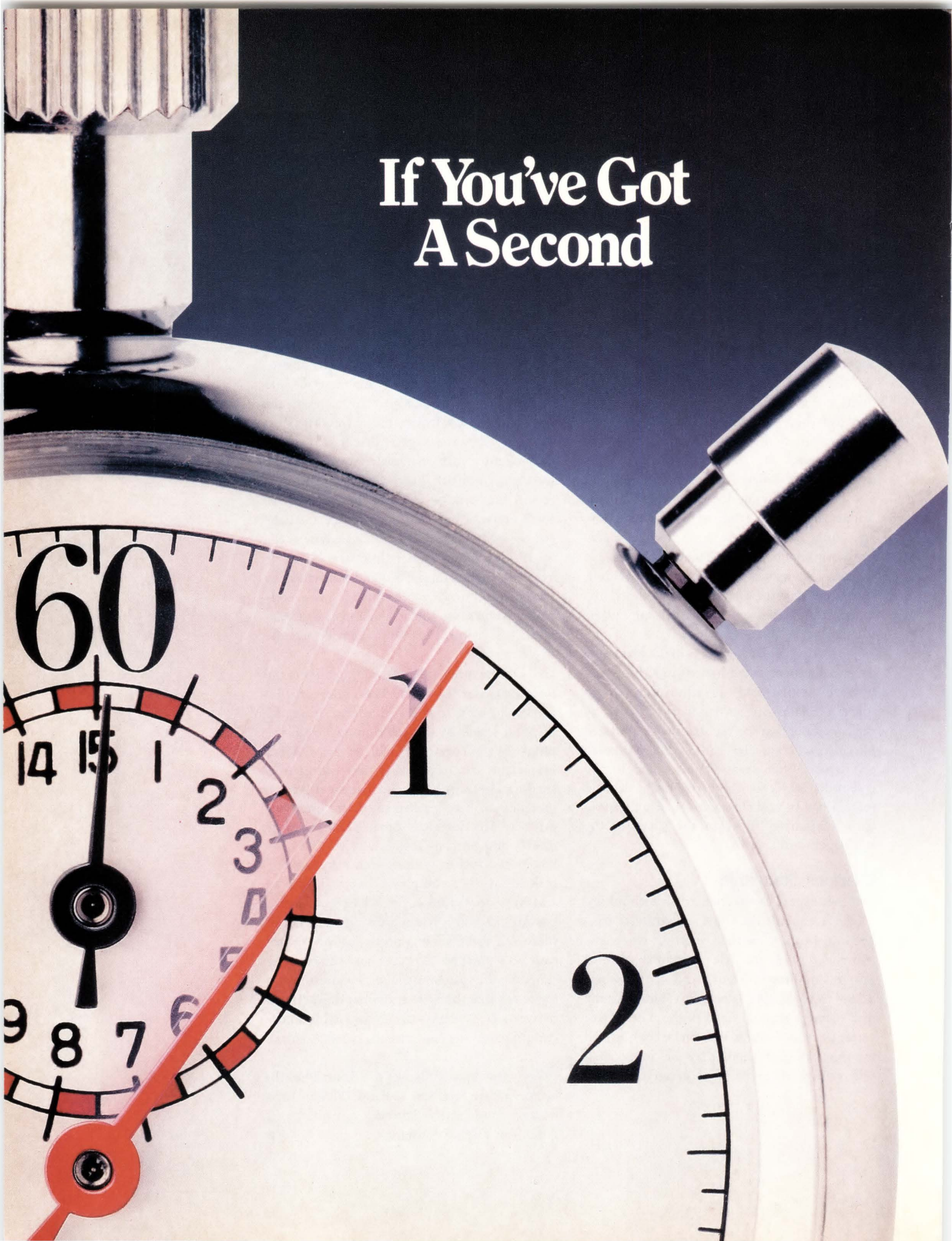
Looking from the inside out, the first interface involves the computer's I/O bus and the controller. The controller physically must match the board size and plug shapes that the bus demands. Beyond that, the controller must know how to communicate on the I/O bus and understand the format of the computer's I/O requests. For example, the MICROVAX II is supplied with a Q-bus that uses the Mass Storage Control Protocol (MSCP) language.

The trend is to divide this interface into two stages: a "host adapter" attaches to the bus, and the controller plugs into the host adapter. The advantage is that it allows one controller to work on many computers simply by using different host adapters. The goal is still the same — to connect a disk drive to the bus — but two devices intermediate. An emerging standard for this scheme is the Small Computer System Interface (SCSI). A host adapter sits on the bus and translates bus commands into SCSI commands. The controller connects to the host adapter and translates SCSI commands into instructions the drive can use.

On the other side of the controller is the interface to the disk drive. Again, there are two important parts to this connection: First, the physical shape of the cable must match the plugs on the controller and the drive. More important, the orders that the controller is sending out must be in a format the drive can understand. Two examples of this interface protocol are Enhanced Small Disk Interface (ESDI), and Seagate Technology's ST506.

In conclusion, we have seen that magnetic disk storage is a complex process. Both read and write operations occur as a series of layers, passing through various subsystems. Each of these subsystems has a great deal of control over how quickly I/O occurs, and some can be tuned by the system manager. In addition, we have seen that there are a number of interfaces between the I/O subsystems that enable all the equipment in the computer to work together.

Editor's note: Special thanks to Clifford Smith, senior system engineer at Fairchild Semiconductor, and Alan Kivnik, president of American Digital Systems. ■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SOFTWARE

SQUEEZPAK

An In-Place Disk Compression Utility Your RSX System Shouldn't Be Without.

By James McGlinchey

Recovering fragments of unused disk space long has been a problem with the RSX family of operating systems. While RSX systems can continue to function with a badly fragmented disk, an RSX system will run slower and slower as the overheads increase. File system fragmentation is an insidious gobbler of system resources. The more fragmented a file, the more often F11ACP is required to consult the disk's index file and find the fragments, resulting in higher overheads.

These overheads are invisible to the user, until the Task Builder is unable to find enough contiguous space to build a task image, and reports that it has built a task in a non-contiguous task image file.

Now, you're faced with a decision either to do a full backup and restore, or remove files from the disk so that the Task Builder can build a contiguous task image.

Some operating systems have tools for compressing a disk in place; for example, RT-11 has a "/SZ" switch on its PIP utility that enables the user to compress a disk. RSX, however, doesn't lend itself very well to an in-place disk compressor. The RSX file system is complicated, and RSX has multiple users. Also, an RSX System may have many open files, and may be an unattended system. In spite of user requests, DEC has not shown an interest in building such a facility for RSX.

At one time, disk compression in RSX was simply a byproduct of a normal backup procedure. But, in these days of big disks it takes too long to do a full backup and restore; the disk must be off-line while a backup is being done, making it inaccessible to users. Incremental backups are the rule on large disk systems, and incremental backups do nothing to alleviate fragmentation.

The vulnerability of a file system also increases with its degree of fragmentation. Beyond a certain size and/or degree of fragmentation, RSX creates multiheader files, which have been problematic in the history of RSX, and even today, BRU has some problems making a copy of a multiheader file. A corrupted multiheader file rarely is recoverable.

DEMAC Software Limited, Ottawa, Canada, has an answer to this problem. *SQUEEZPAK* is an in-place disk compression utility that compresses files on a live, mounted disk so that all of the unused free fragments are merged into a few large fragments. *SQUEEZPAK* performs this operation without the need for a scratch disk; the compression is truly in-place.

DEMAC seems to have accounted for all the intricacies of an RSX file system. *SQUEEZPAK* honors the placement of the disk's Index File, [0,0]INDEXF.SYS, leaving it wherever you had placed it. Because it correctly preserves the File ID numbers in the bootable system image, SQZPAK can be used on a bootable disk. It safely compresses RMS files, and makes no attempt to compress an open file. This bit of wizardry was done by adding a second ACP to the system while *SQUEEZPAK* is running; this ACP acts as a

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Installation of *SQUEEZPAK* is fairly simple, and should present no problems to anyone with some experience in building RSX tasks.

preprocessor to F11ACP, enabling *SQEEZPAK* to determine that a file currently is open before considering it for compression. An additional safety feature is built into the careful sequencing of the file copying process, so that files can't be lost if the system were to halt during a *SQUEEZPAK* execution.

Installation of *SQUEEZPAK* is fairly simple, and should present no problems to anyone with some experience in building RSX tasks. Included with the package is a disk fragmentation statistics program which displays the number and size of the free areas of the disk. This utility can be used to decide when to run *SQUEEZPAK*, and to monitor the results.

The *SQUEEZPAK* Utility runs in interactive mode, or can be run with all options defined in the command line. You're advised to experiment a bit with the *SQUEEZPAK* options, as the use of its various options will depend on the condition of your file system. *SQUEEZPAK* can be run in a multipass mode, with the results optionally being displayed after each pass, or it can be set to run until a predetermined number of contiguous blocks have been agglomerated. Diminishing returns can be expected in choosing the number of passes that the optimizer performs. The first pass will yield the most improvement, and you must trade the number of passes for the degree of contiguity of the free space on the disk. The default is three optimization passes, usually sufficient.

SQUEEZPAK deals only with the disk's directory structure and does not affect the internal contents of a file.

It doesn't, for example, compress the contents of an RMS file to recover split buckets. Heavy RMS users should compress their record structure using RMSCNV, RMSDES, and RMSIFL before running *SQUEEZPAK*.

Although performance timings will vary with individual cases, the *SQUEEZPAK* utility compressed a 75 percent full, medium-fragmented RD52 in about 15 minutes, compressing the disk into one very large and two very small fragments. Another pass or two would have resulted in a single fragment. Fewer passes would have resulted in a shorter run time.

Users running *SQUEEZPAK* for the first time are advised by the manufacturer to do a full BRU backup and restore before using SQZ. One user reports that, not having followed this recommendation, it took *SQUEEZPAK* over two days to do the first compress of his RA81! *SQUEEZPAK* basically should be run periodically as preventive maintenance. Note that it intentionally is not a replacement for doing backups. A good backup procedure, regularly performed, is always a required practice.

The *SQUEEZPAK* manual is well written. While aimed at a technically adept reader, it doesn't require an in-depth understanding of RSX internals. The manual is complete, showing good examples of both installation and operation.

The *SQUEEZPAK* package comes with 120-day support; additional support available on a per year basis. Sampled users report the vendor's support has been good, and includes telephone support, tracking new releases of RSX, and repair of reported problems.

Who needs *SQUEEZPAK*? Every RSX system, particularly those with small Winchester disks, should have this utility available.

Jim McGlinchey is an independent software engineering consultant based in Essex Junction, Vermont.

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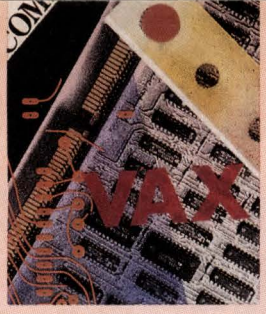

VAX

A DRIFT IN VMS?

By Ravi Bhavnani

This Auto Directory Displayer Keeps VMS Users On Track.

Like most VAX/VMS users, I have subdirectories in my account nested to about three or four levels, and am constantly on the move between them. For quite a while I relied on just a few commands to get me around, for example:

```
SD :== SET DEFAULT
WHERE :== SHOW DEFAULT
UP :== SET DEFAULT [-]
```

and a few specific moves like:

```
MAIN :== SET DEFAULT [RAVI]
FOO :== SET DEFAULT [RAVI.FOO]
```

I found myself executing a WHERE every now and then (especially when I found I didn't see a file I knew I owned) to confirm my current directory. The SET PROMPT command with VMS 4.0 convinced me that I needed an auto directory displayer.

Command Procedure Description

SET_DEF.COM accomplishes its task in three steps: First, the default directory is obtained as a lowercase string; next, all but the lowest level directory is stripped from this string; and finally, the system prompt is modified via the SET PROMPT command.

The full default directory spec is stored in the string "dir". The spec is obtained by using the F$ENVIRONMENT lexical function and is converted to lowercase using the powerful F$EDIT function. The lines between the labels "loop" and "continue" extract successive directory levels and store the most recently extracted directory name in the symbol "dir", and the previous higher level name in "pre_dir". This is done by determining the position of the subdirectory delimiter (a period) using the F$LOCATE function. The lexical function F$EXTRACT performs the actual extraction.

The prompt that will be set is stored in the symbol "prompt". By default, only the lowest level directory name is displayed. If you want to see the parent directory name, simply un-comment the command right after the label "continue". If you are at or just below the root directory, "prompt" will include an unsightly device specification. The lines just before the label "set_prompt" strip this device spec and append the string "$>$" to the final prompt.

The command procedure needs a destination directory as a parameter. Failure to supply this parameter results in control being transferred to the label "bad_usage" which prints a brief error message.

Set-Up And Use

Setting up the utility is easy. Just add the definition:

```
SD :== @ SET_DEF
```

to your LOGIN.COM file. You now should use "SD" instead of the usual SET DEFAULT

PROGRAM 1.

```
$ !   Utility:      SET_DEF.COM
$ !   Author:       Ravi Bhavnani
$ !   Date Created: 2-JUN-1985
$ !   Function:     Sets the DCL prompt to your default directory
$ !
$     on error then exit
$     pre_dir = ""
$     if (p1 .eqs. "") then goto bad_usage
$     set default 'p1'
$     dir = f$environment ("DEFAULT")
$     dir = f$edit (dir, "LOWERCASE")
$ loop:
$     dot = f$locate (".", dir)
$     if (dot .eq. f$length(dir)) then goto continue
$     pre_dir = f$extract (0, dot, dir)
$     dir = dir - pre_dir
$     dir = dir - "."
$     goto loop
$ continue:
$ !
$ !   Uncomment DCL line for parent-dir display
$ !
$ !   dir = pre_dir + "." + dir
$ !
$     prompt = dir - "]" + "> "
$     disk_spec_pos = f$locate ("[", prompt)
$     if disk_spec_pos .eq. f$length(prompt)) then goto set_prompt
$     disk_spec = f$extract (0, disk_spec_pos+1, prompt)
$     prompt = prompt - disk_spec
$ set_prompt:
$     set prompt="''prompt'"
$     exit
$ bad_usage:
$     write sys$output "Directory required"
$     exit
```

FIGURE 1.

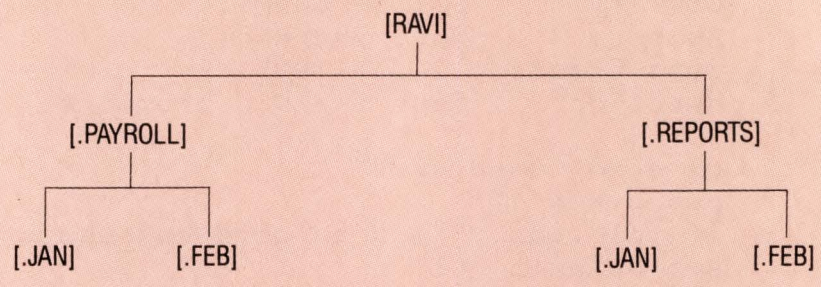

FIGURE 2.

```
Username: RAVI
Password:
            Welcome to VAX/VMS version V 4.2 on node XYZZY

ravi> up
000000> up
Invalid directory specification
000000> adv
ravi.adv> sd [.sources]
adv.sources> sd [—.doc]
ravi.doc> main
ravi> sd
Directory required
ravi>
```

command. Existing quickie-move abbreviations like:

```
$ FOO :== SET DEFAULT [.FOO]
```

should be changed to:

```
FOO :== @ SET_DEF [RAVI.FOO]
```

Note that the full directory spec [RAVI.FOO] is a lot better than the relative form [.FOO] as it lets you travel to FOO from any other directory, not just the directory [RAVI]. Of course, if you have a directory structure like that shown in Figure 1, you might want to stick to the relative version, which would allow you to use the same command to go to [.JAN] from both [.PAYROLL] and [.REPORTS]. Figure 2 shows a sample terminal session using SET_DEF.COM. Note, I have added the line:

```
$ SET PROMPT=:"RAVI> "
```

to my LOGIN.COM to bootstrap an initial prompt on login.

Ravi Bhavnani is a software engineer for the New York Institute of Technology in New York City, New York.

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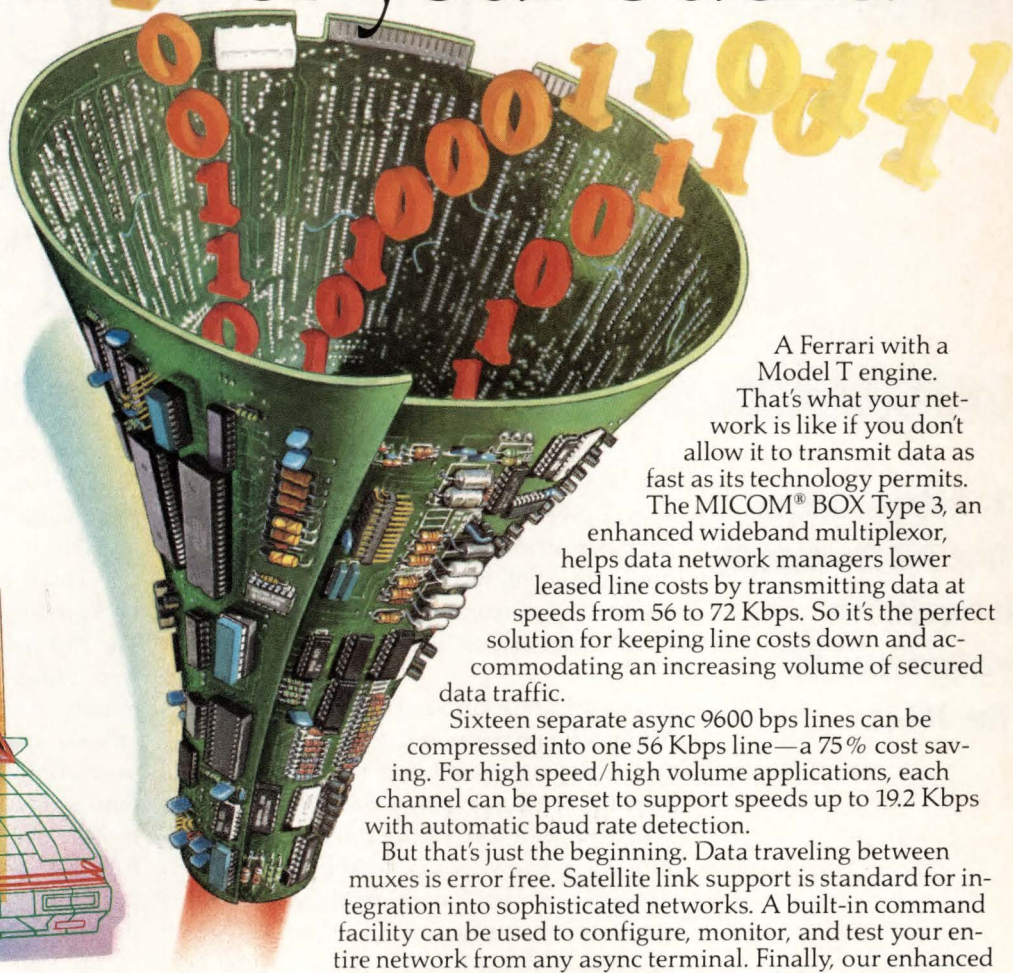

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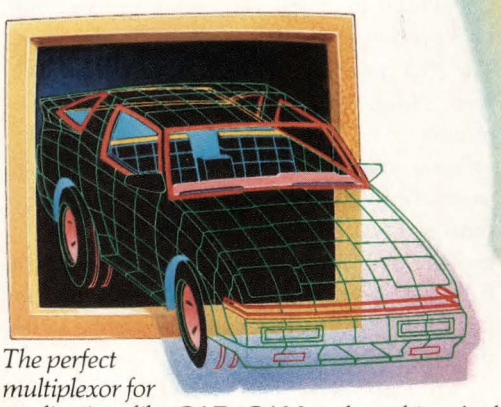

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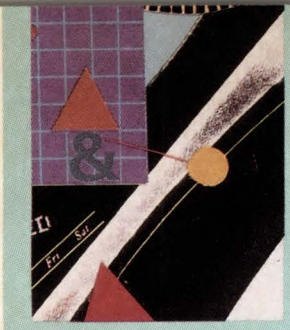

RSTS

PUT YOUR DH-11 IN THE FAST LANE

By John Wolnisty

A 'Hidden' Option That Will Dramatically Increase The Performance Of The DH-11.

The DH-11 is a more efficient terminal interface than the DZ-11 because of its DMA capability, which requires less operating system overheads versus the interrupt-every-character mode of the DZ-11. A "hidden" option that will increase the performance of the DH-11 dramatically has been available for RSTS/E since at least the V6 days.

FIRST A BIT of background. The installation at Morgan Equipment consists of an 11/70 with four Able DH/DMs and three DZ-11s, primarily used for running a nationwide on-line parts system under RSTS/E V8. We also have an 11/44 running RSTS/E V9 with one Able DH/DM for development and other applications. All applications software is in BASIC-PLUS-2, using an in-house macro version of a third-party multikey ISAM system. Performance of the 11/70 is a major issue, and every effort is spent to keep it at maximum efficiency. After running some statistics, to be satisfied that the disks were in good order, that file processor buffering (FIP) time was low enough, and there was lots of caching, etc., it was time to pursue other performance issues.

Given the number of terminals on our system (88 ports, 31 of which are printers) and the high characters-per-second rate, some tests were run to measure just what the impact of terminal output is on the system. The test consisted of a BASIC-PLUS-2 (V2.3) program writing a 454-byte buffer via a PUT statement. The bare minimum of BASIC statements was used since the object of the exercise was to measure the impact of the terminal output. These were run on terminals running at 9600 baud, on the 11/70. The impact was measured by running STATUS, and the results are shown in Table 1.

The *0* load test represents the sleeping background jobs plus the STATUS program. The 25.3 cps are for the STATUS program. Stats were sampled every 30 seconds, over three minutes. The first and last were not used, the others averaged. These results were shocking, to say the least. And this was on only four terminals! The user's terminals normally are set to 2400 baud, so this test is slightly different from actual operations. If this represents the "efficient" DH interface, I wouldn't like to see the DZ performance!

A little investigation revealed that the RSTS/E terminal handler will transmit out the DH in bursts of only 30 characters. But an undocumented option has been available since V6C right up through V9, that enables the DH to transmit in bursts of up to 8128 characters. This option uses XBUF to buffer characters rather than the small buffers. The 11/70 has plenty of memory and XBUF, so this wouldn't be a problem. SYSGEN was rerun, this time CONFIG.MAC was edited, and one line consisting of:

```
APT = 1      ;Enable HSDH
```

was added after the DH controller count definition. SYSGEN was allowed to continue.

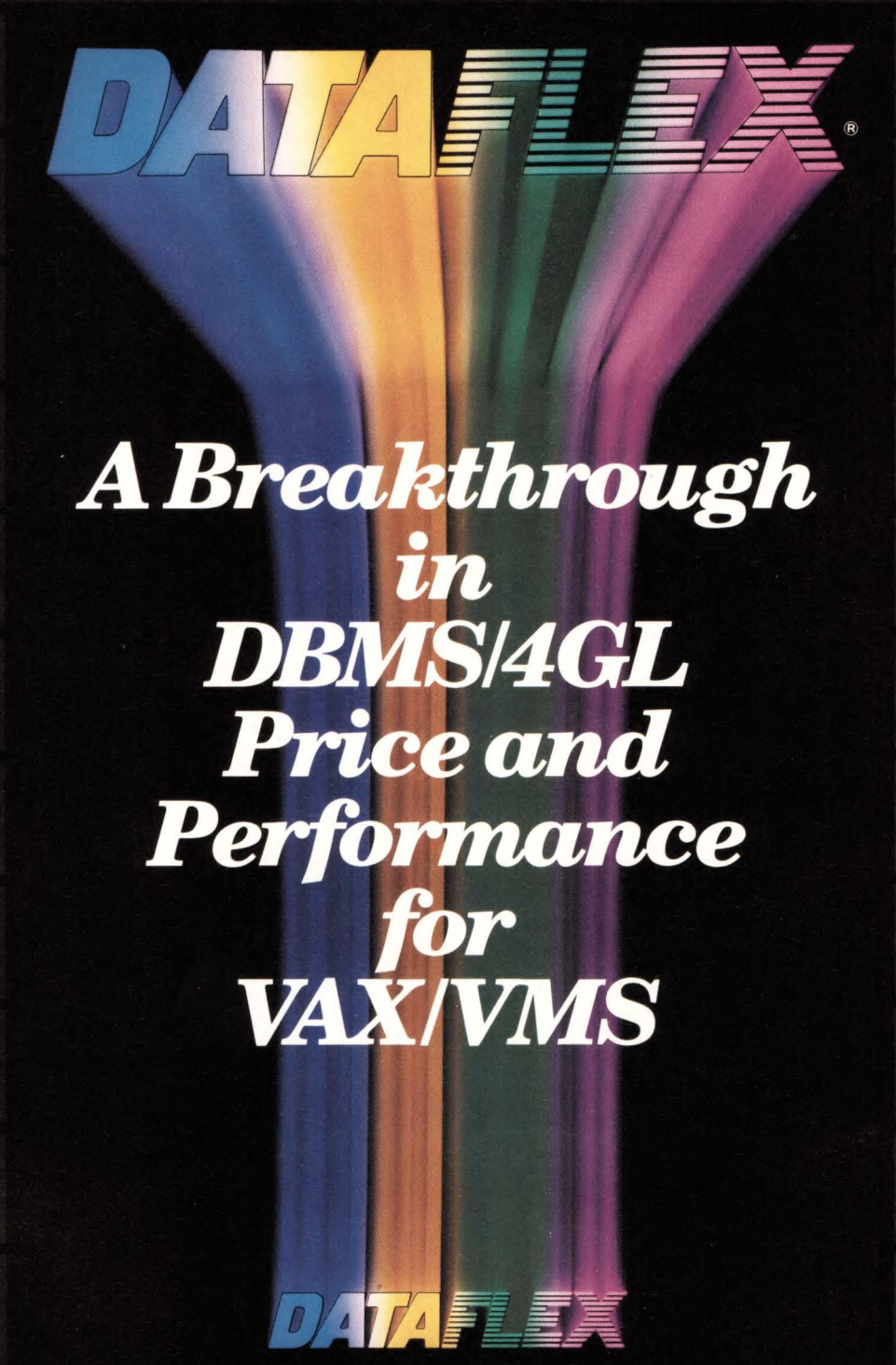

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TABLE 1.

Test Load	%CPU Idle	%CPU User	%SYS Chg.	%SYS Unchg	%CPU I/O	C.P.S. Output
0 term	97	1	1	1	1	25.3
1x9600	80	1	13	6	14	1004
2x9600	65	1	24	9	24	1955
3x9600	50	2	38	10	33	2955
4x9600	34	2	54	11	47	3839

TABLE 2.

Test Load	%CPU Idle	%CPU User	%SYS Chg.	%SYS Unchg	%CPU I/O	C.P.S Output
1x9600	95	1	2	2	2	25.3
2x9600	94	1	2	2	2	25.3
3x9600	93	2	3	3	3	25.3
4x9600	92	2	3	3	3	25.3

TABLE 3.

String Length	HSDH CPU time(10ths)	Normal CPU time
10	4.2	4.3
16	4.3	5.6
22	4.6	7.0
32	4.7	9.2
42	5.1	11.5
52	5.2	13.7
62	5.3	15.8
72	5.2	18.2
100	5.4	24.7
220	6.0	59.7

The new monitor was 1K larger.

This option is of the "no free lunch" category, but it does come close! The use of the High Speed DH module requires your user program to enable it. This means your program must find out if it is running on a DH interface via the UU.TRM system directive. If it is on a DH interface, it must enable the High Speed option by printing a null character, using RECORD 16384% + 1% (177 in the high byte of XRMOD is required for all HSDH commands, this is the same as 16384% + command in BASIC). In BASIC this is:

```
OPEN "KB:" AS FILE #12%
FIELD #12%, 1% AS Z$
LSET Z$ = CHR$(0%)
PUT #12%, RECORD 16384% + 1%
```

All subsequent PUTS to the terminal need RECORD 16384% + option. If option is equal to zero, control returns to your program, whether the I/O has completed or not. The next PUT will wait until the previous one has completed before writing. If option is 8%, control won't return until the I/O completes. If the program uses the asynchronous I/O option (returning without waiting for completion), you can test for completion by PUTing a null with RECORD 16384% + 4%. An error "Device in use" indicates I/O has not completed. A null PUT with RECORD 16384% + 2% will disable subsequent High Speed DH I/O, and return to the normal RSTS/E DH driver.

HOW DID THE PERFORMANCE of this option rate? Using the same test program as before, the results in Table 2 were obtained. With the large DMA transfers enabled, the DH-11 becomes more efficient by a large factor. Since a separate driver is used, no characters-per-second output is registered.

This module works by buffering text strings into XBUF. It stands to reason that this mode works better for longer strings. A test program using different lengths of strings, and comparing HSDH output to normal DH output

VERSION 9 PATCH

I ran into a surprise when bringing this up under Version 9.1. DEC has changed how some of the terminal driver is mapped, and this change in mapping causes a couple of assembly errors when building a monitor with HSDH enabled. The fix, however, is simple. First, edit SYSGEN$:TTDVR.MAC with your favorite editor, then locate the following piece of code:

```
HSBUFO::
  CMPB #TTDH11,TTINTF(R1) ;;IS THIS A DH-11 LINE?
  BNE HSRET ;;NO, RETURN TO THE CALLING ROUTINE
  BIT #DHHS,DHSTAT(R1) ;;IS DMA ENABLED FOR THIS LINE?
  BEQ HSRET ;;NO, RETURN TO THE CALLING ROUTINE
```

Now change the two occurrences of HSRET to HSRET0, so the code now looks like:

```
HSBUFO::
  CMPB #TTDH11,TTINTF(R1) ;;IS THIS A DH-11 LINE?
  BNE HSRET0 ;;NO, RETURN TO THE CALLING ROUTINE
  BIT #DHHS,DHSTAT(R1) ;;IS DMA ENABLED FOR THIS LINE?
  BEQ HSRET0 ;;NO, RETURN TO THE CALLING ROUTINE
```

After the following statement:

```
JMP TTIJSB ;;EXIT AND WAKE UP THE JOB
```

insert:

```
HSRET0: RETURN ; JW 19/12/85
```

This will allow the feature to work correctly under Version 9.1. This patch is not needed with Version 9, or earlier.

was run. The results are shown in Table 3.

At shorter lengths, the differences between the two are less, if at all. As string length increases, the normal DH-11 driver time also increases. The HSDH time smooths out, and the differences between the two increase.

HOW HAVE WE USED this feature in real programs? First, four subroutines were written in MACRO, TTOPEN, TTPUT, TTFLAG, and TTCLOS, which open, write to, test completion, and close the terminal respectively. The open routine tests whether the interface is a DH. If not, the terminal is left open, and I/O continues as usual. So, the same running program runs on DH and non-DH lines alike, and also runs on systems with and without HSDH enabled without causing an error. The terminal is opened on channel 13, which previously was unused by our applications. Programs also use BASIC-PLUS-2 to open the terminal on channel 12. This allows input on channel 12 via BP2, and output on channel 13 via MACRO and the High Speed DH module. This dual channel setup also allows MODE 8% (psuedo-block mode) to be used without any dif-

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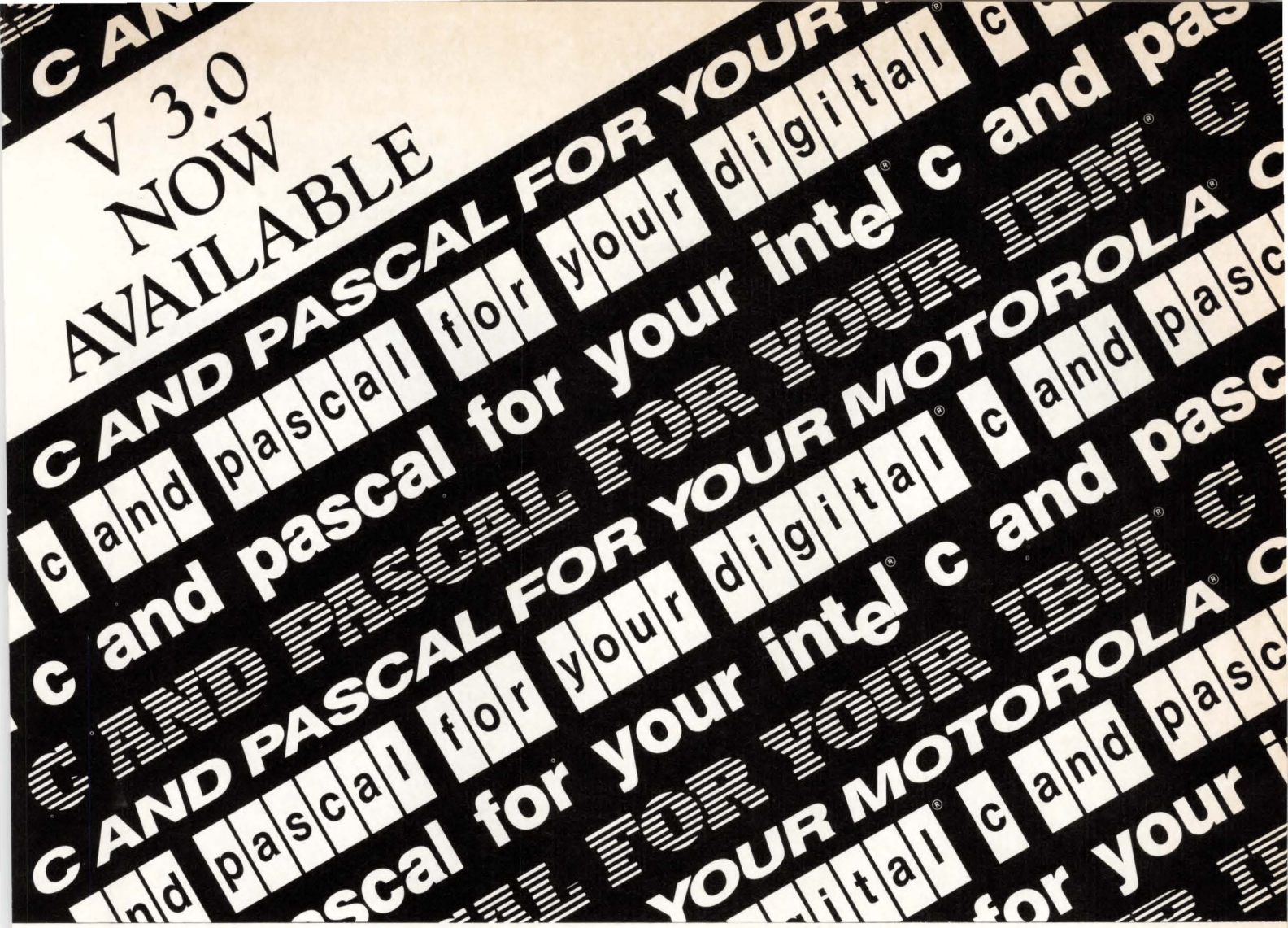

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ficulties. Programs that perform heavy terminal I/O have noticed up to a 50 percent improvement in CPU time. Programs that do only a moderate amount of terminal I/O have had a corresponding slight decrease in CPU time.

