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