This option currently is running under RSTS/E Version 8 and Version 9. The listings that follow illustrate how we use this option. The routines are contained in a clustered resident library, so they are not called directly, but by a short interface routine that also passed the address of R/W work areas.

John Wolnisty contributes to us from Morgan Equipment [Aust.] Pty. Ltd., Brisbane, Queensland, Australia.

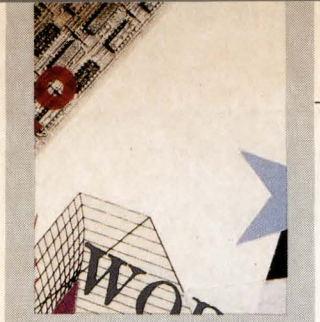
PROGRAM.

```
[TTOPEN.B2S]
2       FUNCTION INTEGER TTOPEN(CHN%,M%,HSDH%)
        ! Channel, open mode, HSDH enable switch: 1=enable
        %IDENT "V1.00 "
        EXTERNAL INTEGER FUNCTION TXOPEN
        !>>>>>>> Common area for Key board functions <<<<<<<
        COMMON ( KB )   KB%,            !  Keyboard Channel &
                        KB.MODE%,       !  KB Open mode &
                        X3%,            !  Cursor addressing switch  &
                        PAINT%,         !  Paint character      &
                        EOS%,           !  End of screen clear flag  &
                        EOL%,           !  End of line clear flag  &
                        V%,             !&
                        Z2%,            &
                        KB.WAIT%,       !  Wait time. 0=infinite  &
                        BYTE KB.INTERFACE, !  Type of controller line&
                        BYTE KB.HSDH.MOD,!  DH DMA modifier flags  &
                        BYTE KB.TYPE,   !Internal terminal type code &
                        BYTE KB.WIDTH,  !  Terminal width       &
                        WORD KB.FEATURES!Bits describing features

        OPEN "KB:" AS FILE #CHN%, MODE M% !Open the terminal for BP2
        TTOPEN=TXOPEN(CHN%,M%,HSDH%)            !  Do open for Macro
        END FUNCTION


[XXKB.MAC]
        .TITLE  KB      Common for terminal interface
        .IDENT  \V1.00 \
        .NLIST  SYM,BEX,ME
        .PSECT  KB,D,GBL,RW,REL,OVR

;Define common area so macro can reach it. Also insert default values
;to initialize the common.


KB::    .WORD           ;TTCHAN
        .WORD           ;TTMODE
        .WORD   1       ;TTDCA
        .WORD   95.     ;TTPNT
        .WORD   -1.     ;EOS%
        .WORD   -2.     ;EOL%
        .WORD   0       ;V%
        .WORD   0       ;Z2%
        .WORD   0       ;TTWAIT
        .BYTE   0       ;TTINFC
        .BYTE   0       ;TTHSDH
        .BYTE   0       ;TTTYPE
        .BYTE   0       ;TTWIDT
        .WORD   0       ;TTFEAT
        .END

[TXOPEN.MAC]
        .TITLE  TXOPEN  Open users terminal
        .IDENT  \V1.00 \
        .PSECT  B2RAFS,RO,I
        .NLIST  SYM,BEX,CND
        .GLOBL  R4VEC,KB,.TTOPN

;This short routine exists, since the actual routines are located
;in a clustered resident library.

TXOPEN::MOV     #KB,R3                  ;Pass KB common
        MOV     #R4VEC,R4               ;Pass RAFS common
        JSR     PC,.TTOPN               ;Call RO routine
        MOV     FMSERR(R4),@2(R5)       ;Return error variable
        RTS     PC
        .END

[XTTOPN.MAC]
        .TITLE  XTTOPN  Open the users terminal
        .PSECT  RA$COD,RO,I
        .IDENT  \V1.00 \
        .NLIST  BEX,SYM
        .ENABL  GBL

;The terminal is opened for output on channel 13.
;This module enables the HSDH code in the terminal driver if the
;user requests it, and it is on a DH interface.
        ;arguments:
        ;       @2(r5)          Function return (error code) set in
        ;                       short calling routine from common
        ;       @4(r5)          channel number.
        ;       @6(r5)          Open mode
        ;       @10(r5)         1= enable HSDH

.TTOPN::
        CLR     FMSERR(R4)              ;Clear error
        JSR     PC,..ZFQ                ;Clear FIRQB
        MOVB    @4(R5),TTCHAN(R3)       ;Move channel to common
        MOV     @6(R5),TTMODE(R3)       ;Ditto for mode
        MOV     TTMODE(R3),FIRQB+FQMODE ;Insert mode into FIRQB
        BEQ     4$                      ;Bypass if zero
        BIS     #100000,FIRQB+FQMODE    ;Flag that this is a real mode
4$:     MOVB    #OPNFQ,FIRQB+FQFUN
        MOVB    #13.*2,FIRQB+FQFIL      ;Open on channel 13
        MOV     #"KB,FIRQB+FQDEV        ;Device is user's KB:
        CALFIP
        JSR     PC,..ZFQ                ;Zap FIRQB again
        MOVB    #UU.TRM,FIRQB+FQFUN     ;Part 1 of terminal stats
        MOVB    #377,FIRQB+FQSIZM       ;This terminal
        .UUO                            ;Get terminal stats
        MOVB    FIRQB+FQFLAG,TTINFC(R3) ;Get interface type.
        CLRB    TTHSDH(R3)              ;Clear HSDH flag
        MOVB    FIRQB+FQPPN,TTWIDT(R3)  ;Get terminal width
        DECB    TTWIDT(R3)              ;Make it real
        JSR     PC,..ZFQ
        MOVB    #UU.TRM,FIRQB+FQFUN     ;Get part 2 of stats
        MOVB    #377,FIRQB+FQSIZM
        MOVB    #1,FIRQB+FQFIL
        .UUO
        MOVB    FIRQB+FQPPN,TTTYPE(R3)  ;Save terminal type
        MOV     FIRQB+FQDEVN,TTFEAT(R3) ;And features
        BIT     #1,@10(R5)              ;Is enable HSDH option spec?
        BEQ     100$                    ;No
        CMPB    TTINFC(R3),#DHLINE      ;Yes. Is it a DH line?
        BEQ     9$
        MOV     #-51.,FMSERR(R4)        ;No. return error 51
        BR      100$
9$:     JSR     PC,..ZXR
        MOV     #2,XRB+XRLEN            ;To satisfy RSTS
        MOV     XRB+XRLEN,XRB+XRBC
        MOV     #..NULL,XRB+XRLOC       ;Its just to fool RSTS
        MOVB    #13.*2,XRB+XRCI
        MOVB    #177,XRB+XRMOD+1        ;HSDH header
        MOVB    #1,XRB+XRMOD            ;Enable HSDH flag
        .WRITE                          ;Tell monitor
        BISB    #1,TTHSDH(R3)           ;Set our switch
99$:    MOV     FIRQB,FMSERR(R4)        ;Return errors
100$:   RTS     PC

        .PSECT  RA$DAT,D,RO
;       All routines are I and D space compatible

..NULL::.WORD   0
DHLINE  =       14
        .END

[XTTPUT.MAC]
        .TITLE  XTTPUT  Write using HSDH if applicable
        .PSECT  RA$COD,RO,I
        .IDENT  \V1.00 \
        .NLIST  BEX,SYM
        .ENABL  GBL

;Note: This routine is called by a similar interface routine to
;TXOPEN, which will not be repeated. The interface only passed R/W
;work addresses to the actual routine, which exists in a clustered
;resident library along with the multikey ISAM system.
;Arguments:
```

PROGRAM.... *continued*

```
;       @2(r5)          Function return (error)
;       @4(r5)          Options
;       @6(r5)          Output string

.TTPUT::JSR     PC,..ZXR                ;Clear XRB
        CLR     FMSERR(R4)              ;Clear error return
        MOV     #13.*2,XRB+XRCI         ;Macro channel is always 13
        MOV     6(R5),R1                ;Get BP2 string header
        MOV     @R1,XRB+XRLOC           ;Move starting address
        MOV     2(R1),XRB+XRLEN         ;Move length
        MOV     XRB+XRLEN,XRB+XRBC      ;Ditto
        BITB    #1,TTHSDH(R3)           ;Is HSDH enabled?
        BEQ     20$                     ;No. Then skip modifiers
        MOV     #77420,XRB+XRMOD        ;Yes. Insert HSDH header +
                                        ;HSDH put function
        BIS     @4(R5),XRB+XRMOD        ;OR in any user options
20$:    .WRITE                          ;Do RSTS write
        MOV     FIRQB,FMSERR(R4)        ;Errors back to user
        RTS     PC                      ;Go home
        .END


[XTTFLG.MAC]
        .TITLE  XTTFLG  Modify HSDH module
        .PSECT  RA$COD,RO,I
        .IDENT  \V1.00 \
        .NLIST  BEX,SYM
        .ENABL  GBL

;Again, for brevity, the short calling module is not printed
;Arguments:
;       @2(r5)          Function return
;       @4(r5)          Function value


.TTFLG::JSR     PC,..ZXR                ;Clear XRB
        CLR     FMSERR(R4)              ;Clear error return
        BITB    #1,TTHSDH(R3)           ;Is HSDH enabled?
        BEQ     20$                     ;No. Then skip entire routine
        MOV     #13.*2,XRB+XRCI         ;Insert channel number
        MOV     #..NULL,XRB+XRLOC       ;To satisfy RSTS, even though
                                        ;never written
        MOV     #2,XRB+XRLEN            ;Satisfy RSTS
        MOV     XRB+XRLEN,XRB+XRBC      ;Ditto
        MOVB    #177,XRB+XRMOD+1        ;HSDH function header
        MOVB    @4(R5),XRB+XRMOD        ;Move user's request
        CMPB    XRB+XRMOD,#2            ;Is it a disable?
        BNE     11$                     ;No.
        BICB    #1,TTHSDH(R3)           ;Yes. Then clear our flag in
                                        ;common
11$:    .WRITE                          ;Do it
        MOV     FIRQB,FMSERR(R4)        ;Return RSTS error
20$:    RTS     PC                      ;Return
        .END


[XTTCLS.MAC]
        .TITLE  XTTCLS  Close terminal
        .PSECT  RA$COD,RO,I
        .IDENT  \V1.00 \
        .NLIST  BEX,SYM
        .ENABL  GBL

;Argument:      @2(r5)  error return

.TTCLS::JSR     PC,..ZFQ                ;Clear FIRQB
        CLR     FMSERR(R4)              ;And error
        MOVB    #13.*2,FIRQB+FQFIL      ;Always channel 13
        MOVB    #CLSFQ,FIRQB+FQFUN      ;RSTS close
        CALFIP                          ;Call FIP
        BICB    #1,TTHSDH(R3)           ;Clear our flag in common
        MOV     FIRQB,FMSERR(R4)        ;Return error
        RTS     PC                      ;Go home
        .END
```

■



4GLs

TODAY IS HERE!

By Dave Mallery

A Robust And Full-Featured 4GL From The Land Down Under.

From the land of the koala, the kookaburra and (temporarily) the America's Cup, comes a new contender in the ever more populous and competitive land of 4GLs.

TODAY is a serious entrant that uses a fresh approach in a number of areas. The creators were convinced that a true 4GL must have an active data dictionary that is referenced at run time. That is possible only with an interpreted or *p-code* language. Yet, they insisted that the performance match compiled BASIC or COBOL. That's a tall order.

TODAY is non-procedural, yet has procedural hooks and abilities that are there if you need them. *TODAY* also is an enclosed environment, and is operating system independent to a surprising degree. This independence yields true portability. You can develop a *TODAY* application on an AT, copy the files to a VAX and run them just as easily as to an HP-3000. You can *develop* in any environment and run in any. And yes, *TODAY* runs under VMS, MS/DOS, UNIX and on HP-3000 operating systems.

TODAY supports a full-blown development environment. That means version control, documentation production and change history reports. It can adapt to foreign languages, even to the level of assigning foreign synonyms to the logic functions in the command language. All help messages and errors are under developer control. And, if necessary, *TODAY* can call programs and subroutines written in other languages.

THIS PACKAGE IS another example of robust software migrating *into* the VMS environment. That's a trend we see growing all the time as sharp marketers seek new markets for their software. *TODAY* doesn't carry with it a distinct UNIX flavor, which is unusual, since most imports retain a taste of their origins. Part of the reason, no doubt, is its design goal of total operating system separation. The only homage to its national, if not hardware, origin is paid by a distinct "Aussie" twang to the documentation!

TODAY is written in *TODAY.* Another neat trick if you can do it. The development environment is simply another *TODAY* application. This was achieved by a gradual process of bootstrapping during development. The run-time environment is a large program written in C that must be ported to the target machine, much like a version of UNIX. The only other porting consideration is the file handling, which must be "translated" from the *TODAY* command structure to whatever native (RMS) file system is to be supported. *TODAY* also supports interfaces to Informix SQL and the Britton Lee Database Machine (see *DEC PROFESSIONAL*, October 1986, Vol. 5, No. 10), and to HP, in the *Relate 3000* and *IMAGE* database packages.

The transportable application, therefore, ends up in a p-code that is known to the run-time environment (the exerciser). Only a single copy of the exerciser is present in a machine with any number of *TODAY* users. This results in a large memory consumption savings, and contributes to overall efficiency. One

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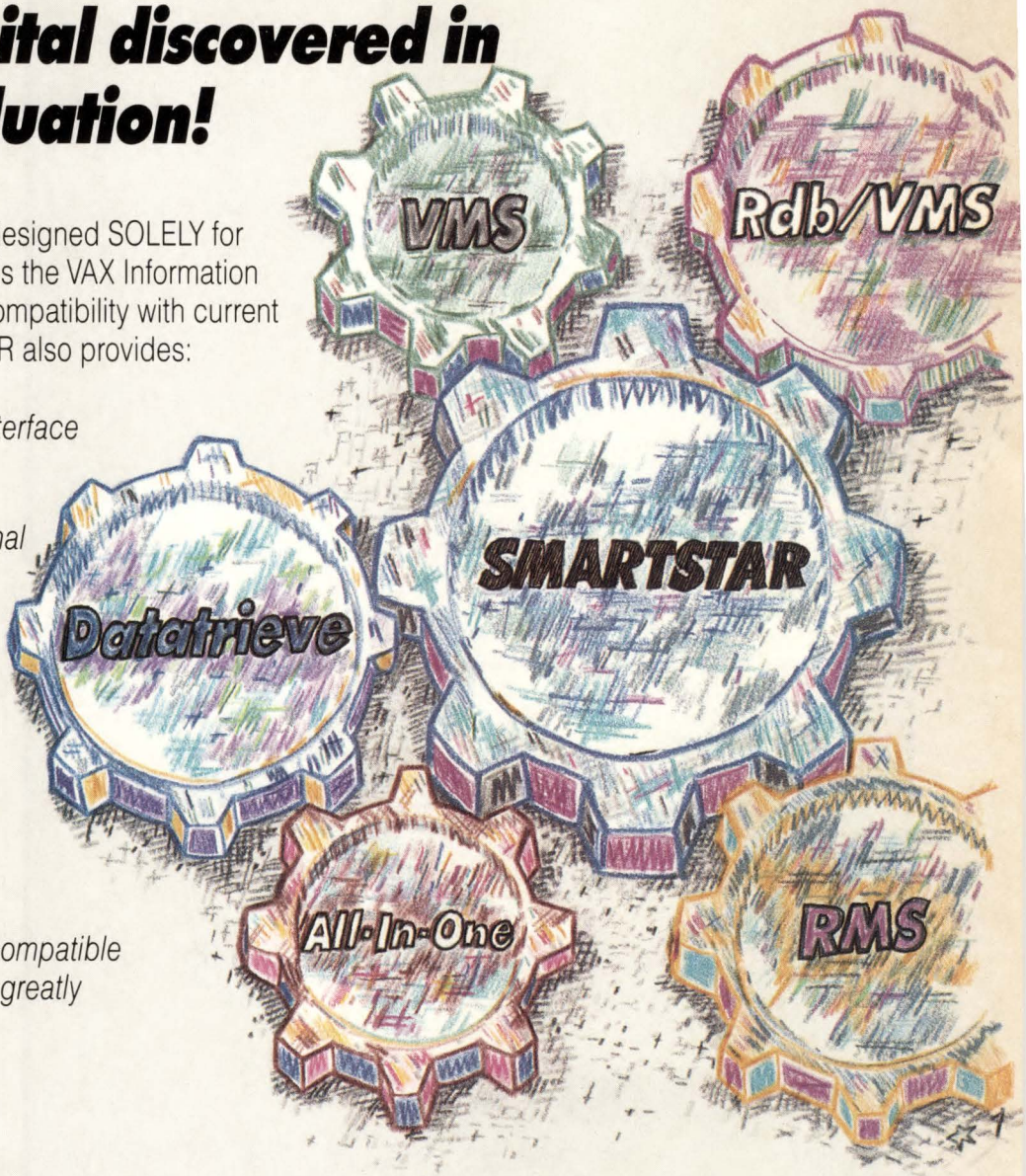

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```
**TODAY**                    DATA AREAS MENU                    11/12/86

  Application    adtrackg          Mode Global          User dave
  Version        adtrackg

                        1 Data Dictionary
                        2 Compound Item Description
                        3 Compound Item Detail

                        4 Record Description
                        5 Record Detail
                        6 Format Description
                        7 Format Detail

                        8 Database Definition
                        9 File Definition
                       10 Index Definition

                       11 Work Area Description
                       12 Work Area Detail

Control:                  Areas pf1   Screen pf2   Logic pf3   Data pf4
```

The* TODAY *data area menu.

```
**TODAY**                      DATA MENU                        11/12/86

  Application    adtrackg          Mode Global          User dave
  Version        adtrackg

                        1 Ranges
                        2 Tables
                        3 Help Messages
                        4 Error Messages
                        5 Literals
                        6 Numerics
                        7 Constants
                        8 Variables
                        9 Scratch Pad Names

Control:                  Areas pf1   Screen pf2   Logic pf3   Data pf4
```

The* TODAY *data elements menu.

immediate and obvious VMS-related advantage is that the application is freed from the madding image-activation burden — non-trivial, and perhaps very significant.

Security has been addressed at several levels. Terminals and ports must be assigned by the administrator, and can be assigned passwords. All passwords are one-way encrypted by *TODAY*. Site passwords are optional. Usernames are checked and their privilege level matched to the port, as well as to the application requested. Applications can have access passwords; however, security does not extend downward to the data item level. I note that the active data dictionary does not preclude that level of security.

The dictionary structure is the heart and soul of *TODAY*, and requires a rather full description. The key to a truly non-procedural system is in the dictionary. Many of the validation tests and formatting criteria that you normally have to write as part of the application code are supplied once (and centrally!) to the dictionary.

THERE ARE TWO main data-related menus: the data areas menu, and the data elements menu. (See Screens 1 and 2.) Using this pair of menus, the data elements within an application are defined and delimited, edits are specified, and prompts and help messages declared. The elements are enumerated into records, which are defined as members of files. This is very comprehensive and serves both to locate centrally and *document* fully all the data in an application.

My first attempt to use *TODAY* on real data was pretty successful. In most of my previous reviews I've used an RMS file or two from our in-house ad tracking system as test data. For this review, I moved one of the files, a simple two-key RMS file, to the MICROVAX where *TODAY* is installed.

I defined the individual data elements to the dictionary, grouped

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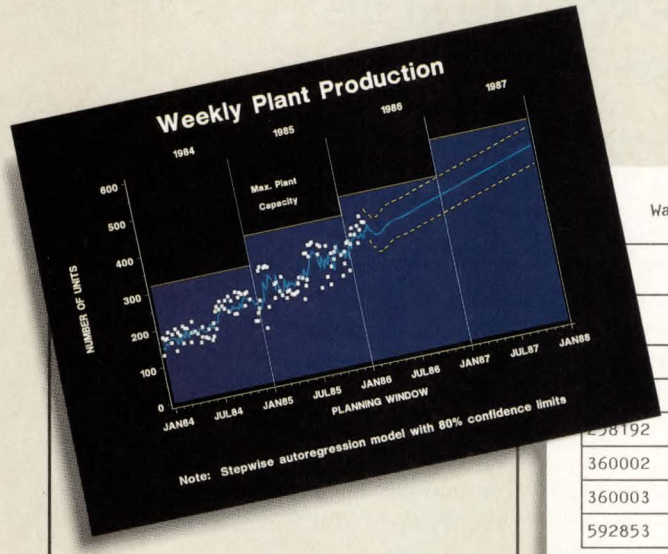

Warehouse Inventory Report - 16JAN87

	Quantity on Hand	Quantity on Order	Projected Reorder Date
	123980	10000	THU, FEB 12, 87
	89450	5000	FRI, FEB 20, 87
258192	20110	1000	MON, MAR 30, 87
360002	8585	0	TUE, FEB 10, 87
360003	15985	500	TUE, FEB 10, 87
592853	469120	20000	WED, FEB 18, 87

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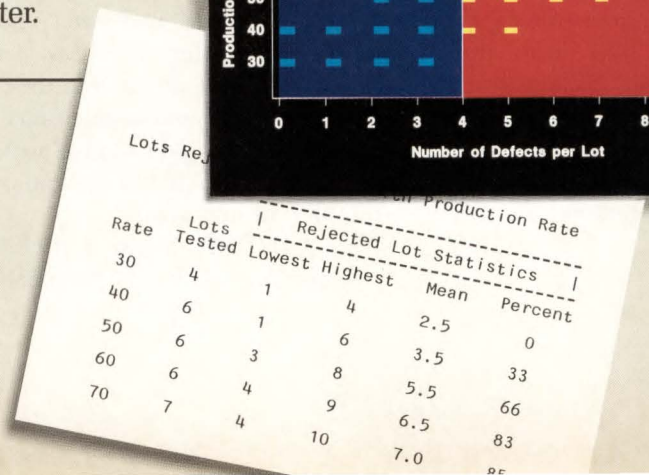

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. . . *TODAY* accepted my external RMS-indexed file without a whimper. Not all packages will do that.

them under a newly minted record name pointing the file description to the file (in another directory), had *TODAY* generate a screen with the automatic-generation facility, defined a simple, one-entry menu and then tested it. Elapsed time, with some manual shuffling, was about an hour.

The first test revealed some errors in field length. These were fixed back in the dictionary, and the application was regenerated. Generation takes about one minute. The only severe problem that appeared was that *TODAY* doesn't support single-byte integers (0-255). My data record has two of the buggers. At that point, I was seeing data from the file on the screen, punctuated with loud complaints about data formats on the four-byte floater I had forgotten, but true real data nonetheless.

A GOOD TEST of a purported 4GL is whether an experienced programmer can produce rudimentary screens and reports on real data (not the training examples) from a cold start in about one day. *TODAY* passed the test.

Another impressive fact is that *TODAY* accepted my external RMS-indexed file without a whimper. Not all packages will do that. Some get very finicky about the exact FDL used to define them and can give you fits when you simply open a file.

I used the screen-painting option to delete a few filler fields that were included in the dictionary but not needed in the finished screen. An important feature is that there's no necessary linkage between a screen and a record. The linkages are defined at the screen field level. Process logic can be connected to any screen field and can be performed either before, after, or both, as well as not performed if no update is intended, or if the field is blank. Within the command structure, the flow of control is defined by a process detail block. This can be a simple sequence of commands up through extremely dense logic.

FOR MY NEXT TRICK, I brought over the second file, a three-key RMS file containing every advertiser in the DEC market. Since the screen for the first file (every ad placed in the market in 1985) had only an advertiser key, I decided to "join" the files and display the advertiser name from the second file on the screen along with the advertisement detail. The joining consists of a function that you write to be executed after the field containing the advertiser key is placed on the screen. It does a read to the advertiser file and puts the name on the screen. The actual "move" that causes data to be screened is canned in the screen data element in the dictionary. The function merely says: "After you get the record, do the canned move in the next screen element."

This took a little time, since I was leaving the most elementary parts of *TODAY* and moving into "intermediate" user status. I found the documentation excellent, especially when I paid attention to the examples in the excellent training manual. If I had had the luxury of a full-blown training course, I would have had no trouble at all with this step.

TODAY boasts a decision table operator that is most formidable. It is a method of evaluating a complex set of questions in differing combinations, and then exercising an action or a sequence of actions for the combination of questions which is evaluated as true. Up to eight "questions" may be specified, each of which is expressed as a *TODAY* IF-logic command. Up to eight actions may be specified, each of which may initiate the execution of such items as function, process, screen, report or another decision table. You may specify up to 31 different conditions or combinations of questions to be tested. Also, for each condition, you specify how each question should be evaluated: true, false, or don't care. For each condition, you specify which of the defined actions is to be performed and in which sequence.

One of the beauties of this structure is that it's kept in the dictionary with its own maintenance menu, and is fully self documenting! Speaking of documentation, *TODAY* can produce partial or full sets of documentation on demand from the developer menu.

The next test entailed getting some performance measure, however simple. I've used this file repeatedly on other products, and have found that just the simple act of reading and summarizing the file can take from 44 seconds in simple VAX BASIC, to all night in *dBASE III*, running on a Logicraft board (not Logicraft's fault, but the *dBASE III*'s!). I threw together a simple

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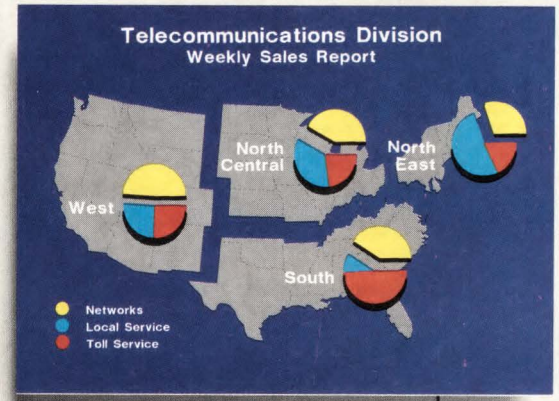

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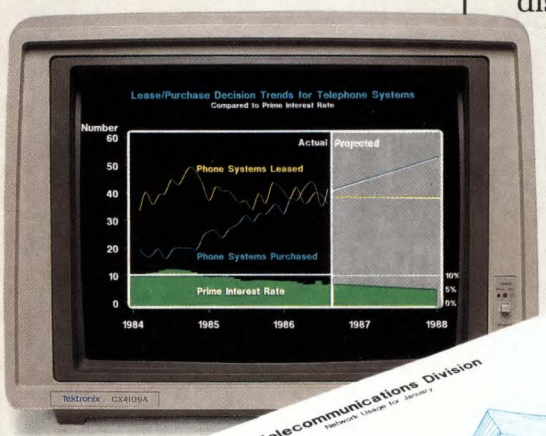

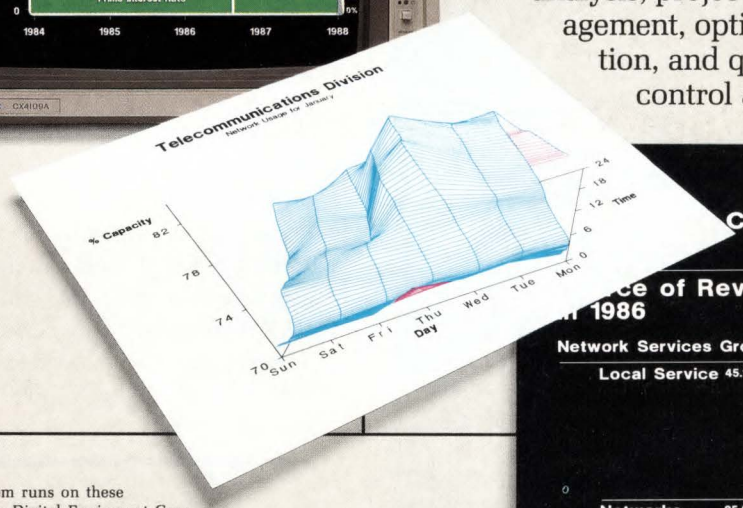

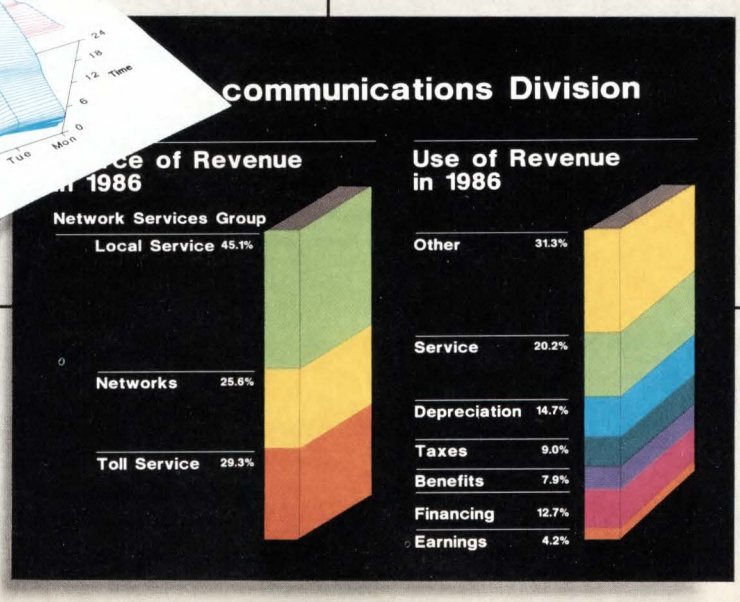

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summarizing report of the file that sorted and did two level breaks. Elapsed time: two minutes, 30 seconds. Quite respectable.

TODAY is quite a piece of work. If you are in the market for an application developer, don't let the "p-code" interpreter throw you. The actual performance is fine. There are big bonuses in the freedom from interminable compiles and links. Development time is money. Ask anyone who comes from the RSTS world with BASIC PLUS — we never had to compile and link. Since most of the effort on a software product is toward maintenance in the long term, the compile and link doesn't end with initial delivery. Another interesting option is that you can do your development on an AT, and never burden the host machine with the development overhead.

My advice to purchasers of these application systems is to take the time to bring in evaluation systems and learn them. There is no other way to evaluate something as robust and full-featured as *TODAY*. ■

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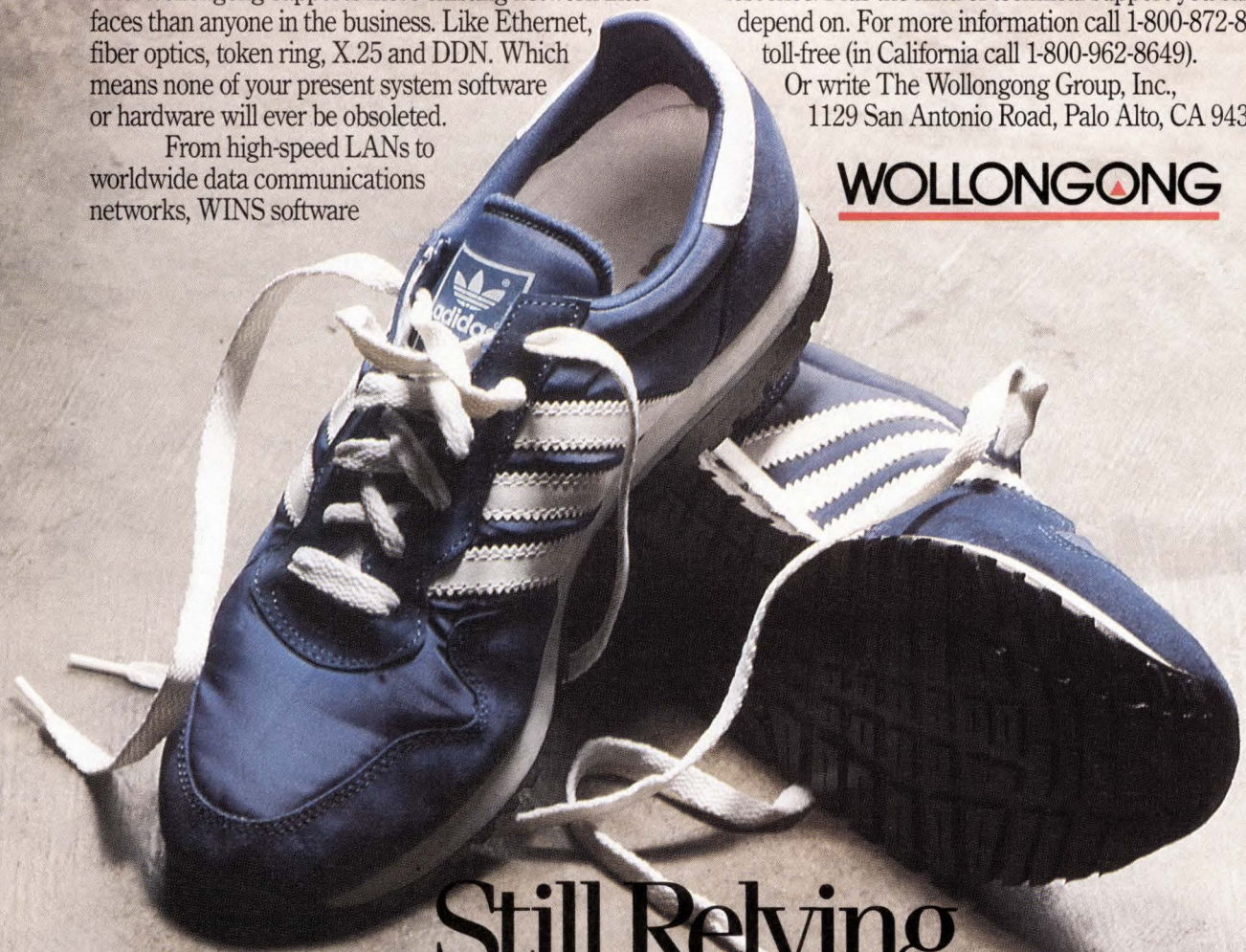

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DBMS

MASS-11 MANAGER

A Personal Database For The VAX.

By Carl Marbach

A database product from a word processing company? What's next, a four door sedan from Digital? Microsystems Engineering Company (MEC), Hoffman Estates, Illinois, has been providing a full word processing system for the VAX for some time. (See "MASS-11," *DEC PROFESSIONAL*, Vol. 4, No. 4, p.108.) In the past the company offered a database system, DBM, but hadn't widely promoted it. The new *MANAGER* system replaces DBM and positions MEC as a personal software supplier to the VAX and PC world.

While constantly improving its word processing package, *MASS-11*, MEC has looked to new products and markets. Anticipating VAX to PC connectivity it developed *MASS-11* for the IBM PC and made it compatible with the VAX version.

Compatibility is an overused term, somewhat like "user friendly." A product that's supposed to be "compatible" too often isn't. To their credit the MEC developers went the extra mile to make compatibility mean something. The PC version of *MASS-11* comes with a VAX communications package for transmitting files between the PC and VAX. The files transmitted are fully editable; i.e., they retain all internal ruler settings, special attributes like bolding and underlining, and the editing process is the same on both machines, except for the obvious keyboard differences.

HAVING CONQUERED the world of PC and VAX word processing, MEC expanded the capability of its word processing product and entered the database field with a companion product that provides a personal database for use on VAXs and PCs.

MANAGER increases functionality of the *MASS-11* word processing package by adding a real system to manage the LIST part of list processing. List processing is a system (included in most popular word processors) that allows you to build a FORM document that, when merged with a LIST will print many letters (or reports) with specific words in each letter replaced by a field contained in the LIST. If the LIST looks like:

```
<SAL>Mr.
<FNAME>Carl
<LNAME>Marbach
< >
<SAL>Mrs.
<FNAME>Helen
<LNAME>Marbach
< >
```

And the FORM looks like:

```
Dear <SAL> <LNAME>,
Hello <FNAME>!
```

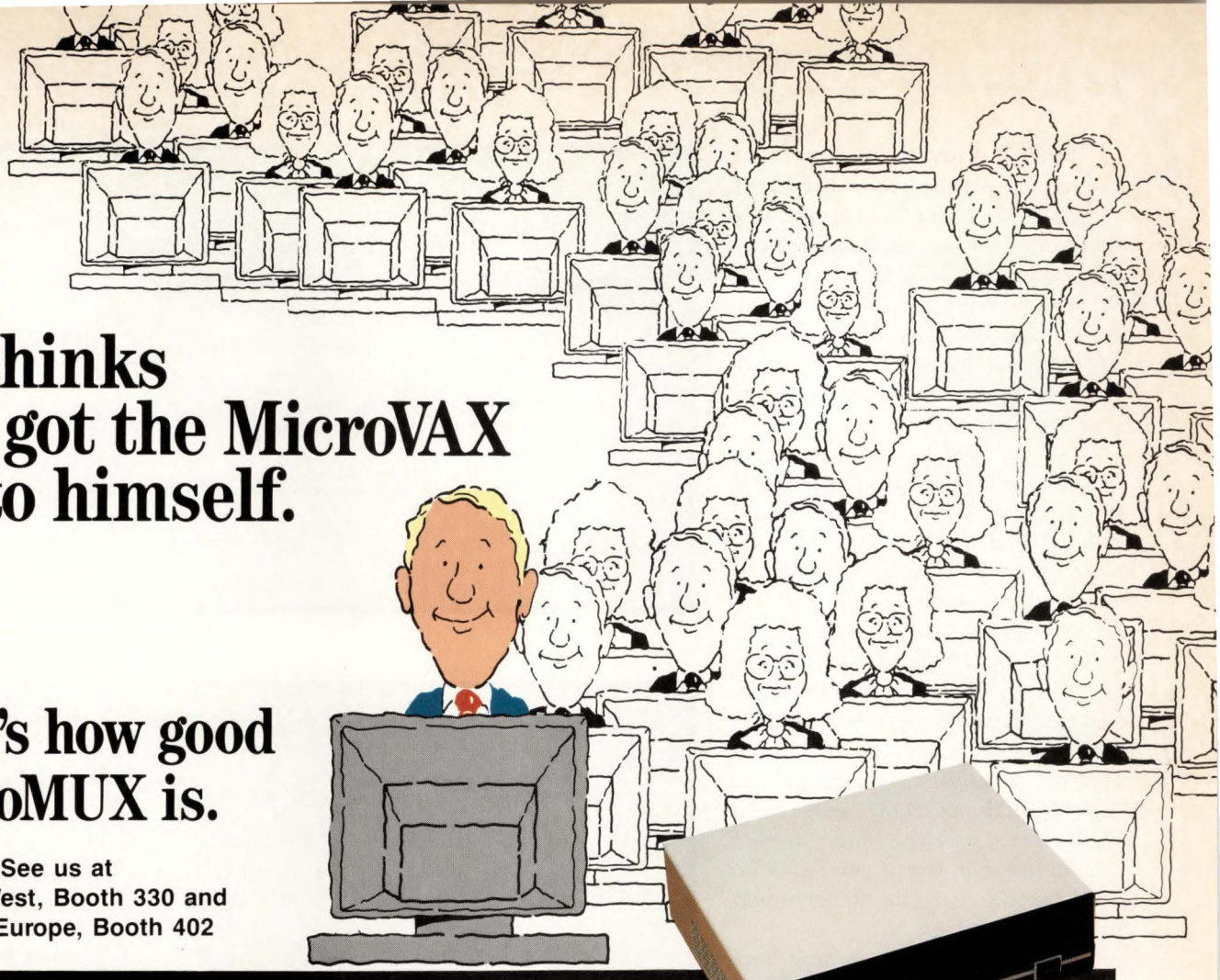
list processing would produce two letters that started:

```
Dear Mr. Marbach,
Hello Carl!
```

and:

```
Dear Mrs. Marbach,

Hello Helen!
```



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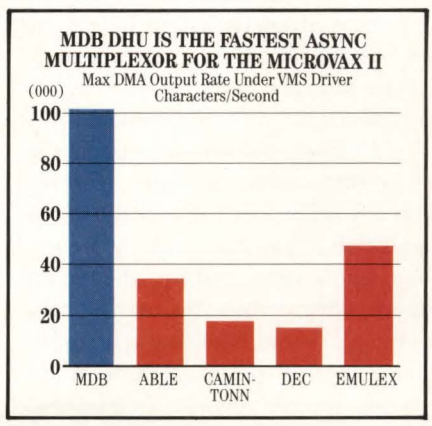

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Small lists never were a problem, but keeping large ones up to date wasn't easy to do. In a list of 500 people how do you find the one you want? Searching sequentially is at best inefficient. What really was needed was some way to manage the data in the list, a *MANAGER*. Many LISTS are really databases to which you want to write letters periodically.

Another reason for developing a database came from outside the world of word processing. There basically are four categories of successful PC software: word processing, spreadsheets, database application systems and presentation graphics. In personal databases, *dBASE II* and *dBASE III* are packages near the top. These two products allow you to store and retrieve data easily, as well as to write complete application systems around the data. While *MANAGER* is not *dBASE*, and in some modes is very different, it has a distinct *dBASE* flavor. In fact, if you can write *dBASE* code, you can sit down and operate *MANAGER*.

While early developers may have considered these products personal, the world didn't and today there are many applications, some large and complicated, that are built with *dBASE II, III,* and *MANAGER*.

THE SOFTWARE ENGINEERS at MEC saw an opportunity to bring the personal database to the VAX. To qualify as personal, a database has to be easy to use, simple to learn, full featured, operate in expert mode when required and, of course, be programmable.

MASS-11 MANAGER operates in a way that enables someone working with a word processing package to feel comfortable. You can work up a complete application within the menu system, which while this may be constraining to some, is an easy way for the novice to find his way through the system. In the expert COMMAND mode, it operates more like a conventional personal database.

```
                    MASS-11 MANAGER

                    1 - Manager Prompt Menu

                    3 - Defaults Menu

                    4 - Command Mode

                    7 - Utilities Menu

                    8 - Applications Menu

                    9 - Return to MASS-11 Main Menu

                    Enter The Desired Function : /

DataBase                        Work Area                   Record No.
NONE                            PRIMARY                           0
```

Screen 1.

```
                  MASS-11 MANAGER PROMPT MENU

   CRE - Create Database File      GO  - Go To Record Number, Top or Bottom
   USE - Use Database File         INQ - Inquiry for Selected Record(s)

   APP - Append New Record(s)      LOC - Locate Specific Record(s)
   EDI - Edit Data Record(s)       DEL - Delete Data Record(s)

   DIS - Display Data Record(s)    LIS - List Structure or Records
   BRO - Browse                    SEL - Select Work Area

   FOR - Form Creating & Editing   REP - Select Records for Mass-11 Report
   COM - Command Mode              EXI - Exit To Main Menu

                  Enter The Desired Function : cre

   At the sub-menus, Press [PF2] to Execute Commands; [PF4] to Cancel Commands

DataBase                        Work Area                   Record No.
NONE                            PRIMARY                           0
```

Screen 2.

```
CREATE a database file: Set up or alter the record structure of a database
  file and add the file to the current directory.

No. Field Name                  Type  Width  Deci  Comma
1   ARTICLE_NAME                 C     30
2   ISSUE_DATE                   D
3   VOLUME                       N     2      0     n
4   NUMBER                       N     2      0     n
5   PAGE_NUMBER                  N     4      0     n
6   KEY_WORDS                    C     30
7

Field name: Up to 30 characters long, using letters, numbers, and underscores,
beginning with a letter, no blanks.  Type: Enter C (Character), N (Numeric)
D (Date), T (Time), L (Logical), or M (Money). Deci (Numeric fields only):
Enter number to indicate number of decimal places. Comma: Enter Y or N
for numeric field displayed with or without commas. PF1 I - Inserts field;
PF1 D - Deletes field.  RETURN after each entry completed. PF1 5, PF1 6
-  Move left & right between fields.  PF1 9, PF1 0 - Scroll fields up,
down in window.  PF1 X - Exit and save; PF1 Q - Quit without saving.

    Record Length :  76   Name Length :  60
```

Screen 3.

In fact, *MASS-11 MANAGER* looks and works a lot like *dBASE*. Many commands are the same and anyone familiar with *dBASE* already should be familiar enough with *MANAGER* to skip the menu-to-menu method and go directly to command mode where he will find most of the *dBASE* commands implemented in form and function.

Menu System

MANAGER is accessed from the *MASS-11* Main Menu. It places you in a system of prompted sub-menus that will help you build your database, adding records and then editing the records you entered. To create a sample database, we do the following:

1. At the Main Menu select prompting (Screen 1).
2. From this menu, which displays all of the *MANAGER* options, select CRE (Screen 2).
3. We now have created a database definition with field numbers one through six described and named CBMART (Screen 3).
4. Data entry begins (Screen 4).
5. The entry begun in Screen 4 is displayed in Screen 5.

```
APPEND new data: Enter data to the database file in use.  To add
 existing records from another database file, go to the UTILITIES MENU.

(FIELDS)      |                                                          >|

(FIELDS) **Optional** Enter a list of fields here if you wish to enter data
only into specific fields of each data record.  Separate field names with
commas.  Press PF3 S to see the field names for the database file in use.
Example: To enter a new customer's name and address only into a customer
database, type: Customer_Name, Street, City, State, Zip_Code.  PF1 F
will display a list of the fields and allow you to select fields by placing
an X on the blank next to the field.

DataBase                        Work Area                    Record No.
CBMART                          PRIMARY                               0
```

Screen 4.

```
    RECORD NO:00001                                          PAGE :01

ARTICLE_NAME DEC TERMINALS A FOND LOOK
  ISSUE_DATE 12/01/86
      VOLUME 5
      NUMBER 12
 PAGE_NUMBER 86
   KEY_WORDS TERMINAL,TTY33,VT05,VT52,LA36
```

Screen 5.

6. Data editing is performed on various screens. Note that as you scroll between lines on these screens, the bottom area describes what kind of information *MANAGER* will deal with (Screens 6a-6e).

COMMAND mode offers a shortcut through the menu system, but leaves the basic interactive session intact. It's the COMMAND mode in which programs will be written, and the mode in which experienced users will want to work.

Screen 7 shows an example of COMMAND mode using the CBMART database and displaying its structure. All of the menu commands are available in COMMAND mode. A collection of command mode instructions in a file comprise a "DO" file that can be processed automatically, like a program or procedure, by *MANAGER*. "DO" files give *MANAGER* the programmability necessary to write applications based on the data stored in the database.

Facilities are included for customized input form generation, field validation, sorting, indexing and other features included in a complete database. Output reports can be formatted through the *MASS-11* list processing capabilities using the <field_name> construct to create the desired look.

MANAGER's documentation is "early word processing," which means that there are more examples than any other kind of text. Sometimes it's hard to separate text in the manual from the examples, but when you're trying to do any of the procedures, it's a good bet that a sample is contained in the guide. In the "Friendly Advice" section of the Appendix, MEC suggests that you read the manual and work through the self-

```
EDIT data: Change or correct records in a database file.  You can select
  fields and records to be edited.

(Scope)       |ALL                                                      >|
(FIELDS)      |
(WHILE)       |
(FOR)         |
(INDEX)       |
(ORDERED BY)  |
```

```
(Scope) **Optional** The region from which records will be selected can be
chosen by typing ALL for all records, NEXT n for n records beginning with the
current record, NEXT -n for n records preceding the current record, RECORD n
for the specific record numbered n, or RECORD n TO m to indicate a range of
records from n to m.  The default Scope is the current record.  Examples:
ALL ; NEXT 20 ; RECORD 567 ; RECORD 5 TO 50.
```

a.

```
(WHILE) **Optional** WHILE selects records only as long as the condition
is true.  If the first record encountered does not satisfy the condition, the
search is stopped and no records are selected.  (), **, *, /, +, - can be
used with numeric fields.  <, >, =, <>, <=, >= can be used with numeric,
character and money fields.  .AND., .OR., and .NOT. can be used
to form logical expressions.  Enclose character strings in ' or ".
Press PF3 S to see field names for database file in use.  Example:
Last_name <> 'Jones' will display all records up to but not including "Jones".
```

b.

```
(FOR) **Optional** When FOR condition is specified, only records which satisfy
the FOR condition will be selected.  With numeric and money fields, the
following can be used: (), ** (exponentiation), *, /, +, -.  With any
field type, these can be used: <, >, =, <> (not equal to), <=, >=.
Enclose character strings in single or double quotes.  To create a logical
expression and with logical fields, use .AND., .OR., and .NOT.  Press PF3 S to
see field names for database file in use.  Examples: Birthday < DATE[4/1/86],
(Last_name >='C') .AND. (Last_name < 'D'), .NOT. Related, 200 = Cost.
```

c.

```
(INDEX) **Optional** Type in a field name here if you want the data displayed
in indexed order (default order is ascending.  Type /d after the field name
for descending order).
NOTE:  Indexes can be created from the UTILITIES MENU.
Example: If one of the indexes you had created earlier was on the field
Salary, and you would like to look at your database file in the order from
highest to lowest Salary, you would enter Salary/d here.
```

d.

```
(ORDERED BY) **Optional** If you want the records you are editing to appear
sorted by a field or fields, enter the names of the field(s) here.  If you
want a field in descending order, type /D after the field name.  Press PF3 S
for a list of field names for the database file in use.  Example: If you
wanted to see personnel records ordered by department, and then by salary,
from highest to lowest, within each department, you might enter: Department,
highest Salary to lowest Salary, you would enter Salary/d here.

DataBase                        Work Area                       Record No.
CBMART                          PRIMARY                                1
```

e.

Screens 6a-6e.

```
M>USE CBMART
M>DISPLAY STRUCTURE
DATA BASE NAME CBMART.
DATE OF CREATION 12/14/86
DATE OF LAST UPDATE 12/15/86
RECORD LENGTH : 77
NO OF FIELDS :   6
NO OF RULES :   0
NO OF RECORDS :      2
FLDNO   NAME                            TYP     LEN     DECI   COMMA
  1     ARTICLE_NAME                    C        30
  2     ISSUE_DATE                      D         8
  3     VOLUME                          N         2      0      N
  4     NUMBER                          N         2      0      N
  5     PAGE_NUMBER                     N         4      0      N
  6     KEY_WORDS                       C        30

M>
```

Screen 7.

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training guide. There are better and more pleasing manuals to read but this one gets the job done.

MEC listens to its customers, and they've been saying that it has become a popular personal database for users on VAXs where *MASS-11* already is the word processing package in use. The most vocal requesters are asking for more features, more programmability and the ability to dispense with the menu system altogether in the expert mode.

It's hard to build a product that's easy to learn and use and still provides enough functionality to be a complete application development system. Costing significantly less than many of the full-featured 4GLs in the VAX market, *MANAGER* is not a complete development system. But, for personal data storage, or for amateur-written applications, or for the pro who wants to develop a fast and easy data storage system, *MANAGER* might fit the bill.

What's next from MEC? All products will continue to have a brother-sister relationship between the VAX and PCs. Its *DRAW* package, slated for introduction as we go to press, will integrate text and graphics on the PC allowing freehand drawings to be put directly into text documents within *MASS-11*. *LOTUS* PIC files and Hewlett-Packard HPGL files also will be integrated into documents on the PC. Once the files are integrated and manipulated (if you wish) on the PC, the *MASS-11* file can be transmitted to the VAX for printing on your laser printer. MEC is moving toward creating an intelligent workstation in the PC that will do useful things in concert with a VAX.

MANAGER will continue to improve and offers word processing users a real facility to deal with their List Processing needs. For the rest of us who sometimes need to store miscellaneous data like telephone numbers, addresses, articles, kitchen inventory or anything small and personal, *MANAGER* does on a VAX what *dBASE* did on your PC.

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THE GraphText I TERMINAL

By David Goldstein

With The Right Software, Forward Technology's New Offering Is Full Of Possibilities.

Forward Technology's GraphText I terminal is one of the more interesting choices in the terminal market. It has plenty of power to handle almost any application, yet begs for software to wake it from a terminal sleep. However, GraphText I's market is primarily OEMs, so the limitations of the terminal are constrained largely by the software bundled by the distributor.

GraphText I has a modular design. The separate components include a monitor, controller, keyboard, and even a mouse. These attractive pieces occupy only two to three square feet of table space. The display, largest of the items and weighing 31 pounds, is available in portrait or landscape modes. The picture produced is 15 inches, providing a resolution of 1024 x 768 pixels.

The color of the display is noteworthy. Although varying shades are depicted in advertisements, I used a foreground hue of a very light blue against a black background. This unusual color comes from the P40 phosphor, whose long afterglow is used to achieve faster raster scan speeds with less refreshing, thus allowing better resolution. The display, while not of blazing speed, is suitable for most applications. The resolution is excellent.

THE SHEER POWER of the hardware warrants mention. The display processor is a 68000 microprocessor, running at 6.9 MHz, with 96-KB ROM and 2-MB RAM. An additional Z80A processor clocked at 4 MHz is dedicated to communications processing. These processors give considerable power to the user, allowing him to run 68000 code and work locally on an intelligent terminal, with the proper software. Other immediate benefits include powerful text and graphics processing options, and a dedicated laser printer port.

Three important aspects of a terminal are its range of use, text display, and graphics capability. The GraphText I is a hybrid devised to satisfy each. Indeed, its versatility is a major selling point. With proper software support, such a "jack of all trades" should perform impressively.

Terminal Emulation

The strongest standalone capability of the GraphText I is its terminal emulation. Options to mimic DEC's VT100 and VT52, or the Tektronix 4010, or simply to stay in the native GraphText I mode are built into the device and selectable using the SETUP key. These emulations are practically industry standards, and the monitor is so dedicated to mimicking them that GraphText I's engineers seem almost to have dedicated a screen of each window to each terminal type.

For example, going from VT100 to 4010 caused a display region to pop up beneath the previous display area for VT100 text. Also, switching back to VT100 erased the 4010 area and displayed a blank screen ready for characters. This method of clearing the screen obviously was a design choice by the manufacturer, yet was disappointing. First, the VT100

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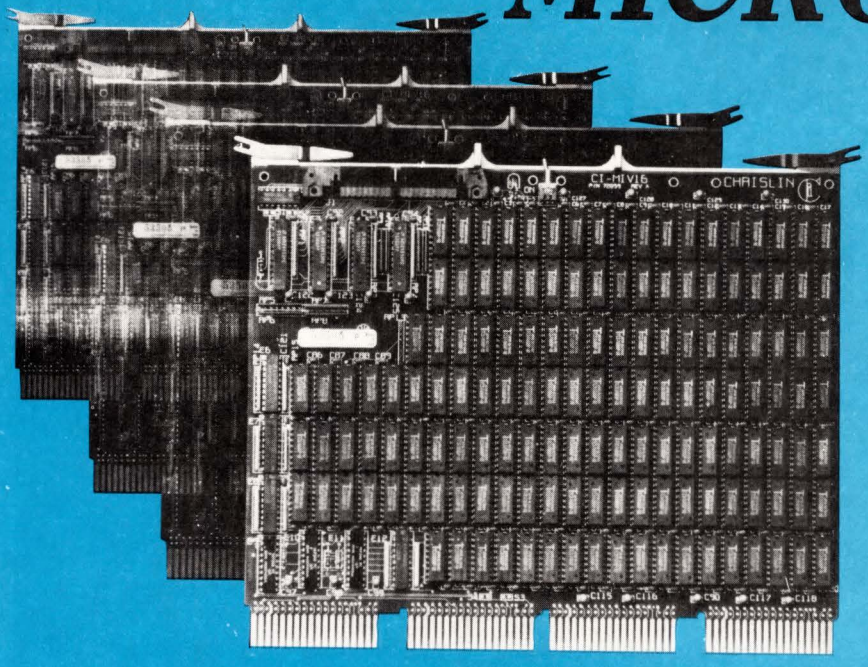

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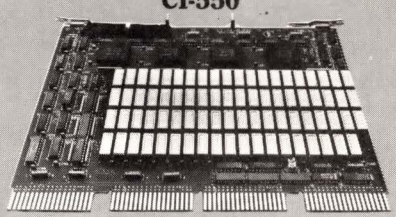

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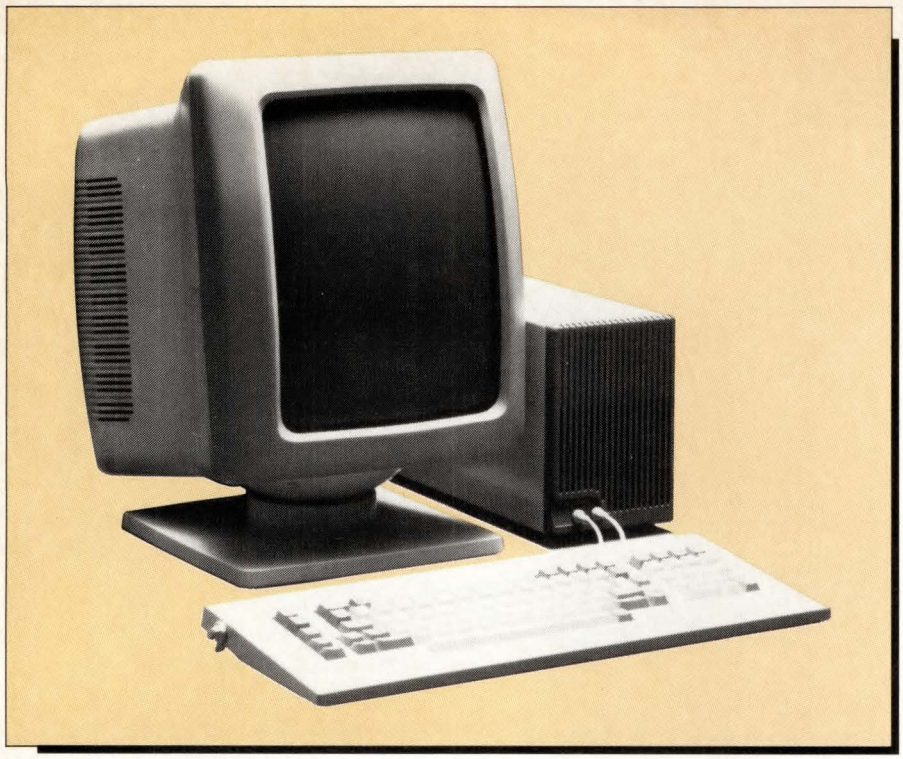

to 4010 change was noticeably slow. I chose a graphics task requiring program editing using EDT to test the various terminal types. EDT almost always demanded the VT100 emulation, while RENDER (Multiware, Inc., Davis, California), a graphics package, would run under VT100 mode, but was designed for, and ran better under, the 4010 emulation.

My attempt to use the 66 available lines on the GraphText I's 15-inch screen was disappointing. Apparently, these are limitations of the editing software. Other unusual characteristics are the nine GraphText I function keys, which generally are placed correctly but lack templates — very useful in multi-terminal emulation and in many other applications. Regardless, I found the terminal quite satisfactory in both modes and deeply appreciated the graphics capability of the 4010 emulation.

Graphics

The GraphText I has various graphics capabilities using different options selectable either from the SETUP mode or through escape codes. Point and line drawing, as well as rectangular region fill, are available as hardware routines.

Each of these tasks can be used with any of the 16 drawing modes, for various effects. The native display mode is convenient and mathematically oriented. Origin is (0,0); positive horizontal moving right, and positive vertical moving up. This allows more intuitive solutions to numerical display problems in such areas as statistics and graphics.

The 2-MB RAM allows 16 pages of data to be stored. Escape codes are included for some tricky downloading of 68000 code. This capability permits the programming of a few more convenient functions used for local graphics processing but missing in hardware, such as ZOOM, PAN, SCROLL, and ROTATE. My impression is that there's very nice display resolution and only fair graphics manipulation, but the possibility of local support for almost any function.

Text Processing

Text handling capacity is another "claim to fame" for this terminal. The GraphText I supports programmable character sets; 192 characters in each set are available for display, although 255 can be programmed and downloaded. Up to 79 fonts are storable at any one time, depending on memory limitations. A few built-in standard fonts, and an optional Kanji set, also are available. With a standard page size of 112 columns by 66 lines, and 2 MB of memory, the potential is here for a fantastic editing terminal *if* the proper software is purchased.

Among the possibilities are:

1. Full page editing. Up to 66 lines can be displayed at once.
2. Proportional spacing. The display is oriented graphically; therefore, software need change only initial display coor-

dinates for characters to facilitate proportional spacing.
3. Superscripts, subscripts, foreign symbols, and graphics are added to text. Similarly, these functions could be used in various applications for sophisticated electronic publishing.

None of the above can be used under current schemes, however, and both proportional spacing and superscripts, etc., require fairly sophisticated text spacing routines (or bit-mapped graphics) not normally found in most text editors.

Documentation

Forward Technology provides simple and well-organized documentation. One document contains all the setup, tutorial and programming information. There's an abundance of lists and short descriptions, but the programming section contains few examples and doesn't explain some of the terminology very well. Finally, there's no information on 68000 code except for a description of the escape sequence to download to and execute on the terminal.

THE GRAPHTEXT I is a terminal full of possibilities. The machine already does a fairly good job of emulating a few standard terminals, and provides a basis for an interesting mixture of graphics and text processing capabilities. Yet, with the right software, this product could produce stellar results as an excellent graphics workstation, an impressive word processing station, and as an emulator for current applications.

David Goldstein is an independent consultant from Philadelphia, Pennsylvania.

GraphText I
Forward Technology, Inc.
227 Devcon Drive
San Jose, CA 95112
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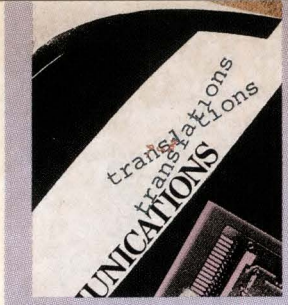
Price: $2,950.



COMMUNICATIONS

REFLECTION 2 PLUS

By Victor J. Chorney

Not Just Another Terminal Emulation and File Transfer Package.

When the first 8088-based machine was introduced several years ago, a few of us were discussing its potential. The one thing we agreed on was that it was unlikely the power of the Z80 chip would ever be exploited. Further, since the Z80 (and its predecessor, the 8080) had been on the market for so long, it was doubtful whether anyone would exploit the 8088 before it, too, became obsolete.

Well, the next generation of processors has arrived, but Walker Richer & Quinn has taken a significant step in exploiting the power of the "old" 8088 anyway. I'm enthusiastic about the result. Calling *Reflection 2 Plus* just another terminal package is like calling CD ROM just another storage device.

Installation

While installation is merely a matter of copying the desired files from the two distribution diskettes and running the INSTALL program, configuring the software for a particular operation requires a bit more effort. You must select from a series of setup menus and choose the desired options. The selections then are saved to a configuration file. For more than one type of operation, you can create a suitable configuration file for each by simply overriding the default name. Upon execution, you select the appropriate configuration file.

VT220 Terminal Emulation

Reflection 2 Plus offers complete VT220 terminal emulation, and the methods for getting around the obvious PC hardware limitations are quite ingenious:

1. The 132-column mode is "supported" by implementing horizontal scrolling. As a further enhancement, the right margin actually can be set to greater than 132 columns for extra-wide printers.
2. Double-width mode is simulated by inserting an extra space between each character.
3. Multiple video attributes are "grouped" for user selection.

I used EDT to see how the video attributes are handled. When I invoked "help," I received the familiar line-graphics "keypad" and the bold-character control key display. Interestingly, because IBM hardware doesn't allow simultaneous display of 16 video attributes, you can choose the desired attribute presentation. The choices are shades of color (tones of grey) or character attributes.

File Transfer

Five protocols are available: WRQ eight-bit and WRQ seven-bit (*Reflection* provides programs for both), XMODEM, KERMIT and "clear text" using XON/XOFF flow control. Further, you even have a choice of methods/interfaces to control actual file transfer: menu, command interface, or batch file. As a result, you can determine for yourself just how sophisticated or automated you want the operation to be. That's all well and good, you say, but what's so wonderful about it? Well, once you have your transfer operation in progress in either direction — PC to host or host to PC — you actually can go back to DOS and do something else!

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I started a long document transfer to the VAX to test this, then popped out to DOS (via the Alt-<Right-Shift> "hot key") and started *Lotus 1-2-3*. The only time I really noticed degradation in the file transfer performance was when I accessed the hard disk. While performing console operations, the modem lights just kept flickering as if connected to some other device. Thus, when I said the CPU power had been unlocked, I wasn't exaggerating!

The operations of BACKUP and RESTORE are among the many supported by *Reflection*. The host, therefore, can be used as an archival device for your critical PC-based files. And, because the command language is so versatile, the archiving operation can be set up to be initiated and controlled by the host.

Printing

The high degree of versatility *Reflected* in file transfer also is apparent when printing, including when background printing. You can do a PRINT SCREEN, of course, and can echo to the printer, but you also can direct output to the printer and to a file simultaneously, from a disk file to the printer, or from the host directly to the printer without it being displayed. The only other thing to implement would be buffering, and guess what? — they did — up to 254 KB worth.

Controls And Menus

All control operations are initiated by pressing the appropriate function key(s); the choices are clearly presented at the bottom of each display. If you know the commands for the desired operation, you need not go through the menu system; otherwise, the commands are available from the "help" screen by pressing F7 at the Main Menu. Pressing Alt-F10 calls the command line, which appears in reverse video at the bottom of the screen. You then may type in the commands.

If you decide to use the menus, you'll find them linked in a simple hierarchical fashion. They're appropriate

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CONTROL DATA

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only for the operation selected, however, and not for multiple purposes.

Menu selections include the Main Menu — a display of the function keys for invoking the setup menus (appearing at the bottom of the screen), and the set-up menus themselves: the Data Communications Parameters Terminal menu, the Operating Modes Printer Characteristics menu, the Display Enhancements Tabs Soft Keys menu and the File Transfer Parameters menu.

Once you've set the desired options, you can eliminate much of the repetitive manual effort by saving the configuration and making minor modifications during actual operation. Inevitably, errors will occur, but the manual provides detailed explanations for most.

Other Features

All IBM and DEC keys are supported, and "mapping" is quite intelligent. Access to the PF1 to PF4 keys, for example, is handled by a simple "toggling." The software also recognizes and differentiates multinational character sets. As a result, if you're directing output to a DEC printer, the correct character will appear on that printer.

With *Reflection*, you can define eight softkeys capable of holding up to 75 characters with an optional 16-character mnemonic label. Depending on how it's made, the definition can be transmitted or interpreted locally.

The package includes command line editing, which allows not only recall of the previous commands (stored in video memory) but modification using the cursor movement, insert, and delete keys.

Finally, *Reflection 2 Plus* provides LAN (Local Area Network) support: Ungermann-Bass, Bridge 3-COM, Syntax, and PC-NET varieties.

Documentation

Reflection 2 Plus comes with an accordion-style command reference card and a user manual. The card is nicely organized; once you've mastered the basics of the software, most opera-

Reflection 2 Plus
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tions can be controlled by referring to it. The manual is extremely comprehensive, and also is my sole target for criticism. There's so much in it, that were it not for the index and the chapter titles at the top of the pages, it would be overwhelming. The problem is that there are only six tabs, and one is for the index. I'd recommend adding your own tabs to help find things quickly.

The Appendix is comprised of nine very useful sections: Command Language Keywords, Host Data to Lotus 1-2-3, Keyboard Functions, Escape Sequences, Control Characters, Keyboard Generated Codes, Character Sets, and Error and Other Screen Messages/Glossary.

Support And Upgrades

Walker, Richer & Quinn provides free warranty phone support (with callback) for *Reflection 2 Plus*. You also can obtain upgrades to newer versions of the product at reasonable cost.

Reflection 2 Plus belongs in your software library if you plan to do any kind of communications. It's suitable for every VAX installation with IBM PCs and compatibles.

Victor J. Chorney is senior consultant at the accounting firm of Glickman, Berkovitz, Levinson & Weiner in Elkins Park, Pennsylvania.

LET'S C NOW

Rex Jaeschke

More On Style

Editor's note: The proper use of white space and the positioning of braces are much debated topics. In this issue, Mr. Jaeschke gives us his ideas on these areas. He also provides some tips in making declarations and function definitions clearer.

Apart from using meaningful names, the next best programming style aid is to use generous amounts of white space. First, use blank lines to separate unrelated sections of code, or sections within related code.

Place a blank line before each function definition and before and after each block of comments. Put a blank line between the last declaration and the first statement in each function block as follows:

```
/* This function .... */

f()
{
        int i;
        double d;
        extern char *finder();

        executable code;

/* block of comments goes here
.............................
............................. */

        if (cond) {
                char c[10];
                long longvalue;

                more code;
        }
}
```

Group preprocessor directives (especially **#defines**) and precede and follow the group with a blank line. For example:

```
/* Command-line Processor routines */

#include <stdio.h>
#include <string.h>
#include "clp.h"

extern double atof();
extern long atol();

/* clpprosw - process all of the switches (if any) on the
command-line.  Returns ERROR if any invalid switches found, else
returns # of switches.  */

clpprosw(argc,argv,clpswtab)
{
        ...
}
```

I often place a blank line after the brace, which terminates a compound statement such as in:

```
if (cond) {
        ...
        ...
}

i = j + f(k);
```

Placing a blank line between cases in a **switch** construct and highlighting nested switches is also useful:

```
switch ((int)(clpswtab->swvtype)) {

case SVSTRING:
        clpswtab->swstring = swvalst;
        return (TRUE);

case SVLONG:
        clpswtab->swlong = atol(swvalst);
        return (TRUE);

case SVDOUBLE:
        clpswtab->swdouble = atof(swvalst);
        return (TRUE);

default:
        error(clpswtab->swvtype);
        return (TRUE);

}
```

Apart from blank lines, blanks can be employed usefully within a line. Separate all operators and language keywords from other tokens by at least one space. The following example shows a very useful function written without any white space at all:

```
char*string_copy(dest,source)
char*dest; char*source; {
char*saveptr=dest;
while(*dest++=*source++) ;
return(saveptr); }
```

White space, and some simple indenting and placement, can make all the difference:

```
char *string_copy(dest, source)
char *dest;
char* source;
{
        char *saveptr = dest;

        while (*dest++ = *source++)
                ;

        return (saveptr);
}
```

6

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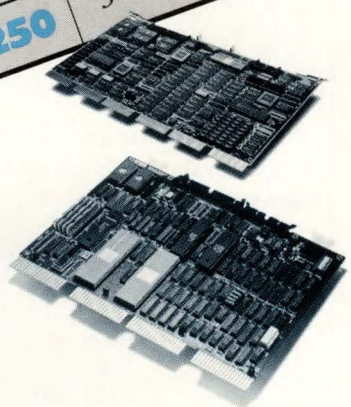

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One rule followed here is to put the null statement on a line of its own, and to use indenting to make it stand out. The null statement need be used only in special circumstances,

The biggest time waster in C is where to put those darn braces. . . . as a free-format language, C couldn't care less . . .

so it makes sense to identify those cases explicitly, even if they are commented.

Another very simple rule is to place a space after each punctuation comma, in declarations and formal and actual argument lists, both in macros and functions.

```
#define max(a,b) ((a)>(b)?(a):(b))
#define max(a, b) ((a) > (b) ? (a) : (b))

#define min(a,b) ((a)<=(b)?(a):(b))
#define min(a, b) ((a) <= (b) ? (a) : (b))

#define abs(x) ((x)<0?-(x):(x))
#define abs(x) ((x) < 0 ? -(x) : (x))

        f(arg_1,arg_2,arg_3,arg_4,arg_5);
        f(arg_1, arg_2, arg_3, arg_4, arg_5);
```

If you insist on not using white space around operators, you can end up with expressions like **i+++++j** and you have to scratch your head and resort to pencil and paper to recall just what you meant, and if that's the same as the compiler interprets it? The expression, by the way, is treated as **i++ ++ +j**, which is a syntax error. This expression is equivalent to **(i++)++ +j** but since the result of **(i++)** is a value, NOT an lvalue, it cannot have the ++ operator applied to it. Even though **i+++ ++i** is a valid expression, the compiler is obliged to diagnose a syntax error if the white space is omitted. This is because a token is the longest sequence of characters that is a legitimate token, and the parser breaks the source into such tokens. It must take ++ + and not + ++.

Positioning Those Braces

Excessive amounts of time are wasted by many programmers in trying to decide the "best" way to layout code. The biggest time waster in C is where to put those darn braces. While you ponder this problem, remember that, as a free-format language, C couldn't care less; it's just a matter of personal preference and perceived readability.

The format used by K&R (and hence by most of those who learned from that text) is as follows:

```
function(arg_list)
arg_list declarations;
{
        declarations/definitions;

        while (cond) {
                ...
                if (cond) {
                        ...
                        if (cond) {
                                ...
                        }
                }
        }

        do {
                ...
        } while (cond);

        switch (value) {

        case a:
                ...
        ...

        default:
                ...

        }
}
```

The rules used here are: 1) Whenever a compound statement follows a test/loop construct, place the opening brace on the same line as the test as shown above. The closing brace occupies its own line and is indented the same as the first character in the initial test expression. 2) In all other uses of a compound statement, both the opening and closing braces are on their own lines and they have the same indentation — that of the start of the previous statement.

The latter rule is used in each function's top-most block level and in constructs like:

```
if (cond) {
        ...
}

{
        declarations/definitions;

        code;
}
```

One popular alternative approach is to always have the brace pair lined up with each other as well as the parent statement as follows:

```
while (cond)
{
        ...
        if (cond)
        {
                ...
                if (cond)
                {
```

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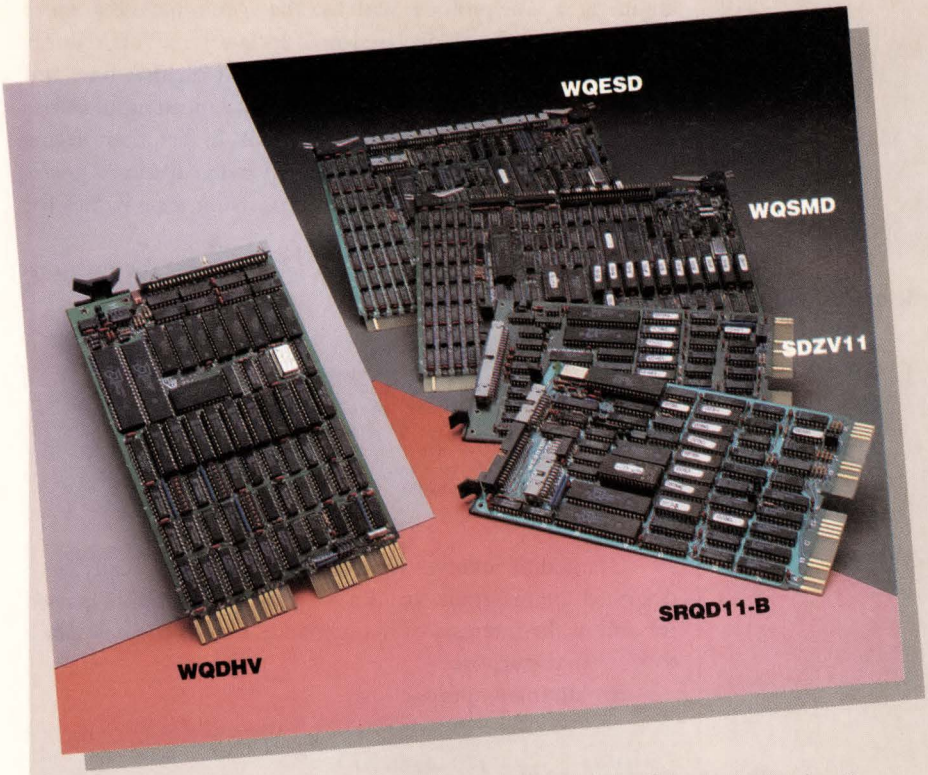

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```
                    ...
                }
        }
}
do
{
        ...
} while (cond);

switch (value)
{
...
}
```

Yet another common method indents the braces with the subordinate code.

```
while (cond)
        {
        ...
        if (cond)
                {
                ...
                if (cond)
                        {
                        ...
                        }
                }
        }

do
        {
        ...
        } while (cond);

switch (value)
        {
...
        }
```

Personally, I favor the K&R approach since that's the first one I saw, it works just fine, and it's probably the lowest common denominator given K&R's popularity. Whatever method you choose, be consistent, and be prepared to enforce it with new programmers. While these practices are largely subjective, they can present a significant obstacle to programmers who practice a different philosophy.

Declaration Format

C allows one or more identifiers to be declared in the same declaration. (Note that, from a syntax viewpoint, a definition is simply a declaration with an initializer list.)

Almost all textbook and classroom examples are trivial; they tend to emphasize some particular technical point and aren't necessarily good examples of programming style. Nowhere is this more so than with declarations. It is common practice to see:

```
f()
{
        int i, j, k;                    /* general comment */
        char name[30], temp[20], c, *pc; /* general comment */

        ...
}
```

While this approach may be adequate for simple routines, or in prototyping, it will not suffice in serious software engineering. The problem with the above example is that more than one identifier is declared in a declaration. This reduces the ability to add a meaningful comment on that line, and places more emphasis on the need for more meaningful names which, unfortunately, don't always result. In fact, there seems to be some competition to get as many variable names as possible on the one line, even if that means using terse names for each.

Just how much work does it take to write the previous example as:

```
int i;          /* index level 1 */
int j;          /* index level 2 */
int k;          /* index level 3 */
char name[30];  /* name of end user */
char temp[20];  /* temp copy of first name */
char c;         /* current name char pointed to */
char *pc;       /* pointer within name */
```

Granted, it involves more typing, but if you really have designed the program, you know what each variable is used for and in the interests of maintenance, here is the best place to state that purpose.

An alternate approach is:

```
int i,          /* index level 1 */
    j,          /* index level 2 */
    k;          /* index level 3 */

char name[30],  /* name of end user */
     temp[20],  /* temp copy of first name */
     c,         /* current name char pointed to */
     *pc;       /* pointer within name */
```

This is equivalent, but, syntactically, it is not the same. In the previous example, **i**, **j**, and **k** are declared in three separate declarations, whereas in this one, they are all part of the same declaration. Note that this is of no real consequence to the compiler.

I prefer one identifier per declaration because that gives me maximum flexibility when using a "cut-n-paste" text editor. I can insert or delete declarations, or rearrange their order without impacting the other declarations. I can't always do that with the latter method. For example, to delete the declaration of the pointer **pc**, I have to change the comma after **c**'s declaration to a semicolon. And if I want to add another **int** after **k**, its semicolon must become a comma.

Why would you want to reorder declarations? Well, I like to group declarations by ascending size of type and alphabetically within those groups; this can be tedious to do manually in an editor. If you have a large number of declarations, and some not-too-fancy software, you can cut the block of declarations and write it to a file, sort it, and reinsert it back. And

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presto, the list is ordered by type and name within type, provided you use a consistent method of indenting and white space between type and identifier name.

This technique is particularly useful with externals. Doing this with all global declarations and/or definitions allows a useful global data dictionary to be constructed.

Function Definitions

A function definition indicates the function's return type as well as its argument list. Omitting the return type defaults to type **int**. (Use the **void** type for functions that have no return value.)

For functions that return values of type *T* where *T* is one of C's native scalar types, the "normal" definition method suffices. However, it may not with aggregate, pointer, **enum**, and **typedef**ed types.

```
char freq(string)
{ ... }

int imax(i, j, k)
{ ... }

long int lmax(li, lj, lk)
{ ... }

double dmax(di, dj, dk)
{ ... }
```

These return types are reasonably obvious, as are the location of each definition. However, if you must put multiple functions in a source file, add good comments to delineate them as follows:

```
/****************************

FREQ - this function ...

****************************/

char freq(string)
{ ... }

/****************************

IMAX - this function ...

****************************/

int imax(i, j, k)
{ ... }
```

Let's look at some more complicated return types. In these examples, the actual function code has been omitted for simplicity.


```
char **search(arg_1, arg_2, arg_3)

struct flags *check(arg_1, arg_2)

union storage locate(arg_1, arg_2, arg_3)

enum color match(arg_1, arg_2, arg_3)

treenode *treesearch(arg_1)

int **(*access(arg1, arg2))()
```

Now, the function definitions are not easy to find or understand. As well as using comments to help both of these shortcomings, a common approach is to put the return type on the line previous to the function name as follows:

```
char **
search(arg_1, arg_2, arg_3)

struct flags *
check(arg_1, arg_2)

union storage
locate(arg_1, arg_2, arg_3)

enum color
match(arg_1, arg_2, arg_3)

treenode *
treesearch(arg_1)
```

Hence, function names in function definitions always begin in column one. However, this doesn't work with the definition of function **access** since the return type is both a prefix and suffix. This problem can be solved using the **typedef** statement.

```
typedef int **(*obscure)();

obscure
f(arg1, arg2)
```

Just in case you are wondering what some of these return types are, here are the English language translations: **search** returns a pointer to a pointer to a **char**. **check** returns a pointer to a structure of type **flags**. **locate** returns a union of type **storage** (not a pointer to a union, but an actual union). **match** returns an enumerated value of type **color**. **treesearch** returns a pointer to a **typedef**ed type **treenode**. And, finally, the really tricky one, **access**. This function returns a pointer to a function which returns a pointer to a pointer to an **int**. Got it?

Readers are encouraged to submit any C-related comments and suggestions to Rex Jaeschke, 2051 Swans Neck Way, Reston, Virginia, 22091.

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.

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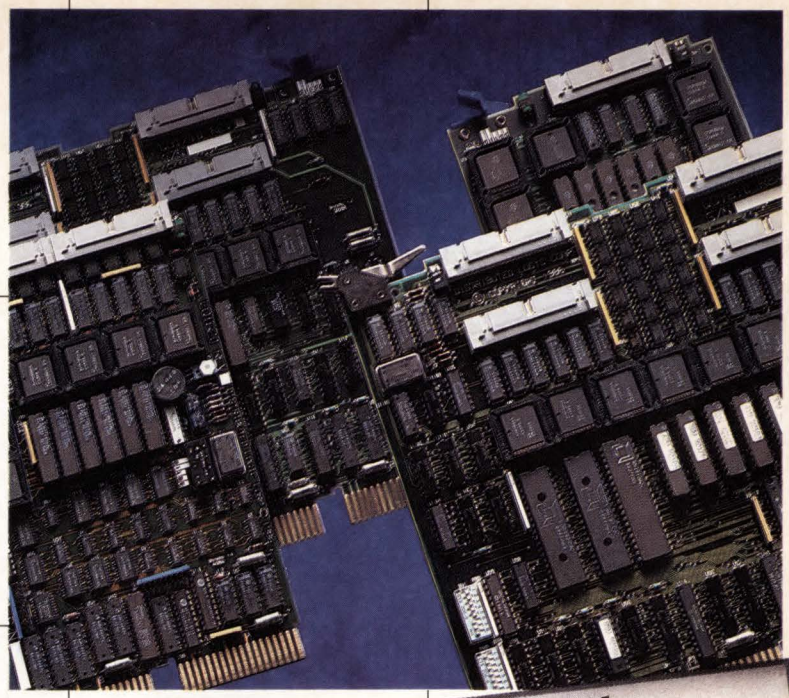

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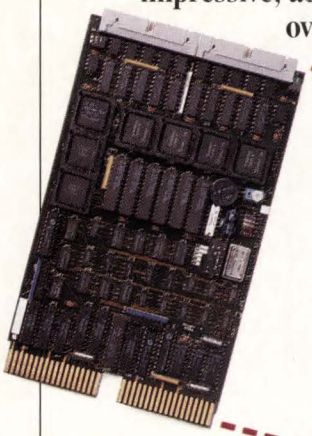
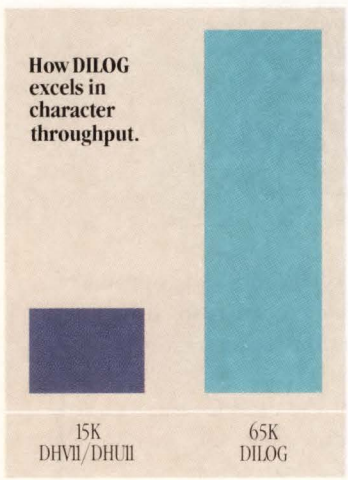


More Economy

DILOG's new generation communications controllers save from $40 to $90 per line. Multiply that by the lines in your system, and you'll see substantial bottom-line benefits.

More Useable Space

In every instance, DILOG uses a smaller board — typically dual-size — or puts more lines on the same size board.

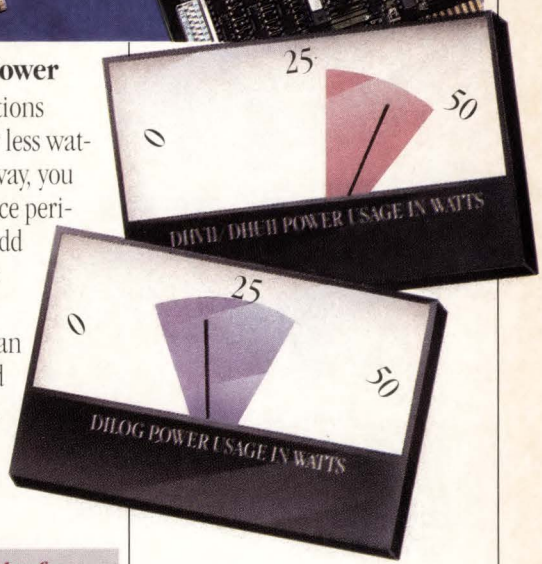


More Throughput

Compare the competition's throughput to DILOG. Yes, we deliver an advantage of better than 400%! Results? Less load on the system and fewer pauses in data transfers. DILOG controllers feature 32 character transmit buffers on each channel and support data rates to 38.4K baud.

More Available Power

DILOG communications controllers draw far less wattage per line. This way, you don't have to sacrifice peripherals when you add communications to QBUS systems. And with UNIBUS, you can eliminate the need for an expansion chassis for controllers.

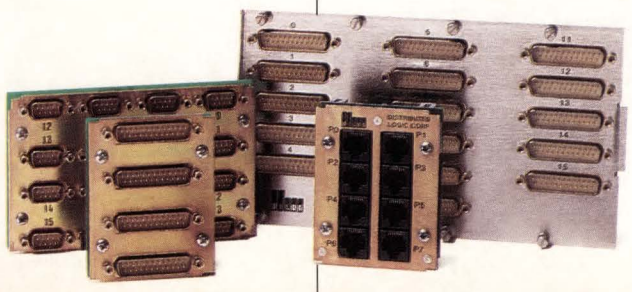


DHV11 compatibles for MicroVAX, MicroPDP-11, LSI-11

CQ1620 — dual board; 8 RS-423 channels; full DHV11 modem set.
CQ1622 — dual board; 8 RS-422 channels; data leads.
CQ1610 — quad board; 16 RS-423 channels; full DHV11 modem set.

DHU11 compatible for VAX and PDP systems

CU1710 — the only full-function 16-channel multiplexer on a quad board; RS-423 channels; full DHU11 modem set.



More Connectivity

A comprehensive choice of distribution panels simplifies installation, provides application flexibility, and assures easy migration to new configurations.

More Information?

Call today and see why DILOG has shipped over 60,000 controllers to some of DEC's best OEMs. Contact: DILOG Corporate Headquarters, 1555 S. Sinclair St., Anaheim, CA 92806; (714) 937-5700 TLX: 6836051. Eastern Regional Sales Office: 64-A White Street, Red Bank, NJ 07701; (201) 530-0044. UK Sales Office: Chester House, Chertsey Rd., Woking, Surrey GU21 5BJ; (4862) 70262 TLX: 859231. International Sales & Manufacturing: Route de Boudry 14, 2016 Cortaillod, Switzerland; (4138) 424454 TLX: 952751.

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FROM THE LAB

Dave Mallery

The Poetry Of A Power Controller

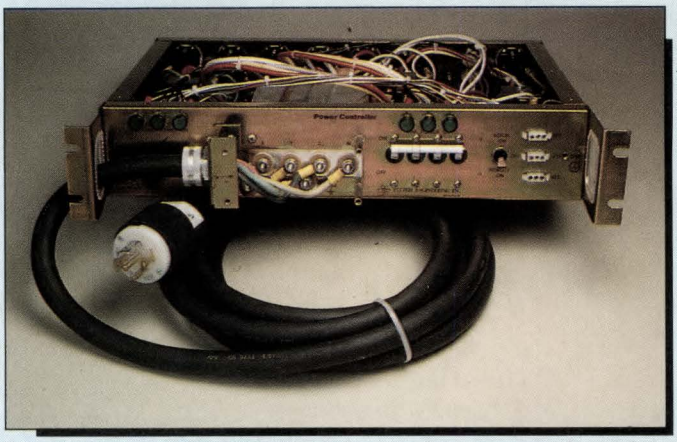
What could be less interesting than a lowly power controller? Well, here's one with a very neat twist: time delay. The Pulizzi Z-Line PC-300 unit has three contactors, each of which switches four outlets. When the unit is activated, they come on with a delay of approximately five seconds

> ***". . . here's one with a very neat twist . . ."***

between each group. That allows the high in-rush current of disk motors that have started, to die down before the next segment of load is applied. In my book, that's a truly neat idea.

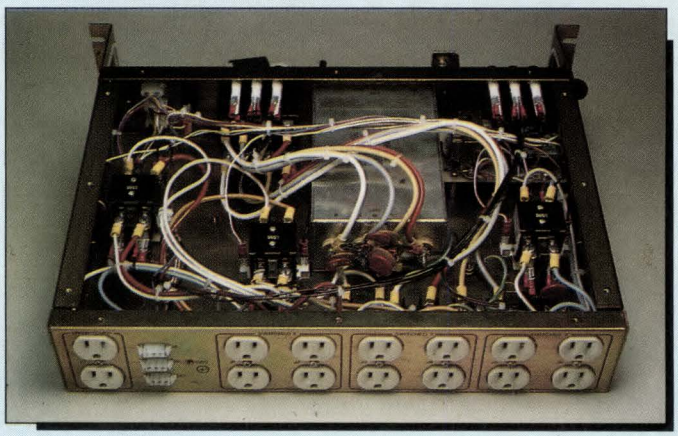
While we have a power controller open on the bench, lets look at the pieces. First, the power comes from the wall in a three-phase cable that contains a ground wire, a neutral wire and three hot lines. It then goes through a filter unit. This is designed to remove spurious high-frequency interference from the incoming a/c wave form (the large silver unit in the center). Note that there are surge supressors strategically located on the output side of the primary filter and on each of the single-phase contactors.

The small circuit board in the upper right controls the timing sequence. After the 1-2-3 sequence is finished, a fourth relay closes a pair that can sequence-on another power controller elsewhere in the system. That pair is available on J8.



Joseph P. Edelman

The front view of the PC-300 (above) with power cable, and the rear showing three sets of power outlets.



The unit has five other connectors that are the remote control inputs. If you connect pin one to pin three the unit will power up, provided the unit is set for "remote." If you short pin two to three, all three of the switched circuits, as well as the J8 remote, will disengage. This is good for power-down sensor circuits such as temperature and water. See *DEC PROFESSIONAL*, August, 1986, Vol. 5., No. 8, for a review of SAM (Smart Ambient Monitor).

This is a fine piece of work. Consider a retro-fit for installations where the number of disk drives has grown to the point where the in-rush current has become a serious consideration. ■

The Pulizzi Z-Line PC-300
Pulizzi Engineering, Inc.
3260 South Susan Street
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(714) 540-4229

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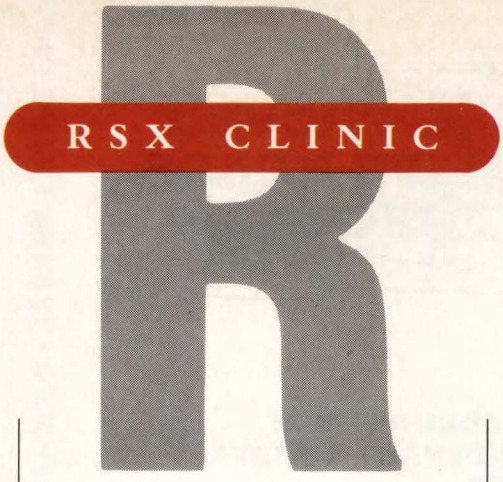

SUPPLEMENTARY DOCUMENTATION

QUESTION: *Are there any books I can read about RSX and creating applications under it? How can I get an RSX internals manual? Any recommendations for going through the RSX manual set?*

REPLY: Let's start with the RSX manual set, which is your primary reference. It largely has been rewritten in the past few years, and now is a good tutorial and reference source. Coming to terms with the RSX manual set can be a frightening proposition though, because the full manual set occupies at least four feet of shelf space. No one can accuse RSX of being sparsely documented.

A manual is read best by "attentive browsing." It's not possible to retain all the detail, but it's always possible to remember the general topic and where you found it. Your objective should be to learn which manual(s) to pick up, given a topic. The Master Index is a help, but using it too often wastes time and desk space.

With an elementary understanding of RSX and its general operation — using terminals, getting a simple RSX task written and running — you'll benefit most by starting with the introductory material in the *Task Builder* and the *Executive Manuals*. The idea is to become acquainted with the topics covered by each manual, so that you know which to pick up when referencing a given item. Save your quest for detailed knowledge for a later pass at the manual.

The RSX manuals are subdivided into tutorial, reference, and appendix sections. The tutorials, including the diagrams, should be read first. Browse the reference material also in the first pass.

The appendices should be scanned lightly for topical content. Appendices are always a surprise because they have two purposes. First, they always contain a terse technical summary of the manual. I always strip the appendices from my manuals and place them in separate binders, creating a summary manual.

The second purpose of an appendices is to provide a place where DEC can put technical material not otherwise classifiable. You'll find lots of special stuff here, so it's a good idea to browse through all of the appendices.

A programmer creating serious software to run under RSX, next should read the *Task Builder Manual* and the *Executive Manual* cover to cover. Those performing system management activities, like system generations and installing and running software packages, should read the *System Management Manual* and the *System Generation Manual* cover to cover.

Next, the command language manuals for DCL and/or MCR should be browsed, read and periodically reread.

The manuals distributed with MICRO/RSX contain minimal information and seem intended for those who want to learn only enough to run a packaged application. The full MICRO/RSX manual set is worthless; buy the full RSX-11M-PLUS manual set instead.

The next source of good information is the *RSX Multi-Tasker*, the RSX newsletter published by DECUS. You must be a DECUS member to subscribe. The *RSX Multi-Tasker* has been published since 1975, and is the most voluminous DECUS newsletter. The first 14 volumes (1975 though 1980) are on microfiche, but I doubt they're still available since only a few hundred were ever made.

Each Special Interest Group (SIG) within DECUS publishes its own newsletter, and all are bound into a single large monthly publication. When you join DECUS, pay close attention to the IAS and RT-11 SIG newsletters, because the information published often applies to RSX.

The ultimate documentation for any operating system is its Executive source code. The serious prospective RSX system programmer should read some of the Executive sources. The source code for the RSX Executive and the privileged tasks is distributed as part of the full RSX distribution kits. The Executive is very modular and well documented. Reading it requires a knowledge of MACRO-11. Those who know a little MACRO-11 will learn a lot more in the process.

By James McGlinchey

I respond to those questions that are both interesting and applicable to the general RSX user. Please mail your questions to: RSX Clinic, DEC PROFESSIONAL, P.O. Box 503, Spring House, PA 19477-0503. Questions also can be submitted through ARIS.

Reading the Executive should start with the SYSXT module (the RSX context switcher), the TDSCH module (the clock processes), SYSCM and LOWCR (executive data), and finally, DLDRV (the RL02 device driver).

At the risk of tooting our own horn, the *DEC PROFESSIONAL* is next on the list. We have an RSX-oriented article in every issue.

Digital Press recently published a book entitled *RSX — A Guide for Users*, by Pieper. This is worthwhile for the inexperienced scientist or programmer who just wants to get the job done with RSX and never-mind-the-niceties-thank-you.

The explanations are in the style of a one-on-one tutorial, with good examples of commands and their importance. The text explains the topic without going into excruciating detail. Every RSX site should have a copy. (Look for a full book review in an upcoming *DEC PROFESSIONAL*.)

The Hitchiker's Guide to RSX is a shorter tutorial written along the same lines, that guides the reader through the major RSX facilities. It also is free. Write to:

A-to-Z Base Product Marketing
MKO1-2/E25
Digital Equipment Corporation
Continental Boulevard
Merrimack, New Hampshire 03054

DEC runs a seminar series called "RSX Real-Time Design and System Performance Management." The handouts are useful supplements to the RSX manual set. The seminar handout contains lots of checklists and recipes for designing applications, generating well-running systems and tuning in-place systems. Included, is a bound set of landmark RSX papers — important articles that either are out of print or never got there. The original RSX design paper written by David Cutler, the author of RSX, is in this collection. You'll have to take the course to get the handout here too, but it's worth it. ■

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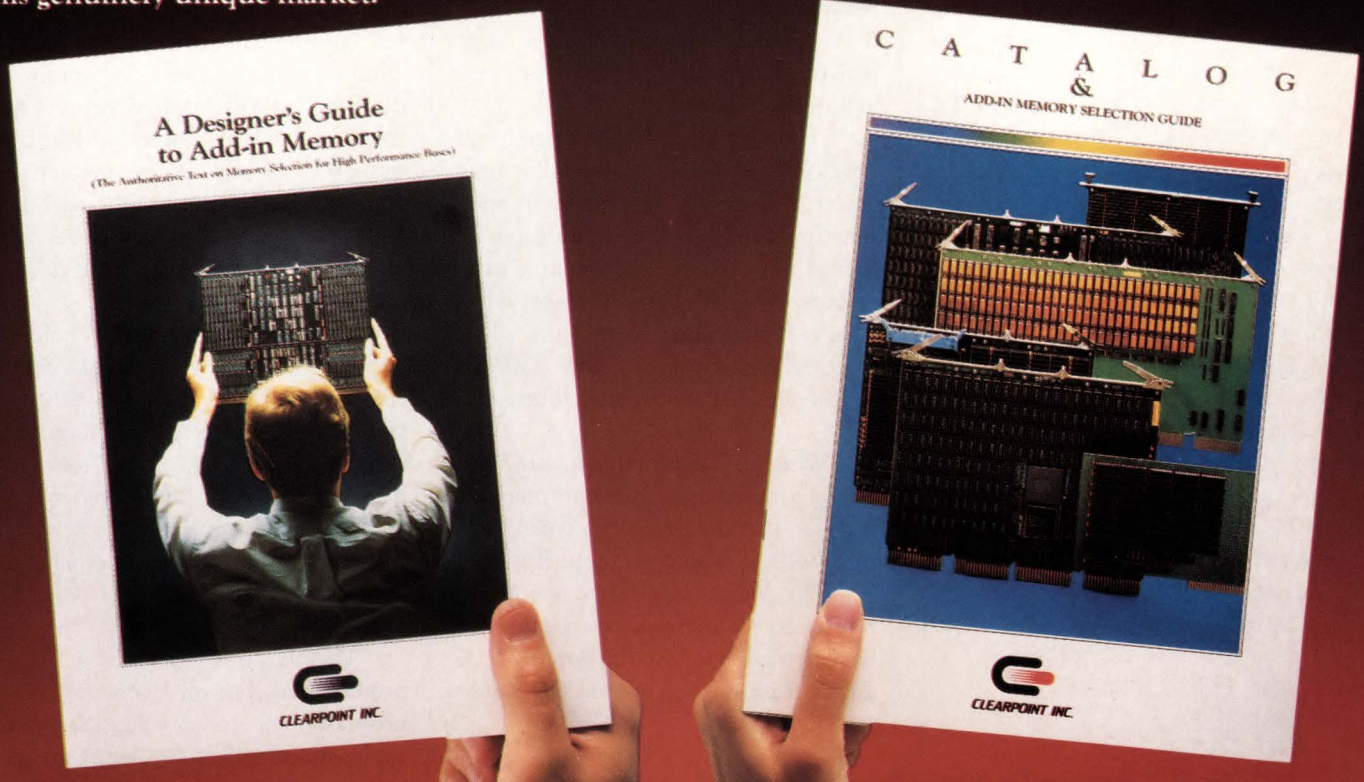

The Designer's Guide to Add-in Memory

will be invaluable to anyone who has waded through product literature to buy a memory board. It provides answers to: what all those specifications really mean in terms of performance; how to look for reliability and quality control in a product; and how to get honest value for your dollar.

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DEC NEWS

Charles Connell

DEC'S Latest In Real-Time

In preparing to announce some significant new products, the folks at DEC talked with *DEC PROFESSIONAL*. In the scientific/real-time product area, these new products range from the smallest VAX ever to powerful large VAXs, and include enhancements to an operating system and new features for a scientific workstation.

Specifically, the following products were announced:

1. The KA620 is a single-board VAX for real-time applications. This computer fits onto the DEC Q-bus and is 8.4 x 10.5 inches. It includes 1 MB of onboard memory and a floating point processor.
2. The rtVAX 8550 and rtVAX 8700 are larger VAX configurations designed for real-time use.
3. Version 2.3 of VAXELN, the DEC real-time operating system for VAX architecture machines.
4. Version 2.3 of the VAXELN real-time development toolkit. This toolkit runs under VMS and is used to build real-time applications, which then are downloaded onto one of the real-time processors. The toolkit runs on every VAX/VMS machine.
5. Enhancements to the VAXlab MICROVAX II-based workstation.

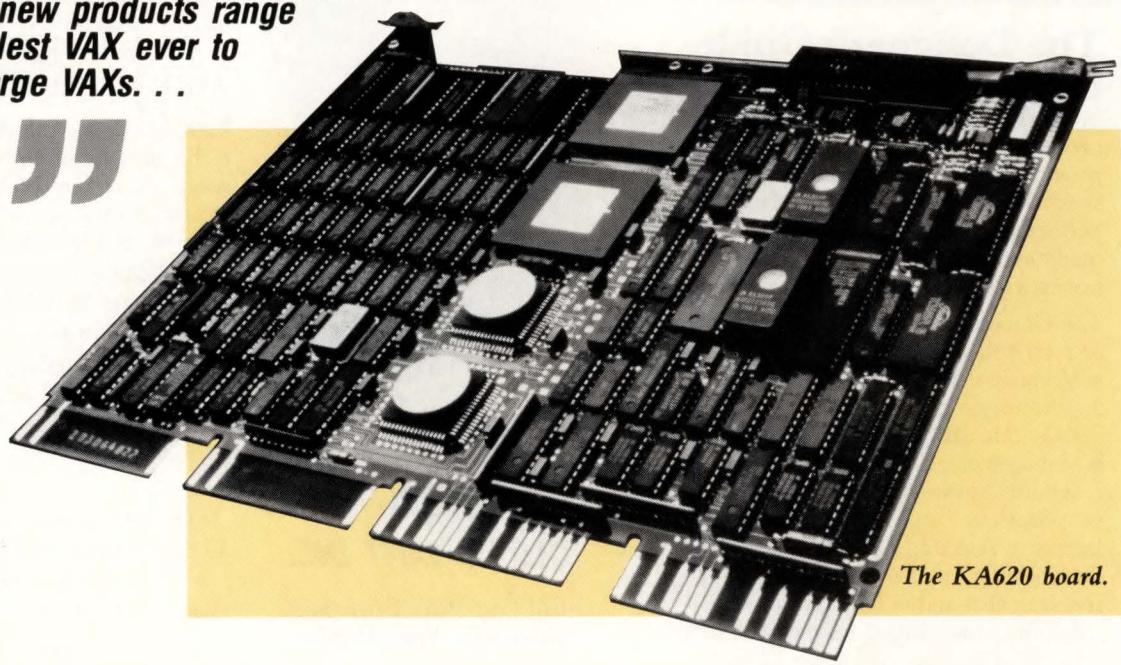
While each part of this package will appeal to some users, the most interesting pieces are the "VAX on a board" and the VAXELN toolkit to support it.

The VAX single-board computer represents the first time that customers have been able to buy the popular VAX architecture on one board. The KA620 will find uses in factory automation, instrumentation, robotics, automated test equipment and device control within larger computers. As mentioned, it is supplied with 1 MB of memory and communicates with other devices over the DEC Q-bus. Memory can be expanded to 16 MB with off-board memory modules. The KA620 also includes a time-and-date clock and power-up diagnostics.

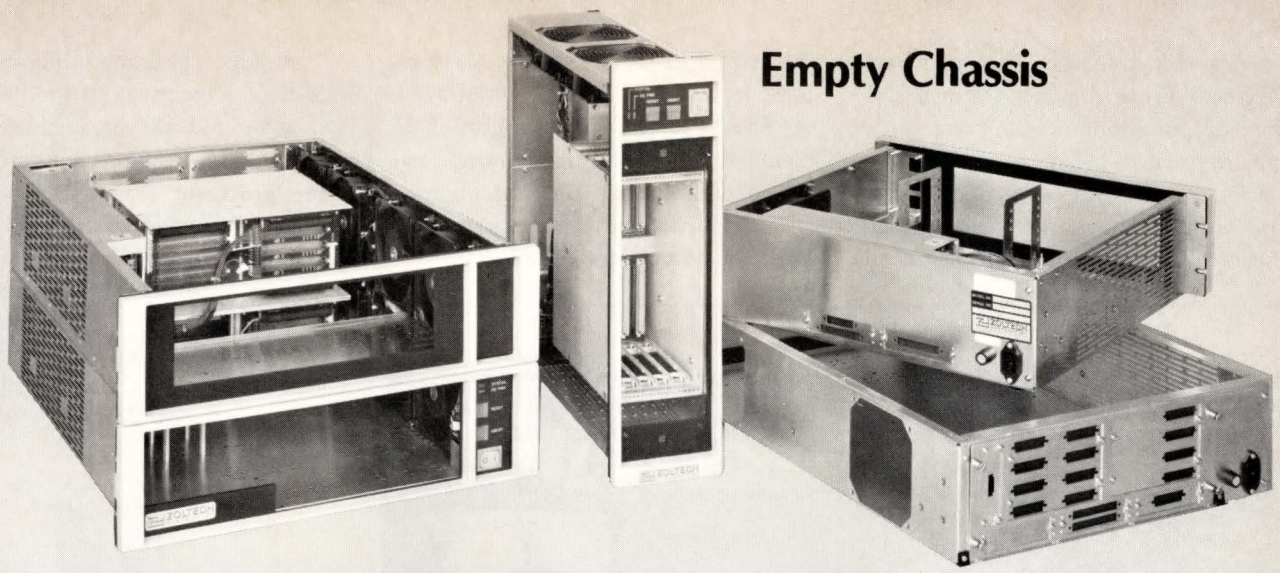
The VAXELN operating system has been around for several years and is enhanced continuously. VAXELN is a small, fast operating system designed to run on computers dedicated to a real-time application. This version of VAXELN supports six processors: the three included in this announcement, the VAX 8500, the VAX-11/73 and the VAX-11/750.

The VAXELN toolkit is a layered product that runs on VMS and allows programmers to develop real-time applications targeted for one of the VAX real-time processors. The development

> ***"In the scientific/real-time product area, these new products range from the smallest VAX ever to powerful large VAXs. . ."***



The KA620 board.



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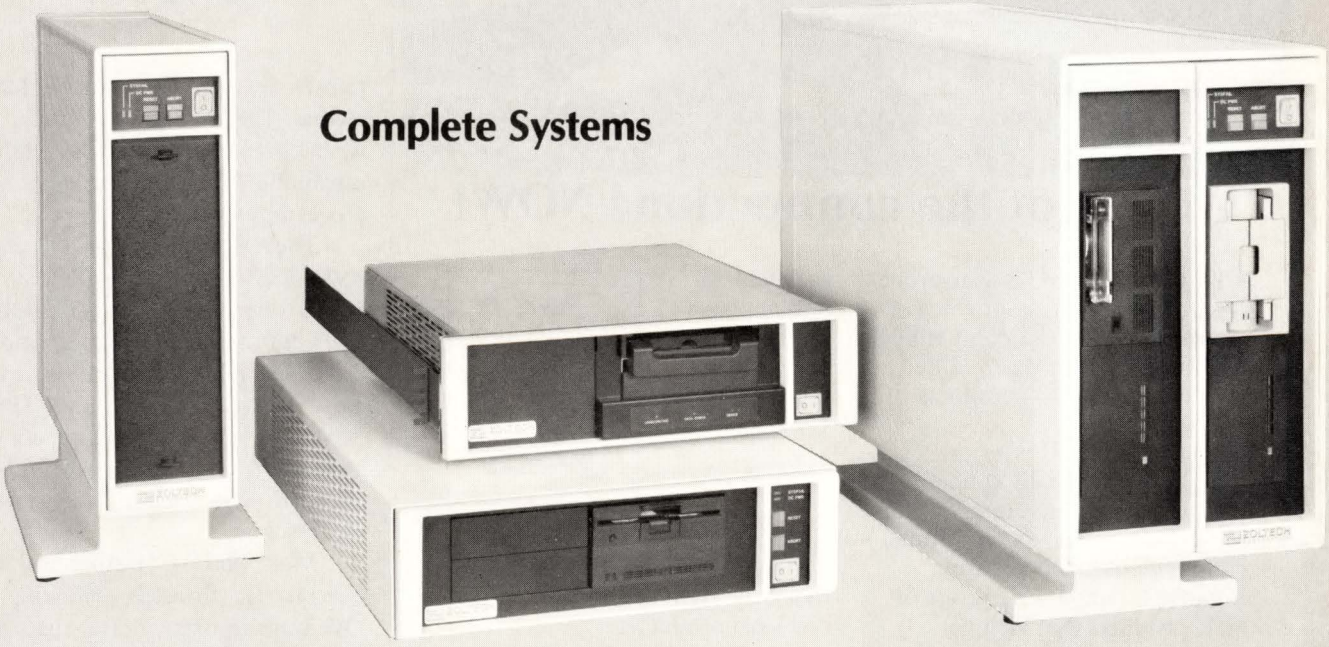

Zoltech's modular design allows literally thousands of configurations to be built with its V-series family of system chassis. Zoltech will deliver anything from empty metal shells to completely tested turnkey systems: You decide what you want to do and Zoltech will do the rest. Q-Bus and VME systems are our specialty, but we also do custom designs.

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process works in the following way. Programmers work under VMS using all the DEC program development tools they're used to: Language Sensitive Editor, Code Management System, DEC/Test Manager, etc. Programs intended for the real-time processor can be written in Extended PASCAL (supplied with the toolkit), C, FORTRAN-77 or Ada. The real-time application is compiled in the normal manner, then linked with special run-time libraries (also supplied in the toolkit) that include VAXELN system service calls.

A system building utility joins the real-time program with the kernel of VAXELN, and the programmer can download the resulting system to the target processor. A new debugger that is also a part of the toolkit allows the programmer to monitor the real-time application from VMS over Ethernet.

Additions to VAXlab include a new parallel/digital interface—the DRQ-3B—for data transfer with other real-time devices. The DRQ-3B allows transfer at rates of up to 2.8 MB per second. The LabStar software for VAXlab has been upgraded as well, with new capabilities for plotting and signal processing.

> ***"The LabStar software for VAXlab has been upgraded as well, with new capabilities for plotting and signal processing."***

The KA620 sells for $4,995, and the rtVAX 8550 and rtVAX 8700 (each with 8 MB of memory) for $330,000 and $398,000 respectively. A VAXELN development kit (at least one is required) costs between $4,000 and $16,080, depending on the development processor. Run-time licenses of VAXELN are included with each of the real-time processors.

Mac Harris, public relations manager for channels marketing, said "We want to make it clear that DEC is very much in the real-time market. Our 16-bit products have been used in that area for years. Now our 32-bit VAX line also is a part of the real-time world."

Shipments of these products already have begun. ■

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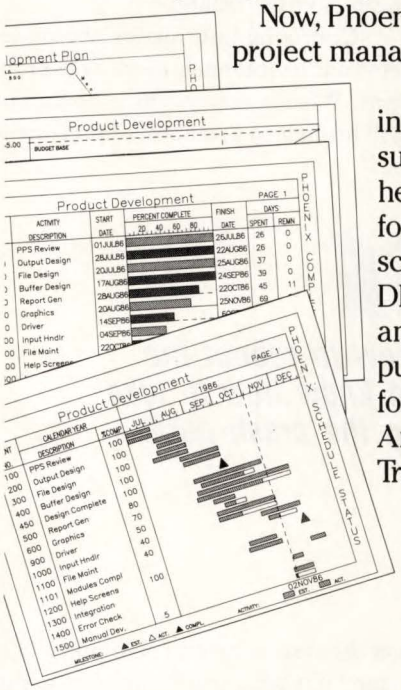

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RESOURCE EXECUTIVE

Ralph Stamerjohn

System Crashes, Part 1

Have you ever noticed how RSX says good-bye to you just as you are getting ready to leave on Friday for the big weekend in the mountains:

```
CRASH — CONT WITH SCRATCH
  MEDIA ON MT0
```

System crashes are a fact of life. While 5:00 p.m. Friday certainly is not a convenient time for a crash, neither is any other time of the week. A crash is never a welcomed experience, but if you're prepared, crashes need not be fatal to your system or your home life.

CRASHES COME IN MANY forms. Most people equate RSX system crashes to the above message and subsequent CPU halt. However, I define crash as any system failure that can be fixed only by rebooting the system. This broader definition includes conditions such as CPU halts or uninterruptible loops, pool exhaustion, memory deadlocks, critical task failure (i.e., F11ACP aborts), and other miscellaneous errors such as removing INStall.

All computer systems crash. The suggestions in this article mostly are common sense and apply to handling system crashes for all systems. However, examples and specific details will be drawn from RSX systems.

The first question regarding crashes is whether you need to bother with them at all? There is a dollar cost associated with handling and analyzing crashes. The cost mostly comes in the form of manpower; either your own, or outside experts if you have no in-house systems expertise.

The payback for the time and money invested in solving crashes comes from the production losses you avoid in the future. A system crash is not a random event. Unlike a spurious hardware glitch, if you do not find and fix the problem that caused your system to crash, the next time the same set of events occurs the system will crash again.

For the lucky sites that consider interruption of service to be only a minor annoyance, crashes can be ignored. Most sites however, can calculate a real cost if their systems fail. The higher this cost, the more steps it's realistic to take to avoid system outages, whether it's 24 hour-a-day, seven day-a-week Field Service coverage, hot and cold system backups, or redundant systems. Crash handling and analysis procedures are an integral part of these steps.

THERE ARE THREE DISTINCT phases to solving system crashes: collecting information when the system fails, checking the symptoms for any obvious causes, and systematically analyzing the crash dump and other data to pinpoint and fix the reason for failure.

Collecting information about system failures presents some real problems. When your system is down you will be under a great deal of pressure to get the system back up. No one will be happy if it takes you 20 minutes to find and load a scratch mag tape in order to get a crash dump. If you give in to peer pressure and reboot, the same problem could rear its head next month when you go into real production.

> ***"Anyone who knows how to reboot the computer system should know how to take a crash dump and log the crash data."***

Responding to system failures is something you should practice. Anyone who knows how to reboot the computer system should know how to take a crash dump and log the crash data.

Training starts with knowing the four different methods of bringing RSX systems to the standard crash routine. A simple example is the system that already has printed the crash message on the console, and you're ready to mount a scratch medium and proceed. If the executive has broken to XDT instead, typing an "X" will cause XDT to jump to the crash routine.

RSX always stores a jump instruc-

WordPerfect Makes Debut on the VAX

Successful runs on Data General systems and IBM Personal Computers have set the stage for WordPerfect's anticipated debut on the VAX. The new version promises the same accomplished performance in terms of quality, power, and flexibility which have made WordPerfect Corporation the critics' choice for word processing on the PC.

Beautifully programmed

The new VMS edition of WordPerfect is written in assembly language to reduce overhead and increase performance. It is arranged to keep character I/O to a minimum and to use memory sparingly.

WordPerfect's installation procedure allows an experienced systems manager to install the program without consulting a systems engineer. The support documentation includes a learning section with step-by-step lessons for the new user and a feature-by-feature reference section for the expert. The VAX version is practically identical to the PC and DG versions so that a practiced WordPerfect user will feel comfortable with the software in a very short time.

WordPerfect documents from any other computer are compatible with WordPerfect documents created on the VAX.

Variety show

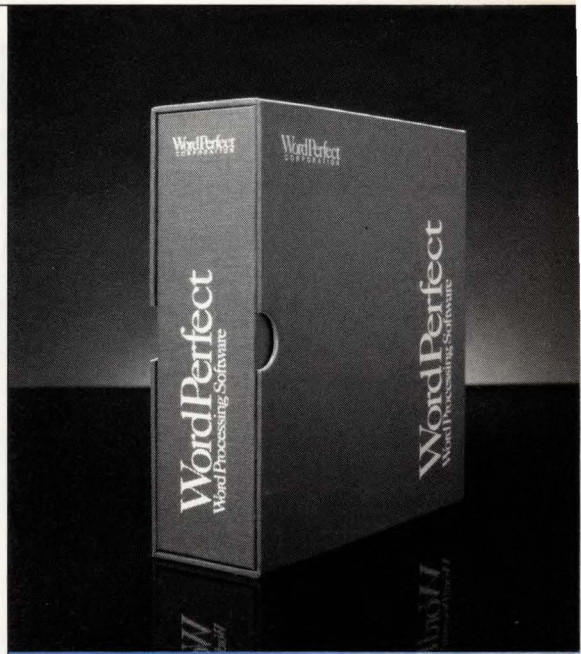
The list of available WordPerfect features goes on and on. Some notables include document password protection, endnotes and footnotes, math, macros, merge, newspaper columns, proportional spacing, a speller, table of contents and index generation, timed file backup, a thesaurus, and support for more than 100 printers. In fact, multiple copies of complete or partial documents can be printed from a single Printer Control menu.

Reservations

WordPerfect for the VAX ranges in price from $5,000 on the MicroVAX II to $13,000 on the 8800. A 30% discount is available for subsequent copies and for government and large accounts. A 50% discount is offered for a cluster copy and for schools. DEC VARs and OEMs that want to offer WordPerfect to their customers will receive additional discounts.

Future performances

Early in 1987, versions of WordPerfect will be ready for the Macintosh, Amiga, and Atari ST computers. Later in the year, WordPerfect will open on IBM's 370 machines, the NCR Tower, and other computers as well. WordPerfect documents created on the VAX will, of course, be compatible with documents created with future versions.



WordPerfect is bringing audiences to their feet with its superb performance on a variety of machines. For more information about the new version for VAX, call or write to the VAX Products Division of WordPerfect Corporation.

WordPerfect on your VAX will provide the kind of office productivity you expect of the world's most popular word processing package.

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tion to the crash routine in physical memory location 40. If the system is in a tight loop, halted, or is in its console ODT mode, you can force a crash dump by starting execution at location 40. For instance, I would type 40G on the console of my PDP-11/24. When you take this approach, you should write down the program counter (PC) of where the system halted as the PC is not saved in the crash dump.

If you still can type MCR commands and want to force a crash, I recommend depositing a 101(8) at location 100(8) using the OPEN command:

```
>OPEN 100/KNLD
00000100 /xxxxxx 101<ESC>
```

The system will crash with an odd-address trap the next time the system clock ticks (sometime in the next 1/60th of a second). This technique also can be used from the console when the system seems to be in a tight but interruptable loop. The advantage over the 40G mechanism is that current program counter and processor status are pushed onto the stack by the clock interrupt.

> ***"The crash device must have been loaded into memory prior to the system failure."***

If none of these methods results in the crash message, either the executive crash routine is corrupted or there is a severe hardware error. In either case it will be impossible to get a crash dump and you simply should log the failure and try to reboot the system.

ONCE YOUR SYSTEM HALTS after writing the crash message, you are ready to load the crash medium and write the crash dump. You selected the crash device when you generated your RSX-11M or RSX-11M-PLUS system. MICRO/RSX and pregenerated RSX-11M-PLUS systems have loadable crash device support. Obviously the crash device must have been loaded into memory prior to the system failure.

You always should choose magnetic tape devices over disk drives, and floppy disks over hard disks as crash devices. If you must use a disk device,

be sure you train your people to write protect other disk drives. The crash routines write over the first "n" blocks of a disk, which is a sure-fire method of destroying the boot and home blocks of an RSX disk.

The system halts again after the crash dump has been written to the scratch medium. If you continue from this halt, the crash routine loops and writes another crash dump. If a problem occurs writing the crash dump, such as a no-write ring in the tape, wait until the system halts again, fix the problem and continue.

The various executive crash routines work by writing physical memory to the crash device until a non-existent memory error occurs. Thus the crash dump does not include any device or CPU registers located in the I/O page. If you suspect a hardware device error caused the crash, it's a good idea to examine the device registers manually from the console when the system halts after writing the crash dump.

A system crash is the wrong time to look through hardware manuals for various addresses. Put together a simple one-to-two page document with contact names, the reboot procedures, and any relevant CPU and device registers, and tape the list to the side of the CPU.

You should dedicate tapes or disks as crash medium and not use them for any other purposes. A system crash is the wrong time to scramble around looking for a scratch medium. You might have to suffer another production loss before you can get the information needed to solve the problem and avoid system outages.

You aren't quite finished when you've taken the crash dump and rebooted the system. The crash dump records what happened inside the computer at the time of the crash. You need to record what was happening outside the system. Don't rely on your memory or that of others. It may be days or months before you really dig into this crash dump.

This is nothing more than informally asking different people what they were doing when the system crashed and what they think went wrong. Pay special attention to anything new that just was attempted. You also should look at the console terminal and other terminals for messages out of the ordinary. You're looking for a picture of what was going on when the system crashed.

The resulting information needs to be logged in some fashion. You don't expect system crashes; you probably haven't allowed the two-to-three hours it takes to start digging into a crash dump. For now, take the crash dump, reboot the system, get the picture of what's going on and get back to productive work. The crash becomes tomorrow's problem (unless the system crashes again in 10 minutes).

Some sort of filing system for crash dumps is required. I use the piles of crash listings approach. As soon as the system comes back up, I use the command file CRASH.CMD to read the dump to a disk file and generate an initial listing (see Program 1). I put all my crash dumps in the same account and name the files according to the date.

The crash listing becomes my file for this crash. I write all notes about the crash directly on the listing. If there is any console output or other notes to keep, I staple the paper to the crash listing. My filing system is the stack(s) of crash listings.

When I solve a crash, the crash dump file extension is changed from CDA to YEA. The notes on the crash

PROGRAM 1.

```
.;
.; Command file to read crash dumps, name according to the
.; date and crash, and get initial CDA listing using the
.; options /ACT/PCB.
.;
.; The name is the form DDMMMYYX where 'X' is the crash
.; of the day (A for the first, B for the second, etc.)
.;
        SET /UIC=[1,17]
        .ENABLE SUBSTITUTION
.;
.; Get date and parse out day, month, year.
.;
        .PARSE  <DATE>  "--" DD MM YR
.;
.; Loop and find which crash sequence number to use.
.;
        .SETN   POS     0
        .SETS   SEQ     "ABCDEFGHIJKLMNOPQRSTUVWXYZ"
.100:   .INC    POS
        .SETS   FILE    DD+MM+YR+SEQ[POS:POS]
        .TESTFILE       'FILE'.CDA
        .IF     <FILERR> = 1 .GOTO 100
.;
.; Install necessary tasks, load driver, and get dump.
.;
        .IFNINS ...LOA  INS $LOA
        .IFNINS ...UNL  INS $UNL
        .IFNINS ...CDA  INS $CDA
        .IFNLOA MM:     LOA MM:/HIGH/PAR=GEN
        CDA 'FILE'/-SP,'FILE'/MEMSIZ:'<MEMSIZ>'.=[1,54]/STB,MM:/PCB/ACT
.;
.; Clean-up from command file.
.;
        UNL MM:
        REM CDA
```

listing are updated and all but the first few pages are thrown away. These cover sheets and any attachments are put into an actual file drawer.

Eventually crash files and listings accumulate and I need to recover the disk and office space. Any solved and dead-end crash dump files are appended to a BRU tape used just to hold such files. Again just the cover sheets from the discarded crashes are kept and everything else is thrown away.

The full output from the Crash Dump Analyzer easily can use several trees to print (over 300 pages for large systems). I prefer to use just a few switches in the initial listing and get more detailed output later if I need it. The two most useful switches are /ACT and /PCB. The /ACT switch generates a list of all the active tasks in the system. The /PCB switch is useful because of the memory map it outputs.

YOU START ANALYZING a crash dump by looking through the crash listing and getting a picture of what was happening inside the system when the crash occurred. You look for the obvious and the unexpected.

Probably the most common RSX problem is "pool exhausted." The beginning section of the crash listing shows if pool is low. If so, sometimes the initial listing shows what is consuming pool. Look for large I/O counts and long receive queues.

One example of the unexpected is finding active tasks that shouldn't be active. Tasks such as TKTN or PMD mean some task has aborted. If ERRLOG is active, some device errors are being logged.

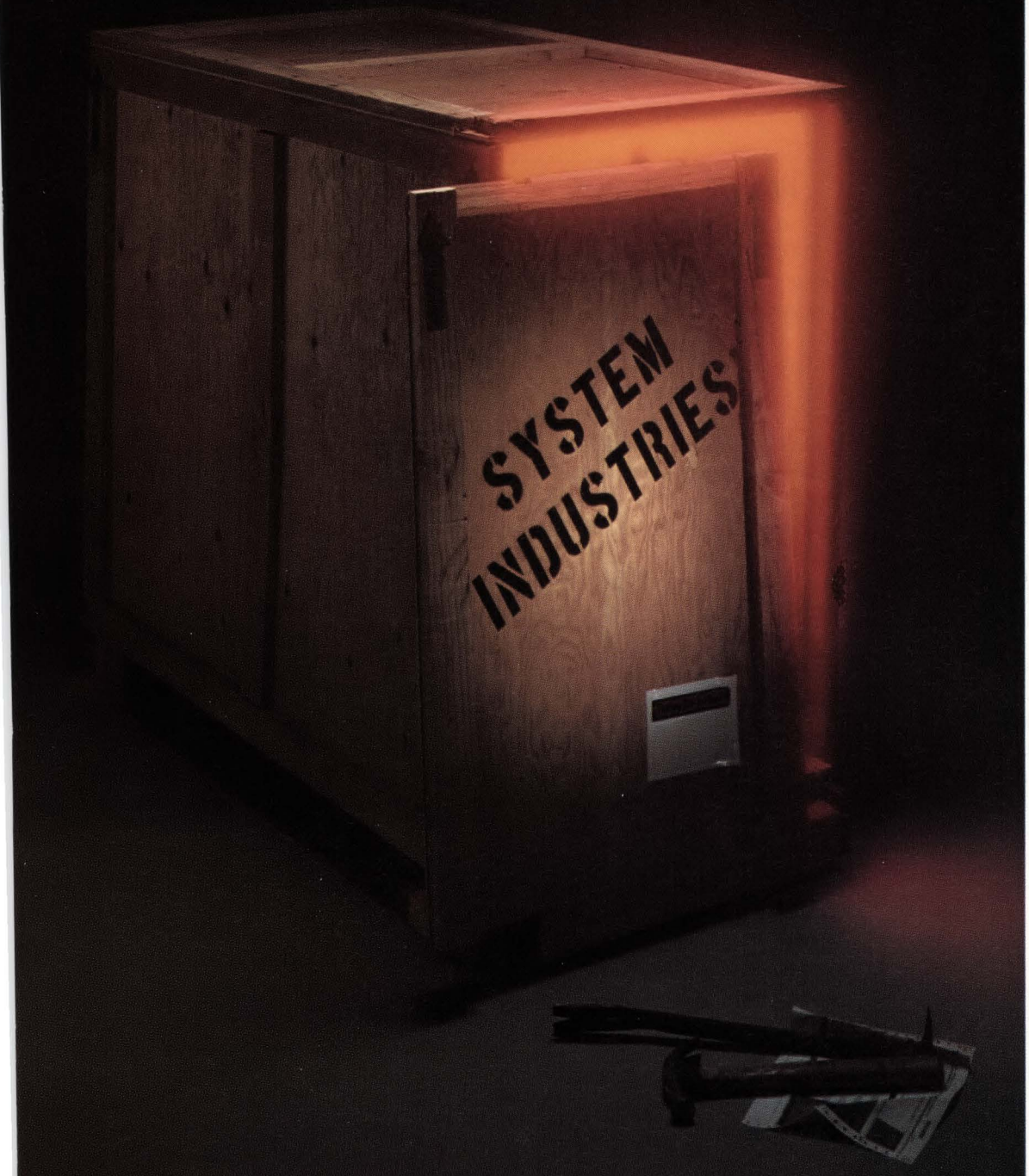
You also should look for the opposite, tasks that should be active but aren't. The tasks — LDR, F11ACP, and MCR — should be active at all times. Your application probably has similar tasks. The active task portion of the crash listing should be examined for tasks with outstanding I/O. This probably is not a direct indicator of the problem, but many system crashes are related to I/O in progress.

Now that you have a picture of what was happening both inside and outside the system when the crash occurred, you're ready to play detective.

In Part 2 I'll discuss how to be a crash detective and solve the really tough crash dumps.

Ralph Stamerjohn is principal engineer at Meridian Technology Corporation, St. Louis, Missouri.

The Performance Alternative



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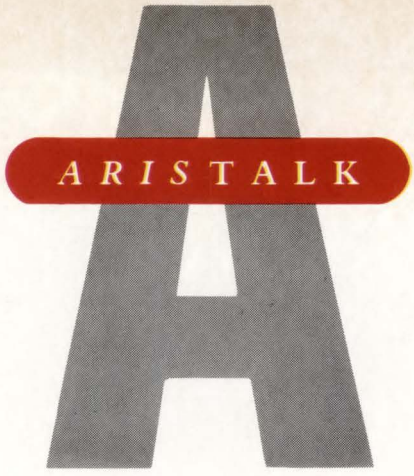

BABY *BELL* BLUES

QUERY:

Andrew Jackson: When I use AT&T, I have no problems with ARIS, but if I call in using one of the discount long-distance carriers, I get a CONNECT message, then, an immediate NO CARRIER. I'm using XTALK XVI in VT100 mode, 300 and 1200 baud. I'd like very much to use the cut-rate carrier, but I suspect that the ARIS modems lack sensitivity to the cut-rate carrier's signal. Any ideas to help me cut my AT&T phone bill?

REPLIES:

Bob Dudley: Although I think our ARIS noise problems originate from the phone company CO (central office), last in the link to ARIS, I thought some information about noisy lines might be of interest. You don't have to put up with them!

All FCC-qualified asynchronous modems (any you're likely to buy or own) are designed to meet or exceed the FCC tariff that governs voice-grade lines. The FCC tariffs define what bandwidth, gain, white noise, etc., is permitted on a voice-grade line. Thus, if the phone lines meet the FCC tariff, you can expect to see a hit (noise) an average of once a (24-hour-use) day. If you get more noise then this, the phone line you're using is not voice grade; i.e., it's in violation of the FCC tariff.

The phone companies know this, of course. But in the old days, no one cared about the noise because modems weren't squealing at each other. So, the phone company maintained a nonchalant attitude toward this FCC tariff. Even today, when we complain about the noise, the phone company says everything is fine — *prove* that the line is bad. Well, if you move up the chain of supervisors you'll eventually find someone who knows that he has to meet the FCC tariff. Once you find that person, you're home free — he'll even send repair people with actual test equipment(!) out to your facility, if they can't clean it up at the CO. However, be sure your modems and in-house connections are "clean," or you may face a large repair bill due to your equipment and not theirs.

Once you've found that magic supervisor, a simpler solution sometimes is to request that your noisy phone line be rerouted at the CO, or routed through a different CO. This often bypasses the old switching equipment which is generally the culprit. By the way, replacing the old switching equipment and conditioned lines, which cannot possibly meet voice grade tariffs, is one of the reasons the phone companies want to charge for modem use on phone lines.

Hope this helps,

Bob

Richard B. Gilbert: Bob, Do those FCC tariffs apply to intrastate calls? It seems to me that the FCC would have jurisdiction only over interstate calls.

In addition to the noise problem, there's also a problem with line losses. My phone lines have a measured loss of 14 decibels at 2400 Hz between the computer room and the central office. This means that by the time the signal reaches the central office, it's already so feeble that *any* noise on the line is enough to drown out the signal. Modems with 2400-baud capacity and adaptive equalization are barely able to cope with these lines at 1200 baud. A good connection at 2400 baud is a rare thing.

Bob Dudley: Richard, Sorry about the previous message, noise was too exasparating to continue! FCC tariffs apply intrastate also, in the same vein

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, 1200, or 2400.

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20. I don't think I could bring up four graphs at once.

21. It wouldn't do multiple key sorts.

22. I don't want it if it can't do database operations.

23. The last thing I need is another stand-alone software product.

24. What good is it if it can't import text from my WP?

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26. I don't think it could support international currency, date and time formats.

27. I would have to remember too many file names.

28. It wouldn't let me point-to formulas like my PC spreadsheet does.

29. I don't want to have to buy any more hardware.

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that the FCC can mandate CB traffic to 5 watts or less, regardless of state boundaries.

On two- or four-wire leased lines, decibel loss is defined by tariffs, depending on conditioned versus unconditioned lines. The new equipment the phone companies use can be nicely tuned UP/DOWN (by them) to set the carrier at whatever level you wish, not necessarily what the tariff specifies. I've found that most of the "data" phone company people are responsive (they once were part of a department that no longer exists formally), and will "heat up" your line if the carrier is weak for some reason.

Public two-wire decibel loss is also controlled by FCC tariffs. A 14-db loss between your drop and the CO is unacceptable. Ask the phone company to fix it! You don't say whether this is a public or leased line, but in either case, if you're sure the loss is between their CO and their drop at your building, then they're not meeting their FCC requirement. Go get 'em!

Bob

Richard B. Gilbert: Bob, The lines in question are ordinary dialup lines. New Jersey Bell says there is no specification it has to meet, other than "speak and hear." I'd like to see that FCC tariff. How do I get a copy?

Bob Dudley: Richard, As always, it takes a while to climb the supervisor chain to get verifiable answers. But, apparently some things have changed since deregulation. There's no longer FCC tariff control of intrastate lines; but, tariffs remain for the various types of interstate lines, and I can supply phone numbers if you need them.

According to the SWB (South West Bell) supervisor of the rates department, and verified by the supervisor of the repair service, here is how intrastate is governed in Missouri, for example:

The South West Bell rate department meets from time to time with the PSC (Public Service Commission) to negotiate new rates. SWB then says, "Here's what we want to charge," and the PSC says, "OK, what service are you going to supply for these charges?" SWB says, "For public voice-grade lines, we'll supply lines that meet or exceed IEEE standards, nos. 487-1980, and 820-1985. The PSC says, "OK, as long as you meet those standards, you can charge those rates." (I have copies of these IEEE standards from the repair service supervisor, who was quite cooperative!)

The SWB repair service then is charged with meeting the content of those standards, which addresses *more* requirements than the old FCC tariffs, not less. There are about 20 pages of specifications regarding voltage levels, decibel drops, white noise, etc., and they're *mandatory authority*; i.e., there's an external requirement imposed on the operating company to meet the specifications of the standards. If your lines don't meet them, they *must* fix them!

Adoption of the standards is up to each operating company, however. All of Missouri's phone companies have adopted the above IEEE standards, but other operating companies may not have, although my sources say they're becoming the standard for all operating companies.

The point is, though, that every operating company will have some standard agreeable to the PSC supervising it, and that's the standard you need to find. Even if it's home-brewed by the operating company, it still will specify what they're supplying. There's no such thing as "speak and hear"!

If your phone company can't or won't give you the information, check with the governing PSC in your area. It should be cooperative; after all, it's your watchdog, isn't it??

Bob

Editor's note: ARIS now supports 2400-baud modems to save you time and money. Also, be sure to see the new VAX PROFESSIONAL *cumulative index, and the revamped Used Equipment department for up to date prices and availability.*

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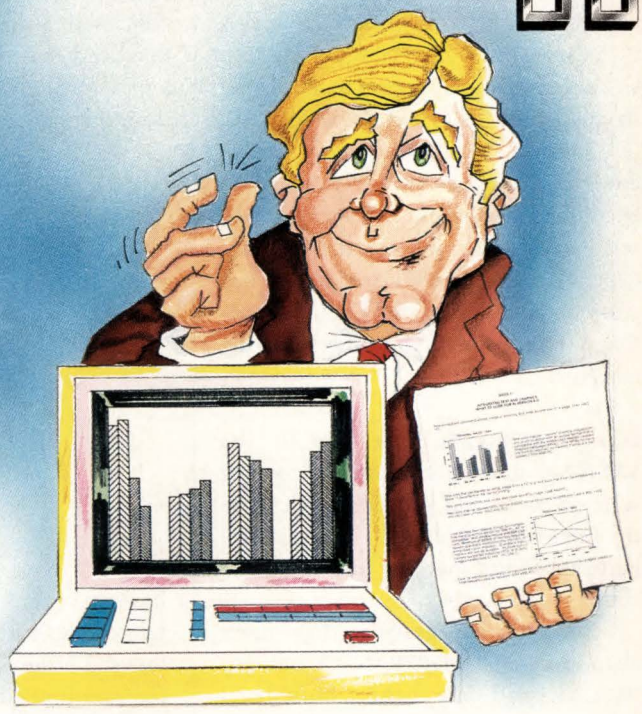

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DCL DIALOGUE

Kevin G. Barkes

Questions, Answers And Comments

It may be somewhat difficult to believe, but this is the seventh "DCL Dialogue" column since its original appearance in the August, 1986 *DEC PROFESSIONAL*.

During the last six months, we've covered a number of topics, tried to encourage discussion, and attempted to set a consistent tone for the column. One recurring theme arises from your comments: a distaste for Digital Command Language that borders on the extreme.

DCL IS A SUPERB interface to the VAX/VMS operating system. Properly written command procedures that use the finer features of DCL can rival "real languages" in capability and execution speed.

I'm not suggesting that users abandon BASIC, FORTRAN, COBOL, C, PASCAL and the other high-level programming languages. As a programming language, DCL is downright atrocious. It's slow, lacks essential control elements and has a list of other drawbacks almost too numerous to mention.

Still, the proliferation of VAXs in non-programming environments has created an intense interest in DCL. For the system manager of a MICROVAX running in an office automation environment, kludgy ol' DCL may be the only method for performing some task better suited to a full-blown language, especially when there's no time to learn programming or no money for a programming staff and a compiler.

DEC is selling VAXs to many people still struggling with the A> prompt in MS-DOS. A word processing manager just beginning to feel comfortable with a dedicated word processor may find that the boss has invested in a new MICROVAX "solution." In addition, there are certain areas where DCL has no peer. System management-related functions and concise, well-focused utilities can be designed, written and implemented in an incredibly brief period of time.

PERHAPS THE PROBLEM is that DEC has made the DCL user interface too good. Users are tempted by its rich content into writing overly ambitious procedures that perform miserably. For example, sometimes it seems that DEC likes to instigate trouble by introducing subroutines and callable functions, while ignoring the need for a simple ELSE statement.

Those who complain most loudly about DCL's limitations are using it in the wrong application or haven't bothered learning to write efficient procedures. The old saw, "It's only DCL" can be answered by the equally hackneyed response, "It's a poor workman who blames his tools."

As for *DCL Dialogue*, we plan to offer cogent hints on exploiting the best command language available.

Reader Comments

Philip J. Piotrowski, a Schaumburg, Illinois-based consultant, notes that many VMS users may not be exploiting fully the capabilities of the RECALL command under 4.x.

> ***"Properly written command procedures that use the finer features of DCL can rival "real languages" in capability and execution speed."***

Mr. Piotrowski notes that VMS now remembers the last 20 commands, and that there are more efficient methods for retrieving these commands than repeatedly hitting the arrow or CTRL-B keys.

A plain RECALL command operates in the same manner as the up-arrow/CTRL-B sequence. RECALL/ALL displays the last 20 commands.

Individual commands can be recalled by entering RECALL n, where n is the number of the command to be recalled, as displayed by RECALL/ALL. The RECALL command itself is never included in the command listings.

Commands also can be recalled by entering RECALL xxx, where xxx is a "leading substring," or the first few characters in a previously-issued com-

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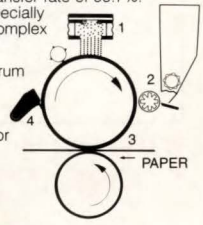

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mand. When used in this manner, RECALL "remembers" the most recently executed command line that matches the leading string. You can specify only one letter if you wish. RECALL S, for example, will return the most recently issued command beginning with an S, whether it is a SHOW TIME, SET DEFAULT or SORT.

Mr. Piotrowski favors defining two keys on the terminal, such as:

```
$ DEFINE/KEY PF3 "RECALL/ALL"
  /NOECHO/TERMINATE
$ DEFINE/KEY PF4 "RECALL"
  /ECHO/NOTERMINATE
```

"This allows me to use the PF3 key to display all 20 prior commands with one keystroke," he notes. "I then use the PF4 to provide RECALL, enter the number of the command I want, hit return, and then either edit the line or hit return again to execute it."

Mr. Piotrowski prefers this method to assigning symbols. Personally, I define the global symbol "RA" for RECALL/ALL, "R1" for RECALL 1, etc.

Noting that responses to the INQUIRE command also are stored in the RECALL buffer, Mr. Piotrowski asks, "Is it possible to flush out the saved command buffer by somehow redirecting SYS$COMMAND to a file containing 20 lines of text, and then issue 20 INQUIRE commands?" The "flushing" is useful when you don't want other users to perform a RECALL/ALL at your terminal and see what you've been up to recently.

> ***"RECALL S . . . will return the most recently issued command beginning with an S, whether it is a SHOW TIME, SET DEFAULT or SORT."***

The problem with this method is

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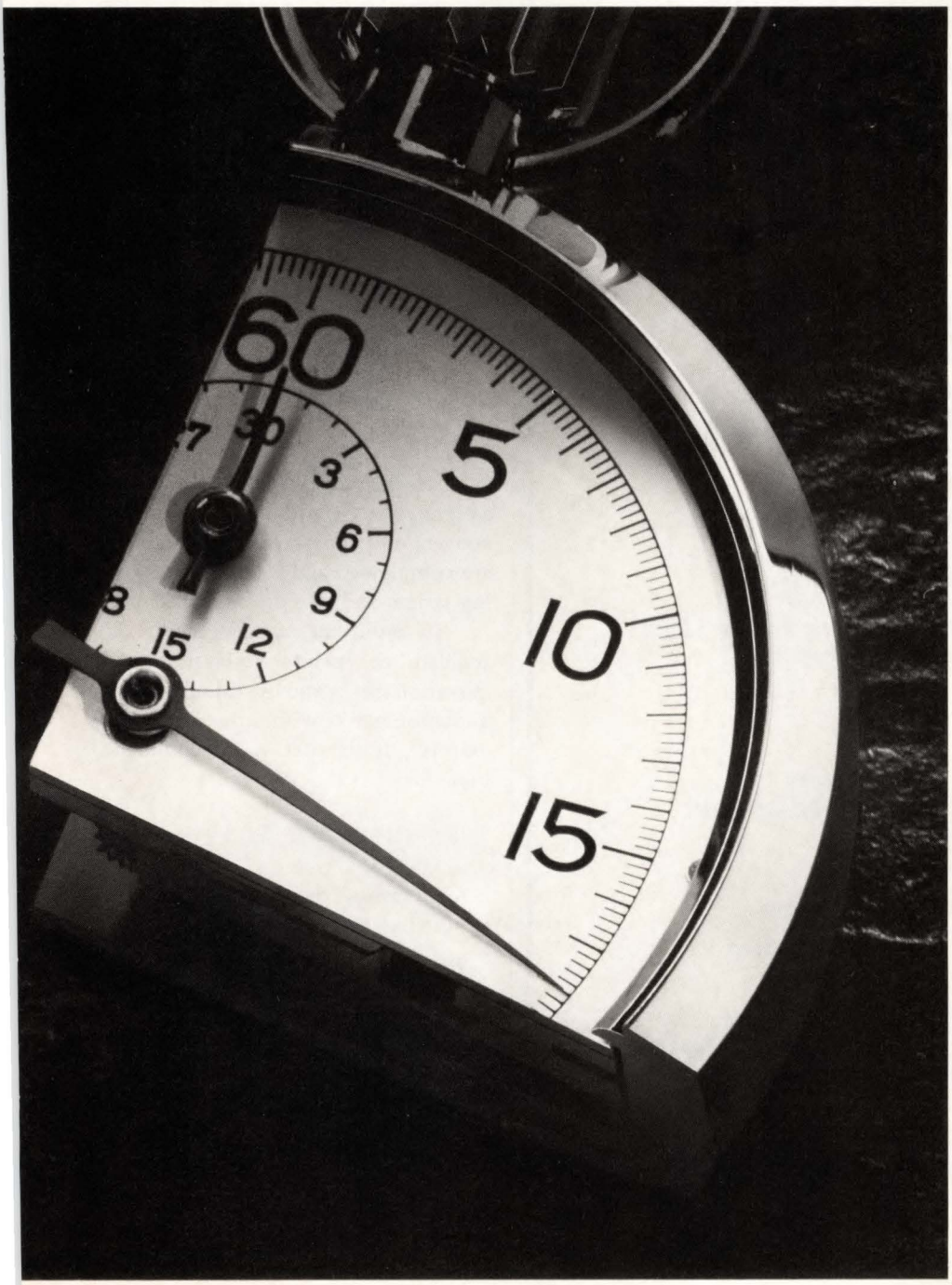

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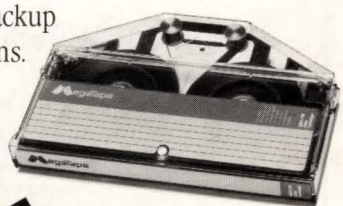

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trying to redirect SYS$COMMAND. DCL won't let you do it in an interactive process; SYS$COMMAND is always the original input stream at process creation, namely the terminal. The INQUIRE command always looks to the terminal for input in interactive mode, which is the reason the command works even from within deeply nested procedures. Any suggestions on other ways to flush the recall buffer?

In attempting to exploit the capabilities of the RECALL buffer, Mr. Piotrowski wrote a simple DCL procedure that would take the response of an INQUIRE command and write it to a file. "When executed," he explains, "I would up-arrow to the command I wished to save, and then just hit return. This worked fine until I had a command line with a quoted string (e.g., SEARCH, ACCOUNTING/TITLE=); the quotes were removed. The response was translated to uppercase, so case-sensitive commands were no good, and, any symbol substitutions were made (i.e., single-quote references)."

This problem stems from the fact that the INQUIRE command defines

> ***The INQUIRE command always looks to the terminal for input in interactive mode . . .***

symbols the same way the ":=" string assignment operator does; strings are converted to uppercase, spaces and tabs are compressed and leading, and trailing spaces and tabs are stripped.

To avoid the situation, edit the recalled line, enclose the entire line in quotation marks and use a double set of quotation marks within the string. For example, if the RECALLed command looks like:

```
SEARCH/EXACT 'FILE' "string"
```

before "saving" the command, edit it to appear like this:

```
"SEARCH/EXACT 'FILE' ""string"""
```

When written to the file, the line will appear as it did originally, with the cases intact, the 'FILE' symbol unevaluated and the "excess" quotes missing.

Mr. Piotrowski's final question deals with altering terminal characteristics and relates back to his use of the PF3 and PF4 keys for RECALL commands.

"I chose the keys for these commands even though I usually work on a VT200-type terminal," he explains. "Most third-party and in-house developed software still requires VT100 terminal emulation. All those nice keys on the VT200 are useless until either the software runs in "native" VT200 mode or a method is available to switch quickly back and forth from VT100 to VT200 mode.

"How can I set up the PF4 key to do a SET TERM/DEVICE=VT200, and then have the F20 key do a SET TERM/DEVICE=VT100? The simple DEFINE/KEY for each key does not work because the VT220 still is "SETUP" as a VT100, and so the function keys do not work. Something needs to change the VT220 hardware setting."

Not being a terminal specialist, this one stumps me. I've used DCL to change terminal characteristics by writing escape sequences to SYS$OUTPUT. A quick perusal of the *VT220 Pocket Programmer Guide* seems to indicate that these settings can be changed in a similar manner (see page 25), but I'm certain you terminal wizards lurking out there already have devised a method to accomplish this. How about hearing from you?

As always, reader comments are welcome. You can contact Kevin G. Barkes by writing his office at 4107 Overlook Street, Library, PA 15129; *DEC PROFESSIONAL*, P.O. Box 503, Spring House, PA 19477; via CompuServe EasyPlex, user I.D. 72067,341; by calling the author's DCL BBS at (412) 854-0511; or by leaving a message in the ARIS Suggestion Box, (215) 542-9458.

Kevin G. Barkes is a specialist in VAX systems software, management, tuning and training, in Library, Pennsylvania.

NETWORKING EDITOR

Bill Hancock

Pay Now Or Pay Later

We don't need to waste time analyzing the network configuration. All we need to do is buy the hardware we need and a DECnet license. DECnet is installed everywhere, so I'm sure that we made the right choice. After all, it works for everyone else, doesn't it?"

Right.

We thought about doing a thorough design. We even looked into using consultants to help us, but the corporate types thought that it was time wasted and consultants cost too much. Frankly, I'm a little concerned; I've never been involved with a network before.

Nice try.

I think we'll do it ourselves. Network design can't be that different from applications programming. Besides, I've been in computer science for a long time and I can learn anything out of a book, so I'll just get a book, read up on it, and design the network.

Medic!

These are actual excuses for not going through the proper motions to design a network. This article is about network design and analysis—what it is, why you need it, and what happens if you don't do it.

"Network design and analysis" is the phrase we networking types use to describe the basic requirements for properly designing a network. A properly generated network design can provide a company with the following benefits:

1. Proper analysis of existing equipment for network installation
2. List of requirements for network installation
3. Proper configuration of network components for optimum cost savings
4. A network topology that is flexible and adaptable
5. Correct selection of network hardware and software for the network function
6. Documentation of the network for future enhancements and modifications
7. Migration path into future network technologies without redesign

After looking over their needs very carefully, I told them that they didn't need a network.

8. A long network life-cycle (reducing the costs of potential replacement)
9. Interconnect paths and methods for multiple network architectures
10. User analysis and configuration of network resources for optimal use
11. Network management plan and methodology to reduce downtime and allow for maximum use of available resources
12. Expectations for performance, reliability, and usability
13. Optimal programming environment for network(ed) applications
14. Training needs for programmers, users, and network managers
15. Recurring expense forecasting and budgeting methods
16. Network support needs (programming, management, user support)
17. Use of mathematical modeling tools to help insure the success of the network design and topology
18. Optimal design to prevent network congestion, queueing delay, and proper placement of routing and management resources on the network.

Network design is more than ordering parts and pieces from a vendor. And it is more than the suggestions the vendor gives you for configuration of your network. As a potential user of network components, you have the final decision on any network configuration and no matter what the vendor tells you to buy, the final decision rests with you.

Identify The Need

The first step of network design is to identify the need for a network. While this may seem obvious, few companies sit down and spend time logically defining the reasons for installing a network. This exercise tells you if a network is necessary or whether there is a more cost-effective method to solve the problem at hand. I once was asked to design a network for a large financial company. After looking over their needs very carefully, I told them that they didn't need a network. At first, the management of the company thought that I was nuts because their vendor had been telling them for months that they needed a network. I had been called in because the customer didn't know much about networking and, fortunately, questioned the vendor's offer of the "right" solution. After working on the project for three weeks, I found that the methodology adopted by the company's management for distributing workload, and the reporting hierarchy involved, was

functioning very well and there was less than 5 percent out-flow of work to other company entities. This meant that 95 percent of the work being done in the respective branches stayed within the branch and did not require corporate intervention. Placing a computer in the middle of their paperwork effort would only have slowed things down. (Yes, Virginia, computers are not always better.) When I explained all of this to the customer, he immediately called the vendor and demanded an explanation. The vendor told the client I was wrong and proceeded to do the one thing that a vendor should never do — cut down the competition — me. Now I was mad! I spent another two weeks (at the customer's request) thoroughly documenting the lack of need for the network and also fighting some of the more irrational vendor claims. Finally, the vendor backed off. He had not done a thorough (or even partial) job of looking at the customer's needs and at the way the customer conducted business. The vendor had no idea what the customer's plans were for the next fiscal year nor did he bother to look into the customer's budgetary constraints.

So, rule number one is to make sure that you really *need* a network. Don't go out and buy one based on vendor pressure, or peer pressure. (Yes, we all wish that we had a network just like Company X down the street.)

How Much?

Step number two is to determine what it's supposed to do and how much it's going to cost? What it is supposed to do is a matter of very carefully defining what functionality the network is to offer. If it's electronic mail, file transfer, or task-to-task communications, great, but WRITE IT DOWN! Also, keep the base functionality of the network clear and concise. Too many good ideas get shot down because the base rationale was too complex even for technical personnel, much less management, who have to approve and budget for it. Remember that your company's management is the signing authority for technical purchases and direction. If they can't understand what the needs are, you can bet that they will be more than a little apprehensive about installing technology they don't understand.

Now comes the problem of cost. Networks are like systems in many of the following ways:

1. They have a life cycle.
2. They require periodic upgrading and expansion.
3. There are recurring costs, such as software and hardware maintenance, telco service, packet services, modems, etc.
4. They require personnel to manage and maintain the network components.
5. Software may need to be developed.

The point is this: If you think that network components are less expensive than a given system, think again. The cost of services and expansion will show that over a period of time, the network may turn out to be the most costly portion of your overall computing plan. Why? Simple. Networks are "service-intensive"; i.e., because of their inherent complexity, networks require the use of vendor services more than typical computer systems might.

NETWORKS ARE USED for communications, and communications services are expensive. Yes, networks can save a company a lot of money if they are used properly. The sad thing is that, without proper design, neither consistency or proper use of a network is achieved by most network users. To illustrate how expenses can creep up on you, here are some things that affect the cost of networking:

1. Cost of hardware components (modems, cabling, channel interfaces, controllers, cabinetry, protocol converters, line conditioners, protocol analyzers, time domain reflectometers,

frequency spectrum analyzers, breakout boxes, bit error rate testers, multiplexers, packet assembler/disassembler boxes, traffic analyzers response time analyzers, phone set tester, line testers, manual and automatic switching units, autodialers, protocol simulators, converters, data encryption equipment, auto callback units, data compression units, junction panels, line drivers, protocol converters, repeaters, bridges, voice frequency testers, front-end processors, servers, and many others).

2. Cost of software components for instance, networking architecture packages (DECnet, SNA, TCP/IP, and others), protocol emulators, protocol conversion, data compression, data analysis, network management, network troubleshooting, network statistics, network security, network applications (such as electronic mail, distributed database applications, office systems, etc.), operating system interfacing software, etc.

3. Cost of operational services such as leased-line costs, building conduit space costs, packet-switch network hookups, packet-switched network kilopacket charges, equipment leases, cable installation and add-ons, earth station channel charges, transponder channel charges, dial-up charges (digital service), dial-up charges (analog service), service surcharges for exceeding pre-agreed usage levels of shared services, general equipment maintenance, software maintenance, pickup/delivery and destination charges, line conditioning, per-call maintenance, per-call consulting services, administrative charges, etc.

4. Cost of consulting; i.e., network design, data collection, data reduction and analysis, network topology, traffic matrix, routing matrix, performance models, applications design, applications programming, queueing delay analysis, network technology assessment, network implementation, net-

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work installation, network management, network user training, network programmer training, network manager training, network project management, network troubleshooting and fault finding, network enhancements and add-ons, network interconnect design and implementation, interconnect training, network planning, network facilities survey, and on and on.

5. Cost of replacement because of improper initial design (all of the above plus the original cost to implement the current network).

This list may look extensive, but it isn't. You may feel that you don't need everything listed above. This may be true initially, but with the influx of network technology and the price of hardware dropping, most of you will find yourselves involved in networking in the near future if you aren't involved already. So, even if you may not use some of the equipment and components listed above, you probably will soon. By the way, do all of you MICROVAX II buyers out there, honestly think you can do without an Ethernet among you for too long? Digital doesn't think so. Those of you buying MICROVAX IIs and not thinking about networking them, dream on. It's not the cost of the hardware or the functionality (which are superb, by the way) — it's the distributed management, support, and logistics costs that can kill you.

Survey The Site

Step three in network design is the site survey. Not a trivial thing, site surveys involve the careful examination of company facilities, building architecture, phone facilities (if you are using phone lines), existing computer hardware and software components, examination of existing contracts (to see if some already cover the needs for the network), power facilities, HVAC facilities, wireways and wire centers, electromagnetic interference possibilities, radio frequency interference possibilities, safety issues, security issues, building wiring and fire codes, electrical codes, reception and shipping facilities, building maintenance capabilities, on-site or vendor maintenance capabilities, and other related items. While this initially may not seem necessary, consider what happened to a friend of mine when he was designing the cable layout for a large electric company: He carefully measured the cable length needs and used a building diagram given to him by the customer as the basis for layout of the wire plan. What he didn't know was that he was using an old plan and that many of the walls and wireways had changed. As a result, he planned wire runs directly through the generator room, which was not on the building diagram. Fortunately, because a proper site survey involves the customer, software, hardware, sales, service and other selected personnel, the incorrect layout of the wire plan was caught before the plan was finalized, and corrections were made.

Site surveys involve many people and require quite a bit of time, to properly layout the network in the environment in which it will function, and to ensure that all the "players" are where they are supposed to be.

> ***If you have been scared to death about network design and analysis as a result of reading this treatise, good!***

The Actual Design

Step number four is the basic network design, data collection/reduction, and data analysis. The network designer started out by actively and aggressively investigating all the needs and wants of the company. He took the justifications that the company wrote up, the functionality statement and the site survey, and identified missing parts and pieces necessary to the network design.

Now, following collection of data to satisfy the missing parts, the designer sets out to investigate the appropriate technology required by the company today, and in the future. Once a series of technologies has been defined, the designer uses mathematical modeling tools (manual and computer-based) to determine data flow ratios, probabilities of error, queueing delays, interconnect problems, least-cost network topological layout, routing paths, redundancy paths, and other items essential to solid network design. The modeled data is collected and reduced to meaningful facts and figures about the design. It then is compared to network requirements dictated by the customer. If the results fit the requirements window, the design being analyzed most likely will be useful in the customer's environment (provided it meets physical needs, support needs, etc.). This process is repeated for every reasonable network technology until all the potential technologies are completely modeled. Following the modeling of network data, a financial analysis is done to determine how much the network will cost to implement, startup, maintain, and expand. And

finally, an assessment analysis is performed to identify networks that are "most" useful (closest to the desired functionality) and "least" useful (on the right track, but not closest to the desired combination of price/performance/ease of use, etc.). The network designer then takes these results back to the site survey team and works with them to iron out any problems, and to identify the design that best suits the needs of the customer.

After the design has been identified by the designer and the site survey team, a formal design document is drafted that documents all of the following: the rationale for the design; a description of the components, along with a network topology; a wiring diagram; expansion capabilities; expected life cycle; applications support environment (and package descriptions, if applicable); network management environment; potential problems; data throughput analysis; testing and verification procedures; identification of network installation resources; an implementation timetable; personnel and training needs; cost analysis and risks. The formal design document is the backbone of the design and serves as a guide for implementation and expansion. Following generation of the design document, the designer makes a presentation to the customer's management, so that all parties involved thoroughly understand what the network looks like, what it is capable of doing, what resources are required, how long it will take to implement it, and how much it will cost to implement, support, and maintain.

If you have been scared to death about network design and analysis as a result of reading this treatise, good! It means you now may realize that the proper design of a network is critical to making your network cost-effective. Using consultants in the network design phase can help reduce the risk factor involved in creating a network and a good consultant can tell you what he can do and also what you can do. While it's true that you could design your network yourself, it probably won't survive over the long haul, or perform as expected if you haven't done a performance analysis before putting the network into place. Proper network design can save a ton of money down the road, and is cost-effective up front. If you are penny-wise and dollar-foolish, you indeed will pay later.

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

DEC PROFESSIONALS

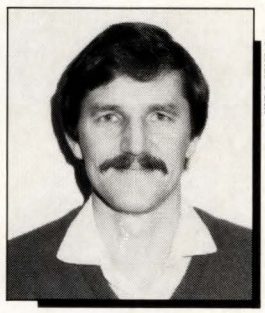
Rex Jaeschke is a Reston, Virginia-based independent computer consultant, writer and lecturer. While he has experience in a wide variety of applications hardware and operating systems, his two specialties are PDP-11 and VAX-11 environments, and the C language. Educated at the South Australian Institute of Technology, Rex spent six years in applied chemistry before switching to computing, where he has worked for 11 years.

Much of Rex's current work is with PDP-11/73s and 11/44s in real-time, process control with RSX-11M-PLUS and RSX-11s, DECnet, FMS-11, FORTRAN, MACRO-11 and color graphics. In the C arena, Rex is the co-founder and editor of *The C Journal*, a quarterly publication of the C language. He also is a member of the ANSI C Standard's Committee and he writes regular columns on C and microcomputing.

James McGlinchey is an independent software engineering consultant specializing in the use of RSX and VMS in industrial and other real-time applications. An engineer, Jim has spent over 12 years as an RSX systems programmer. He is the author of many articles on RSX and its use, including "RSX Clinic," a regular *DEC PROFESSIONAL* feature. Jim maintains his home and consulting base in Essex Junction, Vermont.

Charles Connell recently was made East Coast Editor for Professional Press. He writes feature articles and works with professionals in his area who wish to contribute their own articles to our magazines. Chuck also visits East Coast OEMs and VARs in the DEC marketplace to review interesting new products and cover newsworthy events.

Prior to Chuck's appointment, he served as a VAX/VMS system programmer, college instructor, and consultant. He holds a B.A. degree in linguistics from Hampshire College, and an M.A. in computer science from Boston University, where he specialized in computation theory.



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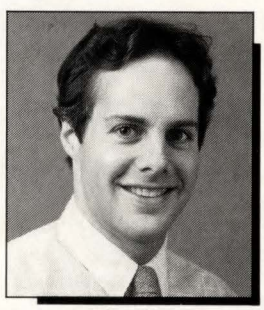

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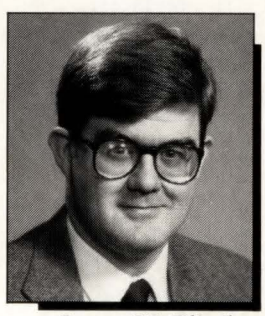


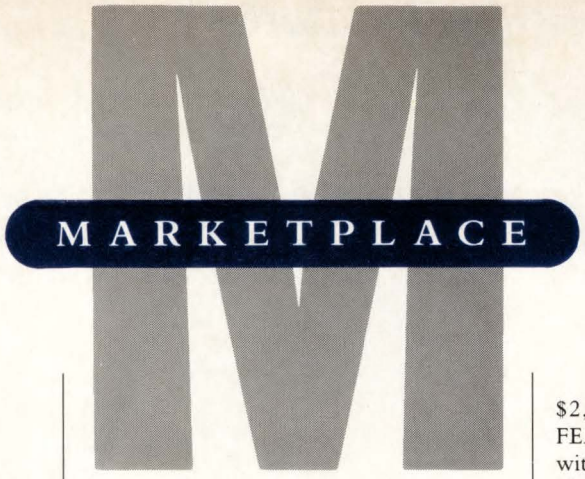
James McGlinchey

Ralph Stamerjohn actively has been developing distributed computer network systems for over 15 years. As the principal engineer and co-founder of Meridian Technology, Ralph currently is responsible for the design of Meridian's network software packages. These products satisfy needs ranging from RSX/VAX resource sharing (LAD/11) to industry standard, multivendor communications (MeriT/XNS), to custom communications solutions.

Prior to joining Meridian, Ralph served as senior systems programming specialist at Monsanto where he developed solutions ranging from custom, real-time systems such as image analysis to general-purpose, network-wide services such as transparent DECnet file access between RSX and DECsystem-10 systems. Ralph is a data communications industry expert, a frequent speaker at seminars and trade shows and an active member of DECUS. Ralph holds a B.S. degree in Computer Engineering from the University of Illinois.

Philip A. Naecker recently joined Professional Press as West Coast editor. Phil contacts West Coast computer professionals and organizations wishing to contribute articles and product information. He also writes articles that are current and immediately useful to DEC users. Phil visits West Coast OEMs and VARs in the DEC marketplace to review new products and cover newsworthy events. He has served as a manager of information services and has been a systems consultant. He is a special technical consultant to the 4GL Special Interest Group (SIG) of DECUS, and is editor of the DECUS periodical, *The Wombat Examiner.*

A graduate of the California Institute of Technology's Environmental Engineering Science program, Phil's background is in computer modeling for the sciences. He also is fluent in many computer languages and has taught several classes in various aspects of computer technology. ■



Teaming Improves Application Support

Reference Technology, Inc. and Micro Data Base Systems, Inc. have teamed together to market CD-ROM systems and database management software. Under the teaming agreement, either company may take the role of prime contractor or subcontractor, depending on the requirements of the customer application.

For further information contact Reference Technology, Inc., 5700 Flatiron Parkway, Boulder, CO 80301; (303) 449-4157.

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MICOM-Interlan Expands Networking Products

MICOM-Interlan has expanded its family of Ethernet networking products with three additions to its NTS family of Network Terminal Servers. All are designed to function in multivendor networking environments by supporting the TCP/IP networking protocol standard.

NTS100 is a "universal" terminal server that permits any mix of eight RS-232C devices to share a single Ethernet connection.

The NTS100 is a compatible extension of the NTS10 Network Terminal Server. The new version features completely new packaging that incorporates firmware cartridge loading of networking software, and rugged membrane switches for all front panel controls. The NTS100's primary function is to streamline local area communications between terminal devices and host computers sharing an Ethernet network. The addition of TCP/IP compatibility greatly expands the number of different host computers the NTS100 can communicate with. For customers with networks using Xerox's XNS/ITP, the NTS100 can be set up to support these protocols in place of TCP/IP.

The NTS100 functions as a terminal connection multiplexer and a computer port access manager. As a terminal multiplexer it allows any mix of eight asynchronous devices to operate concurrently through a single Ethernet connection. By using virtual circuits — electronically established connections between devices on the network — an NTS100 can support four concurrent connections for each attached device. This permits a user at a terminal, or at a PC running as a terminal emulator, to log on to multiple hosts, run multiple applications and perform electronic mail functions simultaneously.

The INTS32/MicroVMS streamlines MicroVAX port sharing by multiplexing up to 32 asynchronous devices onto an Ethernet local area network, and provides all the functions of the NTS100 in a plug-in controller.

Designed especially for MicroVAX/MicroVMS hosts, it provides a direct connection between a MicroVAX and an Ethernet LAN, reducing the amount of costly wiring required and eliminating the need for separate asynchronous controllers.

Compatible with MICOM-Interlan's NTS100 and NTS10 terminal servers, the INTS32/MicroVMS package allows any user whose terminal is attached to a terminal server to communicate over the Ethernet and to gain access to a MicroVAX/MicroVMS host. And, by supporting all of the NTS100 commands, the INTS32/MicroVMS makes it easy for users to establish, suspend, resume and terminate sessions. No new or special commands are necessary.

The NTS470 is a specialized version of the NTS100, multiplexing eight asynchronous lines between a MICOM data PABX and a LAN. With the NTS470, NTS100 users on the LAN can gain access to data PABX resources. Similarly, users on a MICOM data PABX can gain access to information and systems on the LAN.

The data PABX gateway supports all of the features offered by the NTS100. For data PABX users, this means compatibility with TCP/IP and its remote login utility-TELNET.

The NTS100 with XNS Protocol is $2,750, NTS100 with XNS and FEATUREPAK is $2,900, and the NTS100 with TCP Protocol and FEATUREPAK is $2,900. The NTS470 with XNS Protocol are both $3,000. The NTS470 with TCP Protocol is $3,150.

To find out more, contact MICOM-Interlan at 155 Swanson Road, Boxborough, MA 01719; (617) 263-9929.

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Unitronix Opens Midwest Office

Unitronix Corporation has opened its Midwest Regional office in Deerfield, Illinois. From here it will market the PRAXA Business Management System, a fully integrated modular software package, providing all manufacturing management, financial and distribution data in a single company-wide network for information processing. PRAXA Systems software is supported by DEC's VAX and MicroVAX computers.

If you're interested in finding out more, contact Mr. Jonathan Shoolman, Unitronix Corp., PRAXA Systems, Corporate 500 Center, 500 Lake Cook, Suite 210, Deerfield, Illinois 60015; (312) 940-9700.

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Diskeeper Solves Fragmentation Problem

Executive Software, Inc.'s Diskeeper is an online disk defragmenter. Diskeeper runs as a detached process, defragmenting disks by converting fragmented files to contiguous ones and consolidating spaces on the disk.

Diskeeper solves the fragmentation problem. It cleans up a disk online, while the system is active, then automatically keeps the disk defragmented by periodically checking the disk and defragmenting as needed. No system manager intervention is required. Written entirely in MACRO-32 assembly language, Diskeeper can keep DEC's largest drive, the RA81, fragmentation free in under two minutes of CPU time per day. Diskeeper works with disks that are nearly full.

VOS Is Developed For VMS

U.S. Design Corporation has introduced Virtual Optical Storage (VOS) for products from DEC. VOS is a new optical disk drive storage system developed for the VMS operating system which is fully compatible with all DEC Q-bus and UNIBUS-based processors and standard DEC software.

The system consists of U.S. Design's exclusive 1108 (Q-bus) or 1158 (UNIBUS), SCSI host adapters, U.S. Design's Virtual Information Processor (VIP) mass storage magnetic system, and an optical Storage International Laser-Drive 1200 Optical Disk featuring a 2.4 Gigabyte removable optical platter.

VOS is priced at $28,500. OEM discounts are available.

For more information, contact Jeff Lessner, U.S. Design Corporation, 5100 Philadelphia Way, Lanham, MD 20706; (301) 577-2880.

Enter 903 on reader card

Diskeeper is priced at $750 for the MicroVAX, $1,500 for the VAX-11 series, and $2,500 for the VAX 8000 series. The package includes a fragmentation analysis utility at no additional charge.

For information, contact Executive Software, Inc., 5537 Tuxedo Terrace, Los Angeles, CA 90068; (213) 461-6688.

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Version 3.0 Targets The PDP-11s

Whitesmiths, Ltd., now offers its Version 3.0 C and PASCAL cross compilers, hosted on the VAX, targeting the PDP-11 family of computers. The compilers support the development of free-standing (ROMable) programs or programs to be hosted under RSX-11, using the standard DEC assembler and linker. The compiler is available under VMS.

The cross compiler supports all processors in the LSI-11 and PDP-11 family, from the T-11 single chip computer to the 11/73 with floating point co-processor.

New features include C source level interactive debugging with breakpointing and variable display, enhanced support for ROMable code, and improved code generation. The compiler also produces compiler and assembler source listings, including the ability to generate high-level source code and machine object code on one listing.

The RSX-11M Plus compiler has been enhanced to conform more closely to the emerging ANSI C Standard. New ANSI features include structure assignment, structures as function arguments, functions returning structures, const, enum, void, and volatile types, function prototyping, and a complete ANSI C library.

The Version 3.0 PDP-11 PASCAL cross compiler includes Whitesmiths' PASCAL to C Translator. It is a full ISO Level 1 and includes conformant array parameters and numerous extensions for production programming.

The price for the VAX-hosted C cross compiler is $3,000. With PASCAL included, the price is $3,500.

For more information, contact Whitesmiths, Ltd. 39 Power Rd., Westford, MA 01886; (800) 225-1030 or (617) 369-8499. Telex: 750246 software cncm.

Enter 904 on reader card

Century Announces Comm100 Link Software

Century Computing, Inc.'s Comm100 Link software implements SDLC, ADCCP and HDLC data link layer protocols under VAX/VMS. The product allows application programs to read and write data using standard VMS I/O system services.

Application programs deal only with error-free data traffic. All protocol traffic, error detection and retransmission is handled transparently by the Comm100 software.

Using DEC's DMF32 device, Comm100 Link supports data rates up to 9.6 Kbits per second. With the KMS11-BD communication multiplexer, the software can run at up to 56 Kbits per second. It supports 32 communication lines (eight lines per KMS11-BD). Idle polling is handled in KMS11-BD firmware, significantly reducing VAX CPU overhead. The product provides modem control for full- or half-duplex modems.

The product includes a control program with on-line help. The control program configures and monitors the network. Users can configure the VAX host to be a primary or a secondary station independently on each communication line. The control program displays status, showing line and station status, link traffic and communication errors.

The price is $5,000 for the first VAX/VMS single CPU binary license and $3,500 for the first KMS11-BD binary license. Only the VAX quantity discounts are available.

For further information, call or write Bob Novas at Century Computing, Inc., 1100 West Street, Laurel, MD 20707; (301) 953-3330.

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Micro-Term Offers VT220 Emulation

Micro-Term, Inc.'s new Foresight 4520 terminal has perfect VT220 emulation and displays fully-formed letter-quality black characters on a soft-white screen.

The Foresight 4520 has a 14-inch display, with 24 lines of either 80 characters or 132 characters plus a 25th status line on an overscan monitor with true reverse video. The 4520 uses a 20 x 20 character cell with four descenders. Two pages of memory in 80 x 132 column mode are standard on the 4520, as well as complete down-line loadable character set support. Also standard on the 4520 is a programmable compose key, function keys operable in VT100 mode, and low-power consumption.

The Foresight 4520 comes with a warranty of two years with the first 90 days on site, and an optional extended three-year warranty program. Priced at $695, the 4520 is available immediately in production quantities through Micro-Term's nationwide network of regional distributors and VARs. For more information, contact Micro-Term, Inc., 512 Rudder Rd., St. Louis, MO 63026; (314) 343-6515.

Enter 907 on reader card

Plessey Unveils MSS Series

Plessey Peripheral Systems' new Modular Storage Subsystem (MSS) series is designed for applications where highly reliable, removable portable storage modules are required. The product is designed for applications where disk removability and storage are essential for security purposes, including computer aided design (CAD), computer aided manufacturing (CAM), computer aided engineering (CAE), and graphics workstations.

The Plessey MSS Series includes a floor-mount enclosure on swivel casters matching the CED BA123 chassis in color, paint texture, and external appearance. The MSS series subsystems are capable of supporting either two eight-inch or four 5.25-inch drive trays, with a total drive capacity available up to 1.5 gigabytes unformatted.

Expansion kits are available from Plessey, including drives, adapter plates, and necessary mounting hardware and cabling. Each removable drawer is equipped with a zero-insertion force connector that has been designed to withstand up to 20,000 mating and unmating cycles.

The Plessey Modular Storage Subsystem (MSS) is compatible with the VAX, MicroVAX II, Q-Bus, UNIBUS, VME Bus, and Multibus II.

To learn more, contact Kathy Soma at Plessey Peripheral Systems, 17466 Daimler Avenue, Irvine, CA 92714; (714) 261-9945.

Enter 908 on reader card

DATARAM Adds To Memory Products

DATARAM Corporation's latest addition to its full spectrum of DEC-compatible add-in memory products is the DR-283.

The DR-283 is 100 percent hardware and software compatible with DEC's Private Memory Interconnect (PMI) Processors, the

PDP-11/83 and 11/84. A separate version of this board, the DR-283, can be used with any Q-based processor.

DATARAM's DR-283 is available in 1.0-, 2.0-, and 4.0-MB capacities on a single quad-size board, using 256K Dynamic RAMs. By using a single 4 MB DR-283 board in the PDP-11/83, the user can free up one slot in the Q-backplane, which can be used to support additional peripherals.

DATARAM's DR-283 ECC circuitry is 100 percent compatible with DEC's ECC implementation. The DR-283 uses single-bit error correction, double-bit error detection (SECDED) on a 16-bit word.

Additionally, DR-283 features a Control and Status Register (CSR), an on-board error indicator, and block mode DMA and battery backup support.

To find out more, contact DATARAM Corporation, P.O. Box 7528, Princeton, NJ 08543-7528; (609) 799-0071.

Enter 909 on reader card

Persoft Enhances SmarTerm 240

Persoft, Inc.'s Version 1.1 of its SmarTerm 240 communications/terminal emulation package now is being shipped.

SmarTerm 240 allows personal computers to communicate with mainframe and minicomputer hosts and to emulate a wide range of terminals, including the VT240 and the Tektronix 4014 graphics terminals.

SmarTerm 240 provides sophisticated file transfer capabilities with three separate error-free file transfer modes: Xmodem, KERMIT and Persoft's proprietary PDIP protocol. The new version of SmarTerm 240 gives individual users who purchase an optional kit the capability of communicating over certain network systems.

The first two network systems to be supported by SmarTerm 240 are the Ungermann-Bass Net/One system and Bridge Communications EtherTerm system.

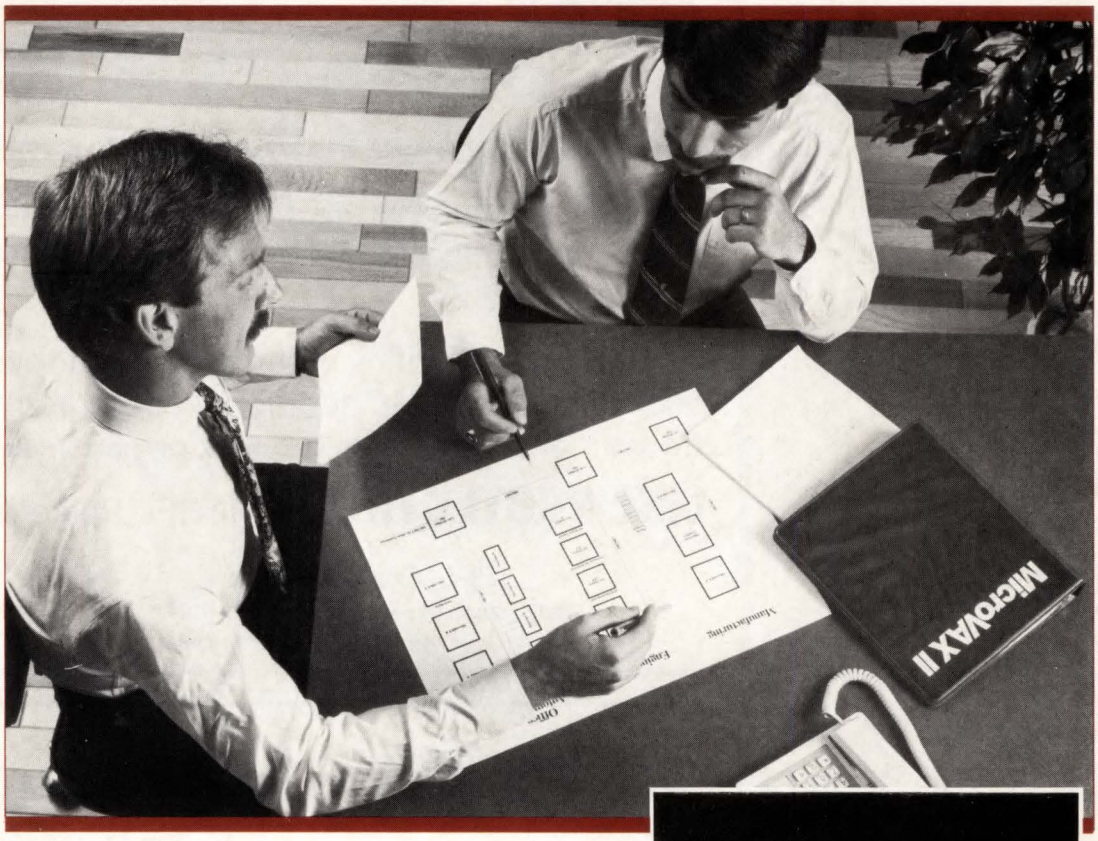
The new version emulates the soft (down-line loadable) character set capability of DEC 200 series terminals. This feature allows the full use of PCs accessing host software, such as WPS-Plus, that use characters not ordinarily found on personal computers.

Another new feature of SmarTerm 240 is support for EGA high-resolution graphics in Tektronix terminal emulation mode. This new feature is in addition to SmarTerm 240's existing support for graphics displays in either Hercules or IBM color graphics modes.

Retail price of the SmarTerm 240 package is $295. Current SmarTerm 240 customers can upgrade to the new version for $50.

For more information, contact Persoft, Inc.,

Buy Digital's MicroVAX II from MTI and get more than a powerful cpu...



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465 Science Drive, Madison, WI 53711; (608) 273-6000.

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AI Ware Releases Package For VAX LISP

AI Ware Inc.'s AI Flavors is integrated into the existing VAX LISP programming environment and brings the power and flexibility of object-oriented programming on LISP machines to VAX computers or AI VAXstation. It allows Flavors-based software to be ported between LISP machines and VAX LISP.

Flavors, an object-oriented programming paradigm, allows the programmer to model complex problems as sets of objects that communicate by passing messages. A Flavor is a type of object that consists of some internal state and a set of messages it understands. These messages form an interface to the outside world, allowing other programs to make use of the functionality of a given Flavor without being concerned with the details of its implementation. When an instance of some Flavor is sent a message, it automatically invokes the appropriate method for handling it.

Flavors can combine existing objects to create new ones. This capability encourages modular programming, incremental development, and reusable software components. Flavor combination often proceeds in a simple hierarchical manner, where a specialized Flavor is constructed by extending the functionality of an existing more general one. Additionally, Flavors supports nonhierarchical combination, where a new object is constructed by mixing a set of Flavors into some base Flavor to tailor its behavior as required.

AI Flavors lists at $1,495.

For more information, contact AI Ware at 11000 Cedar Ave., Suite 212, Cleveland, OH 44106; (216) 421-2380.

Enter 911 on reader card

EVA Enhances VAX/VMS Systems

EVA is a system resource management tool specifically developed for VAX/VMS systems. It provides an array of standard reports and queries that supply the system manager with extensive information about all aspects of his VAX/VMS system's resource usage. This information gives a solid base on which to evaluate the system's performance and to predict future resource requirements.

EVA also enables the user to design his own reports and queries so that he can investigate specific problems on his system, and present information in the format that is most effective in highlighting those problems.

EVA accomplishes this by using a relational database and the Structured Query Language (SQL). With these two features, it is possible to access any data in the database, group the data in the way the user finds most useful, and produce reports that show only the data he requires to examine the particular problem at hand. Its use of a relational database and of SQL makes EVA the most flexible and dynamic resource management package available.

EVA's emphasis on user-generated reports and queries does not come at the expense of the comprehensiveness of its standard reports and queries. EVA's base system provides all of the standard reports that can be expected from a quality system management package. These reports and queries can be per individual VAX user, per

department, and per project.

Some of the data EVA provides as part of its bases system are the top users of the CPU and the percentage of the total CPU time that they use, the users with the highest average direct and buffered I/O rates, and the users with the highest average paging rates.

EVA provides additional features which make it a complete resource management tool for managers of VAX/VMS systems. Some of these features include EVA's ability to operate in a single VAX, VAXcluster, or VAX network environment. Reports can be obtained for the entire system, or from individual nodes or groups of nodes, EVA enables easy transfer of the result of the resource accounting to text files from where they can be used as input to existing financial systems, and EVA performs individual image accounting so that the system manager can track the use of the images he really is interested in.

For further information, contact Orce Systems Software B.V., Huizerstraatweg 111, 1411 GM Naarden (The Netherlands); +31-2159-49344.

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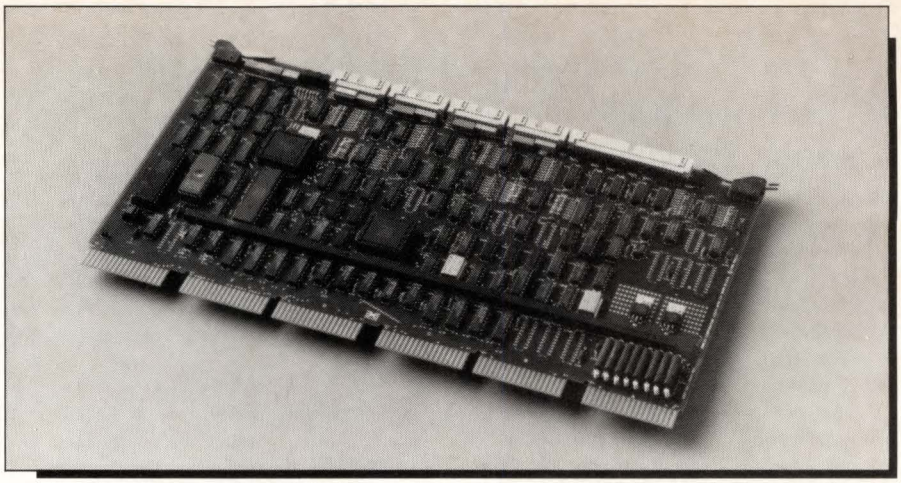


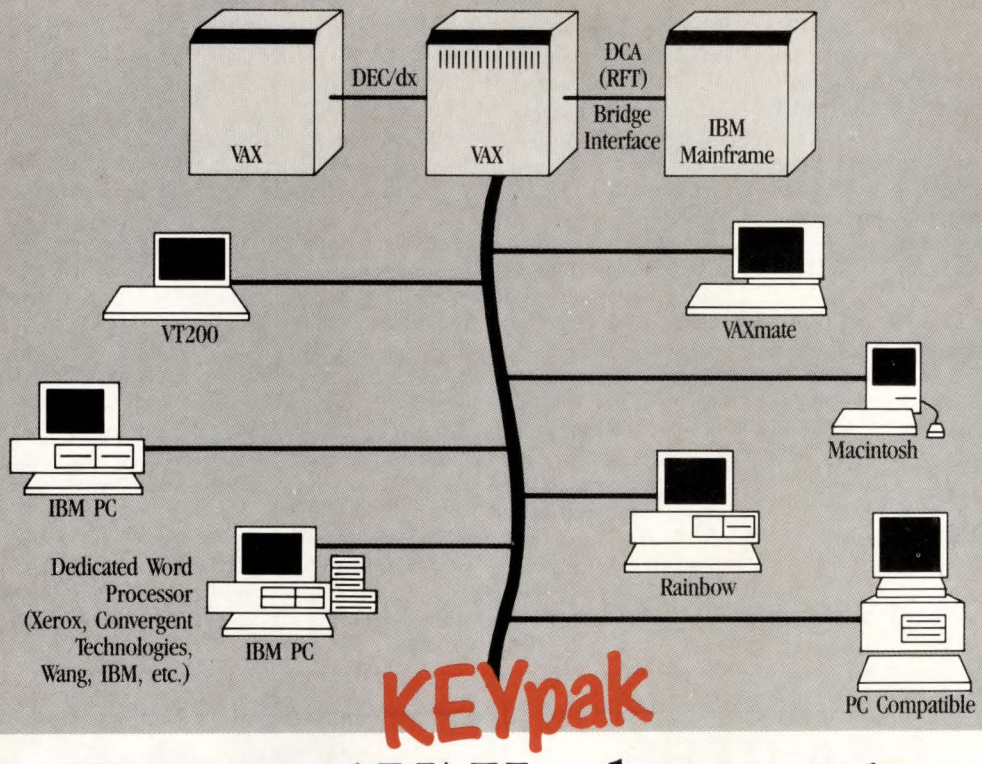
Emulex Corporation's UD33, a hex wide, SMD/SMD-E disk controller for Digital Equipment Corporation's UNIBUS-based systems.

Emulex Introduces UNIBUS Disk Controller

Emulex Corporation introduced the UD33, a microprocessor based/firmware controlled, SMD/SMD-E disk controller for DEC's UNIBUS-based systems.

The UD33 emulates DEC's UDA50, providing MSCP implementation, Rotational Position Sensing and four-drive support. In

DEC provides connectivity.



Keyword ~~VAXpak~~ provides compatibility, regardless of where your documents originate.

Introducing KEYWORD KEYpak – the VAX-based Editable Document Exchange (EDE) software.

If KEYWORD can provide document compatibility to an environment as complex as this, think what it can do for you.

KEYWORD KEYpak solves the compatibility problem regardless of where your documents originate. PCs, dedicated word processors, VAXs, VTs, IBM mainframes or all of them combined, KEYpak provides total Editable Document Exchange (EDE) among dissimilar systems.

KEYpak integrates with DEC's ALL-IN-1 offering complete, transparent operation to the end user. It extends Electronic Mail into Document Mail. KEYpak also functions as a stand-alone application in non ALL-IN-1 environments.

KEYWORD KEYpak

SUPPORTS THE FOLLOWING SYSTEMS:

ASCII	AES/LANIER
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DEC/DX	CPT
IBM DCA (RFT)	DECMATE
IBM DISPLAYWRITE 2/3	WANG
MASS 11	IBM DISPLAYWRITER
MICROSOFT WORD	IBM 0/S6
MULTIMATE	IBM 5520
NAVY/DIF	NBI
OFFICEWRITER	Q-ONE
SAMNA	PHILIPS/MICOM
WANG (WPC)	WORDPLEX
WORDPERFECT	XEROX 860
WORDSTAR	
XEROX (WRITER)	

KEYWORD's industry proven library of bi-directional translation software eliminates post translation editing. It's the largest software library for VAX users so now you can achieve complete integration of your multi-vendor environment.

The KEYpak solution is truly modular and grows according to user requirements. It will ensure that your word processing system investment pays off while improving productivity.

KEYpak is installed at DuPont, U.S. West, Nynex, AT&T, TransAlta Utilities and other major corporations.

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Call KEYWORD now for more information at (800) 661-8161.

KEYWORD

KEYWORD VAXpak has been renamed KEYpak

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addition, the UNIBUS controller offers the user four more key features. First, it implements Fast Head Select that reduces data access overhead during consecutive sector transfers. Second, it features switch-enabled adaptive Direct Memory Access (DMA). Third, it supports power-up auto boot or console boot. Finally, the UD33 has a 16 x 16 bit NOVRAM that contains disk geometry parameters.

The UD33 also has several basic functions, including DMA transfers with 18-bit addressing, stacking of up to 13 commands, seek ordering, bad block management, one-to-one sector interleaving and 52 sectors of buffering.

The UD33 has a list price of $3,500. For further information contact, Emulex Corporation, 3545 Harbor Blvd., P.O. Box 6725, Costa Mesa, CA 92626; (714) 662-5600 (within CA) and (800) EMULEX3 (outside CA).

Enter 912 on reader card

DENT-11 Developed For Dentists

J.L. Computer Systems (JLCS) has released version 4.0 of its DENT-11 system. DENT-11 is an accounting and patient management system designed for the medium-to-large dental office.

DENT-11 is developed for DEC's Micro PDP-11 computer family. It uses the features of S&H Computer Systems, Inc.'s, TSX-PLUS V.6 multiuser operating system with process windowing, and DEC's DBL V.4 language. Future releases will be portable among many different operating systems, such as MS-DOS, UNIX, TSX-PLUS and VAX/VMS.

DENT-11 allows each user to control four processes concurrently from a single terminal and provides full-screen editing with merge capability for correspondence and patient treatment. DENT-11 can be ordered for general practices and/or specialists, and can be custom tailored to meet specific needs.

JLCS includes hardware, software, training, documentation, general installation, and after-sale support (one year free). System prices range from $26,000 to over $100,000. To learn more, contact J.L. Computer Systems, 3401 Lancaster Ave., Wilmington, DE 19805; (302) 998-8030.

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TOUCH OSI Is MAP/TOP Compatible

Touch Communications, Inc. announced Open Systems Interconnect (OSI) compatible software for transparent, multivendor networking which is compliant with the TOP and MAP specifications.

TOUCH OSI allows users to view an entire network of dissimilar computers as a simple extension of their own system. It also extends this same transparent network access to application programs, thereby preserving a user's investment in existing software. The product initially will be available for DOS and VMS operating systems as well as for porting to other operating systems.

TOUCH OSI is a complete implementation of the OSI standards for protocol layers 3 (Network) through 7 (Application) which is capable of running on any of the lower layer IEEE network technologies, including Ethernet and Token-Ring. However, the real challenge, the most significant feature of TOUCH OSI, is the manner in which these protocols are integrated into the host operating system and presented to the user. TOUCH OSI allows users and applica-

tion programs to access network resources using the same commands and naming conventions they use to operate on their own local system. Users need not be aware that they are operating on a network, even if it consists of computers from a variety of manufacturers.

To find out more, contact Touch Communications, Inc., 10 Victor Square, Scotts Valley, CA 95066; (408) 438-4800.

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ASCI Introduces PC/INTACT

Advanced Systems Concepts, Inc. (ASCI) recently announced PC/INTACT, a distributed terminal management system for the Integrated Application Control System (INTACT) transaction processing family.

PC/INTACT, which runs on Digital's VAXmate personal computer and IBM's PC/XT/AT systems, performs distributed terminal management for VAX-based INTACT transaction processing systems. The VAX INTACT processor performs transaction management while PC/INTACT offloads forms processing. Using an Ethernet LAN, PC/INTACT offers performance and availability gains. Using DECnet, PC/INTACT maintains a loosely coupled connection with the host system. If the host is unavailable, PC/INTACT can switch to another available processor within the network. This feature is beneficial when the VAX hosts are within a VAXcluster. PC/INTACT performs all terminal I/O and field edit check processing that are associated with a form.

A form is a number of related fields comprising text, program/operator entered data and its associated attributes. PC/INTACT can access a form database across the network or with a local hard disk, which provides even greater performance. On the VAXmate personal computer, PC/INTACT specifically uses MS-WINDOWS, DECNET-DOS and the LK250 keyboard. INTACT is a prerequisite for using PC/INTACT.

PC/INTACT is licensed on a per CPU basis. The initial cost is $595 with a right to copy cost of $195. Educational institution and large quantity discounts are available.

To find out more, contact Advanced Systems Concepts, Inc., 22 Hudson Place, Hoboken, NJ 07030; (201) 798-6400.

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SCS Announces The V6000 Tapestore Family

Secondary Computer Storage (SCS) has introduced the V6000 Tapestore family that provides any VAX or MicroVAX user using VMS the ability to randomly address either 67 or 234 MB of data on preformatted 3M DC600 HC data cartridges. Data files can be archived, recalled, and overwritten using sequential or directory-controlled file structures.

A single dual-width Q-bus or quad UNIBUS SCSI host adapter can communicate with up to four SCSI tape controllers. Up to four drives can be connected to each tape controller permitting up to 1072 MB of on-line storage. All four controllers simultaneously can search at 120 ips or transfer data at over 4 MB per minute when used with 32-track 134-MB drives and DC600 XTD formatted cartridges.

Systems are housed in a small table top or portable box holding one drive or in 5.25-inch rack-mounted chassis holding two drives. End User Subsystems are priced below $4,000 and are available in 30 to 90 days.

The VMS compatible driver commands and subroutines are easy to configure by unsophisticated users. Two SCSI networks can be supported simultaneously using two host adapters. (Other SCSI devices also can be supported.)

SCS currently supplies systems for Q-bus and UNIBUS PDP-11 computers that support RT-11 and RSX-11M and M+. They are used for data acquisition, archiving and retrieval. All systems use the 3M HCD family of data cartridge drives that assure high data integrity and guaranteed data interchange.

For further information, contact Secondary Computer Storage, 650 North Cannon Ave., Lansdale, PA 19446; (215) 362-7050.

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SofTech Announces Ada-86

SofTech, Inc. announced recently the commercial availability of Ada-86, the first Ada language compiler and software development package for embedded, "bare" Intel 80286, 80186, 8086 microprocessors. The new tools are designed to increase significantly Ada productivity and lower Ada development costs through greatly improved programming speed and ease of use.

Hosted on VAX/VMS and producing code for the Intel targets, Ada-86 consists of an Ada compiler, binding tools, and a library manager. When used in conjunction with commercially available products from DEC and Intel, Ada-86 provides users with a complete Ada software development system. The system components operate in a manner similar to other VAX/VMS-hosted tools.

To find out more, contact SofTech, Inc., 460 Totten Pond Rd., Waltham, MA 02254-9197; (617) 890-6900. TWX: 710-324-6401.

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DECUS Canada Celebrates Anniversary

The 20th annual DECUS Canada symposium will be held at the Queen Elizabeth Hotel in Montreal, Quebec, Canada. It will celebrate two decades of DECUS Symposia and the 20th anniversary of Expo '67.

For more information, contact DECUS Canada, Digital Equipment Users Society, 505 University Ave., 15th Floor, Toronto, Ontario M5G 2H2; (416) 597-3437.

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Protection against damaging commercial power aberrations is provided by Lortec's new 10 KVA three-phase uninterruptable power system.

Protection Offered Against Power Failures

Complete protection against power disruptions that can damage equipment and cause loss of valuable data is available in a new 10 kVA uninterruptible power system (UPS) manufactured by LorTec Power Systems, Inc., for medium-to-large minicomputers and small mainframes.

The 10 kVA (8 kW with 8.0 power factor) three-phase UPS, model 103CRH, is designed to provide clean, continuous power for computer-based equipment and other critical electronic systems. It can handle

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poly-STAR software has features that make users more productive, let information move more freely, and save companies time, money, and frustrations. Pop-up window menus. Hot-key switching. International keyboard support. Enhanced remote control features. Automated error-free file transfer. Smart modem support. An online "phone book" for computer connections. A powerful user-programmable communication language. Prewritten programs for automatic logon, file transfer, and backup.

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(that don't degrade the system they manage)

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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

three-phase and single-phase loads simultaneously.

The unit is compatible with IBM S/38, DEC 11/70, VAX 8650 and 8800, HP 3000 and other similar minicomputers. An optional accessory to interface with the IBM S/38 Power Warning Feature is available for either full UPS or basic UPS applications.

Designed for use with either a self-contained or external stand-by battery plant, LorTec's new 10 kVA UPS consists of a solid-state inverter, battery charger/rectifier and a solid-state automatic static switch. In normal operation, the UPS battery charger section is powered by the commercial ac line and supplies regulated dc power to the inverter, while simultaneously float-charging the battery. The minicomputer or other critical load is continuously supplied clean ac power by the inverter section of the UPS. Should the commercial ac line fail, the batteries automatically, without switching, provide the necessary dc power to the inverter to maintain ac power to the load.

Capable of continuous operation at temperatures as high as 50C, the system's unique Delta-regulated inverter can handle 100 percent unbalanced loads and extended system overloads (125 percent for two hours or 150 percent for one minute). The system can handle all types of loads, including nonlinear and high-crest-factor loads, and loads with power actors from 0.8 leading to 0.8 lagging (without correction).

In addition, the new 10 kVA UPS includes a comprehensive, yet simple, meter, alarm, and control panel. This panel allows the user to continuously monitor 16 critical points and one user-selectable point, such as "standby engine generator running" or "battery disconnect switch open." LEDs, arranged in a convenient power-flow diagram, provide visual indication of system condition. To learn more, contact LorTec Power Systems, Inc., 145 Keep Court, Elyria, OH 44035; (216) 327-5050.

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TEC Adds Configurator To Its Software

TEC Computer Systems, Inc. added a configurator to its current manufacturing and financial control software product offerings.

The configurator provides manufacturers who make-to-order with a tool that facilitates building custom products from a list of standard option sets. The system stores the options and, after selections have been made, generates a bill of materials for the custom order. The configured product then can be scheduled into the manufacturing process. It also shows inventory availability and shortages for planning purposes and quoting delivery dates. The software runs on the VAX and MicroVAX II computers.

To learn more, contact TEC Computer Systems, Inc., 30 Tower Rd., Newton, MA 02164; (617) 964-3890.

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Signal Technology Updates ILS

Signal Technology Inc. has released a new version of its Interactive Laboratory System (ILS) for VAX/VMS environments. Version 6.0 offers expanded support for data acquisition and color graphics, a greatly improved user interface, and multiwindow operation on VAXstations.

ILS is an integrated software system written in FORTRAN. It's used in a variety of scientific and engineering applications that require analysis of time series data using digital signal processing (DSP) techniques. These applications include acoustics, speech, biology, noise and vibration, radar, sonar and many others. ILS operations include frequency analysis, digital filtering, numerical analysis, data manipulation, speech processing and more.

Version 6.0 offers simplified menu operations that permit easy access to most commonly used DSP functions. On-line help is provided at every menu level. Menus can be directly invoked, bypassing multilevel navigation when desired. Easy-to-use keypad

control provides efficient menu traversal.

A new, powerful workstation environment includes multiple graphics windows with ILS 6.0 running on a VAXstation. The user has full control of the creation, deletion, positioning, sizing, and usage of these windows. This feature allows for simultaneous viewing and comparing of results from different analysis steps, and for convenient menu review, at any time. Graphics support on DEC and Tektronix terminals also includes color control on applicable models such as the VAXstation GPX models.

Version 6.0 ILS will be sent free-of-charge to ILS VAX/VMS customers on maintenance. ILS prices range from $5,100 to $19,800.

To learn more, contact Signal Technology, Inc., 5951 Encina Road, Goleta, CA 93117; (800) 235-5787 or (805) 683-3771.

Enter 919 on reader card

MDB Announces Turbo MUX

A DMA Turbo Multiplexer for MicroVAX II computers now is available from MDB. The Turbo MUX is the fastest communications controller available for the MicroVAX and other PDP-11, Q-22-based micro systems. It has very high speed and greatly reduced overhead. By comparison to the DEC DHV11 and other similar multiplexers, the Turbo MUX provides the ability to operate more communications ports, at faster service and data rates, with reduced computer overhead.

The Turbo MUX uses the DHU11 emulation that is standard in all Micro VMS operating systems. The DHU11 driver automatically is implemented after the operating system has determined that a DHU11 is installed. It is the marriage of this DHU11 protocol with MDB's uniquely powerful design that provides speed and efficiencies unmatched by any other manufacturer. Full modem control, split baud rates and automatic bi-directional flow control are standard.

Data transmit rates for the Turbo MUX can be a sustained 38.4 KBaud for all channels, with a total aggregate data rate of over 100,000 characters per second. For received data the MDB hardware efficiently translates the DHU11 requirements using the Receive Timer, so that characters received during a time interval are stored in a 256 character FIFO. The timer can cause up to 192 characters to be serviced by a single interrupt. By contrast, the DHV11 emulation interrupts as soon as one character is received, and literally can bring the MicroVAX computer to its knees by very high overheads. The Turbo MUX's queuing of characters before an interrupt occurs does not cause the MicroVAX to become overloaded, thereby allowing very low overheads.

The 32-port Turbo MUX, because of its superior performance, precludes the requirements of having to purchase additional MicroVAX computers to reach the same number of users. Moreover, the Turbo MUX is expandable from 32 to 256 users, by adding additional Table-Top PBI-A32M units.

The Turbo MUX is available in several configurations for the MicroVAX computers. The list price of the basic 32-port configuration is $6,455. This includes the microprocessor module that mounts in the computer system, and a table top unit that contains the PBI-A32M module. Ten foot interconnection cables between the two units also are included. Delivery is 30 days ARO. For more information, contact MDB Systems, Inc., 1995 North Batavia Street, Orange, CA 92613-5508; (714) 998-6900. TWX 910-593-1339.

Enter 923 on reader card

C-51 Is Available On VAX/VMS And MicroVAX

The Archimedes C-51 Cross-Compiler Kit for 8051 microcontrollers now is available also on VAX/VMS as well as MicroVAX-systems. These versions are fully compatible with earlier PC and VAX/UNIX versions. The complete kit includes the C-compiler and library functions, as well as a macroassembler, linker and librarian.

The C-compiler implements the proposed ANSI-standard C language enhancements, like function prototyping. Five memory models, including a large model for 64K code and 64K data, are available to meet the requirements of different microcontroller designs. The compiler supports the IEEE 32-bit single-precision floating point standard. Mathematical functions include atan, acos, asin, tan, cos, sin, sqrt, exp, pow, exp10, log and log10.

Many C-compiler options are available, such as listings and generation of assembly source code. The C-library includes functions like 'printf'. A LINT-feature performs intermodular typechecking to simplify integration of several modules.

The software works with most PROM-programmers and emulators via several output options such as Intel standard hex. Symbolic debug for different emulators are provided by special emulator converter utilities. The C-51 software supports all 8051-based microcontroller proliferation chips, such as 8052, 8031, 8032, 80515 and 8059.

The VAX and MicroVAX versions are hosted on VMS and UNIX systems. The MicroVAX versions are priced at $3,995. The VAX versions are priced at $4,995.

For additional information, contact Archimedes Software, Inc., at 1728 Union Street, San Francisco, CA 94123; (415) 771-3303.

Enter 921 on reader card

Winchester Adds 11-MB Removable Cartridge

A new family of DEC Q-bus compatible Winchester disk subsystems with capacities ranging up to 110 MB plus an 11-MB removable 5.25-inch Winchester cartridge has been announced by Winchester Systems, Inc. for use on LSI-11 and MicroVAX II systems.

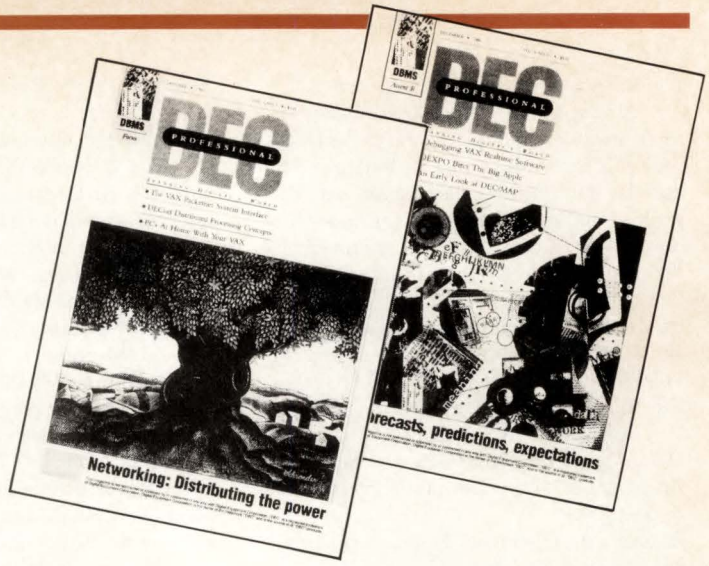
An MSCP interface is featured in the company's "DataSafe" product family which consists of six different models with total capacities of 11, 51, 81 and 121 MB including the removable cartridge drive. Dual removable cartridge drive configurations with total capacities of 22 and 44 MB are offered for applications requiring frequent cartridge duplication or storage of classified data. The MSCP protocol eliminates the 44-MB total capacity limitation imposed by RL02 emulation used in the company's RL02 compatible line of removable cartridge Winchesters.

The DataSafe MSCP family of systems runs all standard LSI-11 and MicroVAX operating system software. All storage is accessed as "DU" devices and the subsystem operates with DEC standard "DU" software drivers. The single dual-wide Q-bus controller board implements the MSCP protocol, supports 18- and 22-bit addressing and controls the fixed and removable disk drives. Systems are housed in a 5 x 9-inch NEMA rackmount or table top enclosure.

Removable Winchester cartridges offer advantages over low-capacity floppies and sequential access tape by providing random access and high capacity in a single removable media. This eliminates the traditionally painful choice between high-capacity and high-speed media. Removable Winchester cartridges are true hard disk platters contained inside a ruggedized cartridge housing. The removable cartridge frequently is used as "working storage" instead of just "backup storage." This eliminates the need to copy to and from a primary device.

Winchester removable subsystems are for valuable data applications such as automatic test equipment and software development. Totally removable data cartridges also are perfect for classified government applications. Data easily can be kept under "lock and key" security.

From DEC PROFESSIONAL



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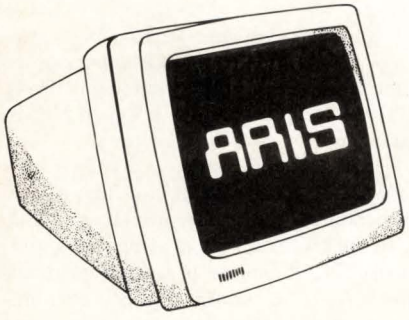

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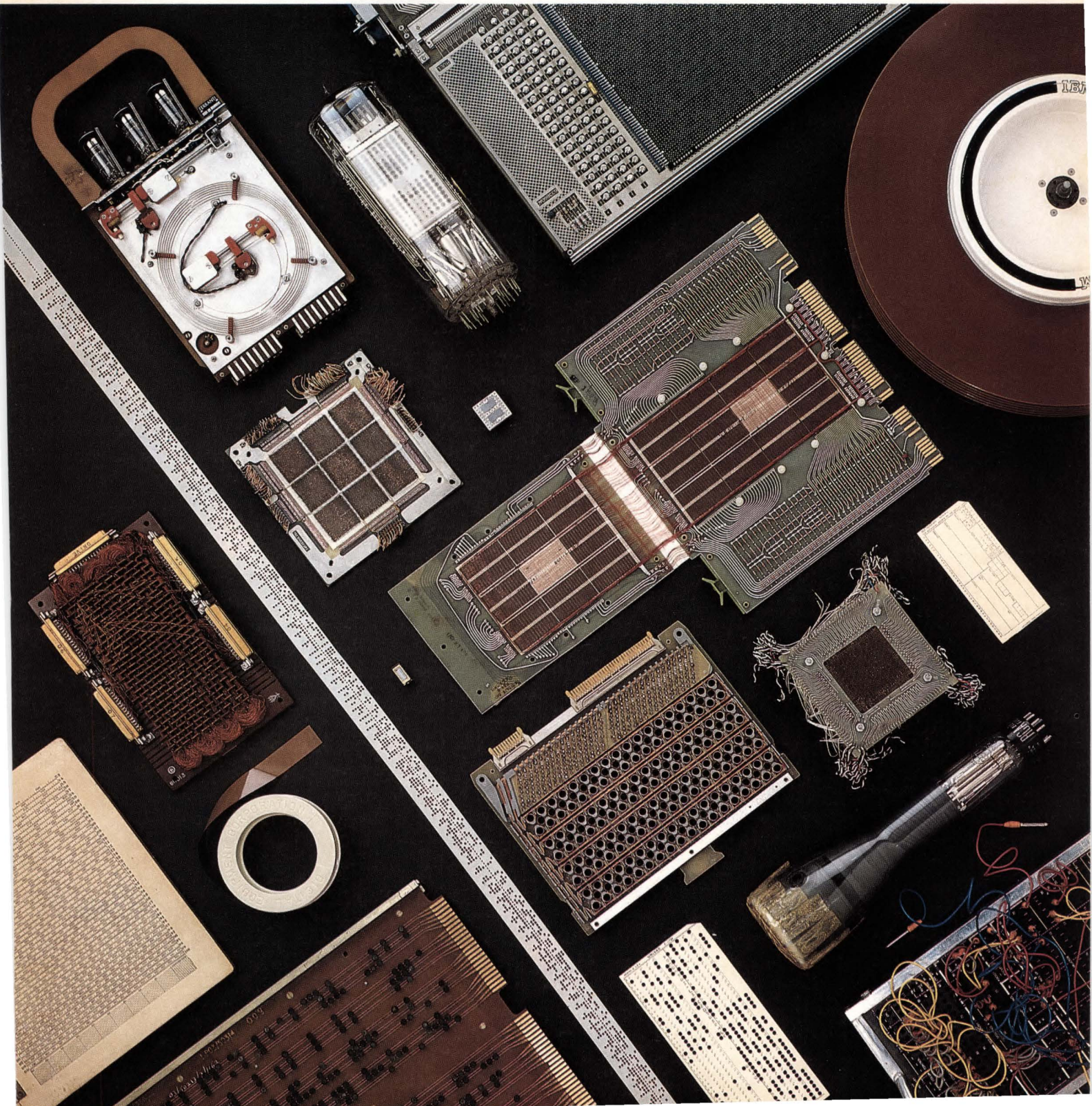

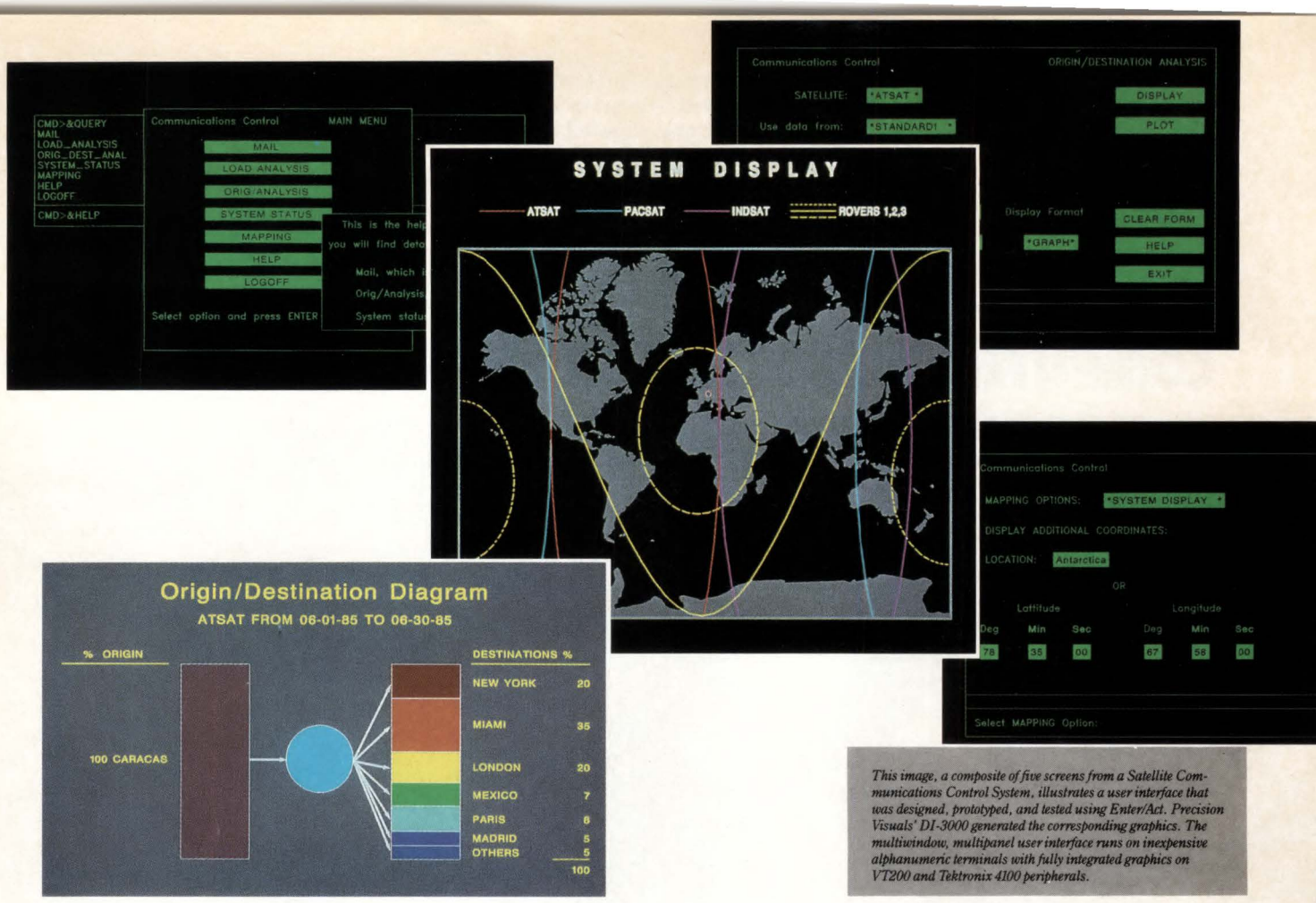

This image, a composite of five screens from a Satellite Communications Control System, illustrates a user interface that was designed, prototyped, and tested using Enter/Act. Precision Visuals' DI-3000 generated the corresponding graphics. The multiwindow, multipanel user interface runs on inexpensive alphanumeric terminals with fully integrated graphics on VT200 and Tektronix 4100 peripherals.

Precision Visuals' Enter/Act™ UIMS

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The Product

Enter/Act is a User Interface Management System (UIMS) to help you design and build interactive software. Enter/Act handles all application aspects of the user/computer interface, including prompt/command interaction, data entry and action menus, and both alphanumeric and graphics window management. Application prototypes are developed in a small fraction of the time normally required with conventional interface design methods. The end user can "test drive" the interface early in the development cycle, providing the developer with valuable tuning feedback for final implementation and solid user acceptance.

The Features

Enter/Act's modular interaction management tools allow runtime selection of the user's preferred interaction method — keyboard commands for experts, action and data menus for occasional users, or prompting dialogues for novices — all displayed in windows with controls to move, size, pop, scroll, or delete. Other key features include: ☐ An interactive (WYSIWYG) menu definition utility ☐ Several layers of context-sensitive on-line HELP embedded easily in the user interface, from one-line reminders to multi-screen tutorials ☐ Multiple security levels for control of information access ☐ A macro utility to capture action sequences and later invoke them with a single command ☐ Command renaming and automatic recognition of command abbreviation ☐ Example-intensive reference and tutorial documentation.

The Environment

Enter/Act lets you quickly define and refine user interfaces in your development environment, and then get top runtime performance when your applications move into production. Initially offered in the DEC VAX/VMS and MicroVAX world, Enter/Act's rich interface capabilities bring you fast, workstation-like windowing capabilities on inexpensive alphanumeric terminals like VT100s. Available with Precision Visuals' DI-3000 graphics library, Enter/Act supports all the popular graphics peripherals, and ensures device independence.

The Offer

Enter/Act's well-documented, easy-to-use tools can reduce your application design, coding, and maintenance requirements by 30% to 70%, depending on the sophistication of your user interface. If you develop your own VAX-based interactive application software, you very likely need Enter/Act. Give us a call to learn more about our Enter/Act UIMS and we will send you a free copy of the insightful booklet, *A Guide to Designing Friendly User/Computer Interfaces,* by Robert Stahl, President of the Interface Design Group.

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Quantity prices for DataSafe MSCP compatible Q-bus subsystems start at $4,750. Delivery is three weeks.
For further information, contact Winchester Systems, 400 West Cummings Park, Woburn, MA 01801; (617) 933-8500, (800) 325-3700.

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The QE-2000 Family Is Expanded

Qualogy's QE-2000 family of Enhanced Small Disk Interface (ESDI) storage systems, designed for DEC's MicroVAX and PDP-11 computers, has been expanded by the addition of a separately available rackmount plug-in subsystem for 5.25-inch ESDI Winchesters. Used with the QE2 controller, MicroVAX and PDP-11, users can reduce disk access time up to 90 percent.

Targeted at users with high-capacity, high-performance applications such as graphics, data acquisition and CAD/CAM, the QE-2000 rackmount subsystem comes with one (310 MB), two (620 MB) or four (1240 MB) drives mounted in a chassis (5.25 x 17.6 x 21.0 inches). The QE2 controller, external cabling and manual are available separately.

Single quantity pricing for the one drive subsystem is $8,995; two drive subsystem, $16,795; four drive subsystem, $32,195. Volume discounts are available. Delivery is 30-45 days ARO.
For more information, contact Qualogy, Inc., 2241 Lundy Ave., San Jose, CA 95131; (408) 946-5800.

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Synercom Introduces Distributed VAX Center

Synercom has announced a Distributed VAX Center (DVC) for mapping information management. The high-performance Distributed VAX Center operates as a stand-alone workstation and as a self-contained work center that serves as the host for up to eight users, including three additional graphic workstations. For customers with more extensive operations, the Distributed VAX Center is designed to operate as a node on a distributed information processing network.

The DVC marries Synercom's newly introduced INFORMAP III mapping database software with the VAXstation II family. The DVC will have impact within organizations such as utilities, telephone companies, local government agencies, and natural resource agencies by making full-function automated mapping technology available to a greater number of personnel.

The DVC provides the following capabilities to organizations that use maps and facilities records in the operation of their business:

Higher performance with a lower cost per user; an ideal startup system for large companies or a full-function, standalone system for smaller organizations or government agencies that previously could not justify purchase of a computerized mapping information system; a key component of an integrated, networking environment that serves the needs of individual users and also provides a communication link for sharing throughout the organization. The DVC also offers the time saving benefits of multiwindowing and multitasking, which means the user can run several activities at the work center concurrently. Synercom's DVC user interface features screen menus containing the most frequently used commands in the daily operation of mapping systems.

The Distributed VAX Center can be purchased as a turnkey system, with prices starting at $93,700, or unbundled, with the software purchased from Synercom at a price of $35,000 and the hardware purchased by the customer directly from DEC. If interested, contact Synercom, 10405 Corporate Dr., Sugar Land, TX 77478; (713) 240-5000.

Enter 929 on reader card

MACSYMA Solves Complex Modeling Problems

MACSYMA mathematical computation software is available from Symbolics, Inc.'s Computer Aided Mathematics Group on Sun Microsystems, Inc.'s Sun-2 and Sun-3 workstations running the Sun 3.0 operating system, and on DEC's MicroVAX II workstation running the MicroVMS operating system.

MACSYMA is an application software program marketed by Symbolics for a range of computer systems, including the Symbolics 3600 family of symbolic processing systems, DEC's VAX line and the MC68010 version of the Masscomp MC5500 engineering workstation. As a layered applications software product, it does not include Symbolics' Genera software environment or substrates.

Scientists, engineers and mathematicians use MACSYMA to solve complex modeling problems in a wide range of technical fields, including aeronautics, mechanical design, electronic circuit design, fluid mechanics, acoustics, electromagnetic field problems, plasma physics, atomic scattering cross sections, control theory, maximum likelihood estimation and genetic studies.

MACSYMA automates symbolic mathematical computation, resulting in improvements in speed, accuracy and modeling power. There are three reasons for these benefits. MACSYMA automates large, routine symbolic mathematical calculations; it applies automated mathematical "expertise" to difficult problems involving algebra, calculus and differential equations, allowing the user to focus on the solutions, not the computational methodology; and MACSYMA replaces significant amounts of numerical analysis with symbolic solutions in a cost-effective manner.

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ATI Offers NEW Ada Design TOOL

Advanced Technology International, Inc. (ATI) has announced a comprehensive new superPDL option designed specifically for Ada users.

The new option, known as Ada-superPDL, provides a straightforward series of Ada languages constructs for design in Ada.

The superPDL package, a VAX-oriented, interactive design tool for software engineering professionals, dramatically has expanded software design capabilities for large, real-time systems at over 50 major firms worldwide since its introduction three years ago. Automatic Code Generation in PASCAL, FORTRAN, and C, and graphic output in the form of detailed Structure Charts, are among the more than a dozen features recently added to the superPDL package through new releases.

Ada-superPDL is geared toward users who wish or need to do design in Ada, but do not want to give up any of the functionality that an interactive design tool provides. It supports the design concepts incorporated in Ada that are required for generating good designs, including division of the subprogram into two functional parts (i.e., a specification and a body), the ability to monitor the interfaces between the bodies of calling programs and the specifications of the called subprograms by keeping track of all possible inconsistencies, and the use of Projects and the Abstract Data-Type mechanism to implement the "package" concept in Ada. It offers a full range of Ada language constructs with which to create the design.

In announcing the new Ada option, ATI also reported plans to make Ada Code Generation and Mil-Std-2167 compliance features available with the Ada-superPDL package in the near future.

For more information, contact Advanced Technology International, Inc., 350 Fifth Ave., 19th Floor, New York, NY 10118; (212) 947-4755. Telex: 237048 B TADUS UR.

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KEYpak Is Compatible With VAX-Based Systems

Keyword Office Technologies Ltd. introduced a new software program called KEYpak that allows documents to be exchanged among multivendor office systems that are based on the VAX family of minicomputers from MicroVAX 11 to VAX 8800.

KEYpak permits editable document exchange among word processing systems such as WordPerfect running on an IBM PC, WPS Plus on the Rainbow, Displaywrite 3 on VAXmate, Microsoft Word on a Macintosh and Mass-11 on VAX. A single document can be distributed in various word processing formats using VAX connectivity and KEYpak compatibility.

KEYpak integrates with DEC's ALL-IN-1, the office system for the VAX that provides VAX users with word processing, electronic mail and other office assistance programs. KEYpak also works without ALL-IN-1 as a standalone application.

The KEYpak document translation environment includes support for all major personal computer-based and dedicated word processing systems, including ASCII, DECdx, DCA(RFT), Displaywrite 2/3, MASS-11, MicroSoft Word, MultiMate, Navy/DIF, OfficeWriter, Samna, Wang (WPC), WordPerfect, Wordstar, Xerox (Writer), AES/Lanier, Convergent Technologies, CPT, DECmate, IBM Displaywriter, IBM OS/6, IBM 5520, NBI, Philips/Micom, Q-One, Wang, Wordplex and Xerox 860. The KEYpak document translation portfolio is one of the largest available in the industry. KEYpak prices range from $4,000 to $57,000.

To find out more, contact Keyword Office Technologies Ltd., 2816—11 Street N.E., Calgary, AB Canada T2E 757; (403) 250-1770.

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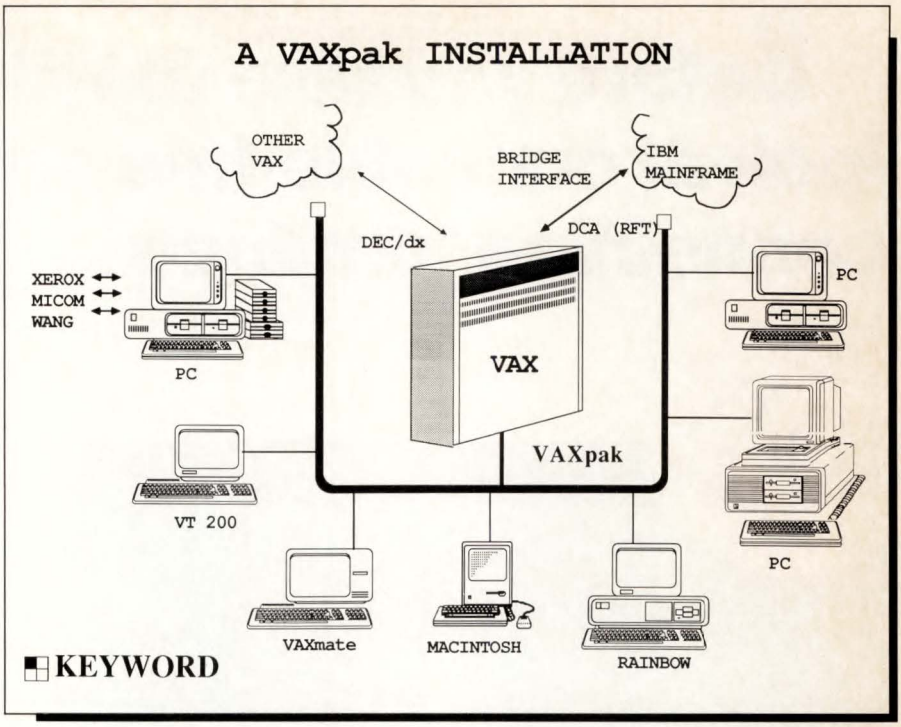

A VAXpak Installation.

KBLock Secures Unattended Terminals

Users of VAX/VMS systems now can guard their terminals against unauthorized use while they are away from their stations, and still allow their processing to continue, with the new KBLock software program, the latest in a line of computer security utilities from Clyde Digital Systems, Inc.

KBLock secures users' terminals by intercepting and "throwing away" unauthorized input. The lock is initiated by pressing a user definable control character. KBLock then blanks out the screen and prompts for the user's account password. No input will be accepted from the keyboard until the correct password has been entered.

KBLock can be started any time the user is logged in. It will allow any command or program to continue processing while it is activated on the terminal and will buffer any output from the process and display it on the screen when the user returns and enters the correct password.

With this software system, the user can blank his screen quickly to keep sensitive information from the view of unwanted or unauthorized visitors.

More information regarding this or other Clyde security products may be obtained from Clyde Digital Systems, P.O. Box 4500, Provo, UT 84603; (801) 224-5306.

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The price for each of the new versions of MACSYMA is $7,500 in quantities of one. To learn more, write or call Symbolics, Inc., 11 Cambridge Center, Cambridge, MA 02142; (800) 622-7962.

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ChemLib Launched By Chemical Design

ChemLib, a new VAX/VMS product from Chemical Design, the latest addition to the Chem-X family of molecular modeling software modules, provides a simple interface to many of the routines and data embedded in the Chem-X system. This makes it easier to link Chem-X to other programs or files — or to make imaginative use of its comprehensive library of 3-D graphics routines.

ChemLib was developed for users who want to interface Chem-X more closely to their own software or data files, "customizing" Chem-X for particular applications. It was designed to allow easy transfer of data between programs. The user's subroutines either may be incorporated into the Chem-X program image or form separate images with data transfer via archive files. In both cases the user's programs can be invoked by simple commands.

The display capabilities of Chem-X are due to a comprehensive library of graphics routines. ChemLib provides easy access to these built-in graphics functions for applications other than molecular modeling.

The line-drawing routines offer the choice of two- or three-dimensional representations, and a variety of line styles. Other drawing options include block mode, polygon fill, seed fill and panel fill. Automatic depth-cueing for 3-D images is available. The colors of different parts of the picture may be selected by the user. Drawings may be scaled up or down and moved around the screen. Special functions for drawing histograms, contour maps and pie charts also are included.

For further information, please contact Dr. Deborah Dunn, Chemical Design Inc., Suite 120, 200 Route 17, Mahwah, NJ 07430; (201) 529-3323.

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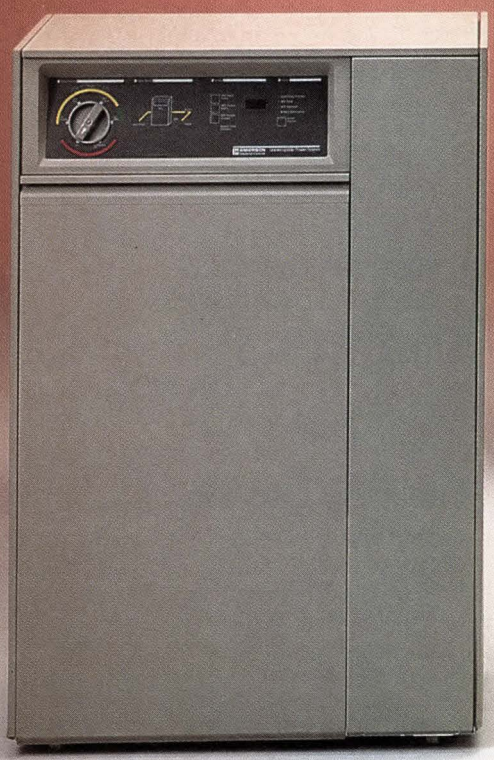

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BACK END

John C. Dvorak

Inquiring Minds

"What's that you're reading?" I asked the babysitter who had come to watch little Johnny, the precocious two year old, while I stepped out for the evening.

"*Micro-Teen*. It's the hot new computer mag. It's really rad, check it out!" The bubble gum chewing teen held it in front of her and popped her gum as she talked. "There's a great centerfold of Malcolm Jamal Warner."

The magazine cover shouted titles like "Menudo's Micro Tips," "Michael J. Fox At His Mac — Pull Out Pix," and "Duran Duran's Super Computer Whiz Quiz." I flipped through the glossy newsprint. There were one too many pictures of Michael J. Fox, and Wham!, I thought. And even a few of The New Monkees.

"So what does all this have to do with computers?," I asked.

"Gawd, get real!" She wrinkled her nose and rolled her eyes. "It tells everything I want to know about computers. I mean, like, what's the big deal? They're only machines, you know."

Pop, Pop, Pop went her gum.

"But, there isn't really anything about computers in here, is there?"

"Yes there is!" She snapped the magazine out of my hands and flipped through it. "Look! See? Here's a software program to budget your allowance. And here's the Menudo Game Disk! And here's the list, uh, where is it now? Here! — a list of phone numbers — the only official guide to the fab teen stars fan club hot lines and bulletin boards! See?" She cocked her head and smirked.

Pop, Pop, Pop went her gum.

"Do you have a computer?," I asked warily.

"What d'ya think, I live in the dark ages or something?"

"No, no, I guess not." Uh, I decided it was time to leave. "Be back around 10."

"Sure. OK." She smiled and waved as I walked out the door.

On the way to a night spot, I stopped at the grocery store for a few items. At the check-out counter was a new tabloid called, *Computer Enquirer*. The cover had a picture of some large woman, with the headline:

" 'THE PC MADE ME DO IT!!' "

Another smaller headline screamed:

"BIRTH DEFECTS LINKED
TO 1200-BAUD MODEM"

I opened the paper. There were all kinds of stories — none that I had ever read before in any computer magazine. There was one about a woman who lost 115 pounds by playing *Flight Simulator* all day, every day for six months. There was a story about a minister who uses a Mac to diagnose ailments and heal them! And I became deeply engrossed in an article about the spontaneous combustion of a software programmer, when someone tapped me on the shoulder from behind. I looked around.

It was a haggard old woman dressed in a rumpled and worn jogging suit, and wearing a ragged scarf with a few spongy pink curlers poking out. "Sir, move forward, please. You're holding up the line."

"Oh sorry."

I took three giant steps forward.

"The article that unravels the mystery of Stonehenge is really good." She pointed to a short piece at the bottom of the page I was reading. "Says they found that it's laid out exactly like the way a computer writes to disk."

"Oh?"

"But the one last month on the aliens who kidnapped that woman and communicated to her in FORTH — that was *very, very* good." She shook her head in awe. "Did you read it?"

"No. But, tell me, do you know much about computers?" Do you use one?"

She stared at me in silence for a long time. I wondered if I had grown another head. When she finally spoke, it was with a steady and cold-edged voice. "I read the *Computer Enquirer* e-v-e-r-y week. Religiously! Is there anything else I need to know?"

I smiled. "Yes, ma'am. I, uh, guess you're right." Then I inched away.

I had one last errand to run before heading to the nightclub — a quick stop at my mother's house — she needed a light bulb changed or something.

Mom greeted me at the door. "Son, you'll never guess what!"

"What?"

"I know all about computers now! Now I can talk to my son. Isn't that wonderful?" She beamed.

"What???"

"It was on *Donahue* today. His whole show was about computers. They're so simple. Why didn't you tell me about compatibility problems before? It's so interesting. Isn't it, son? Son? John? John! JOHN!"

"JOHN! Wake up!" I was shaken vigorously by my editor. I was at another boring seminar. It was about what life would be like if computermania never ended.

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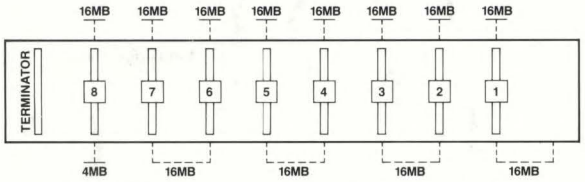

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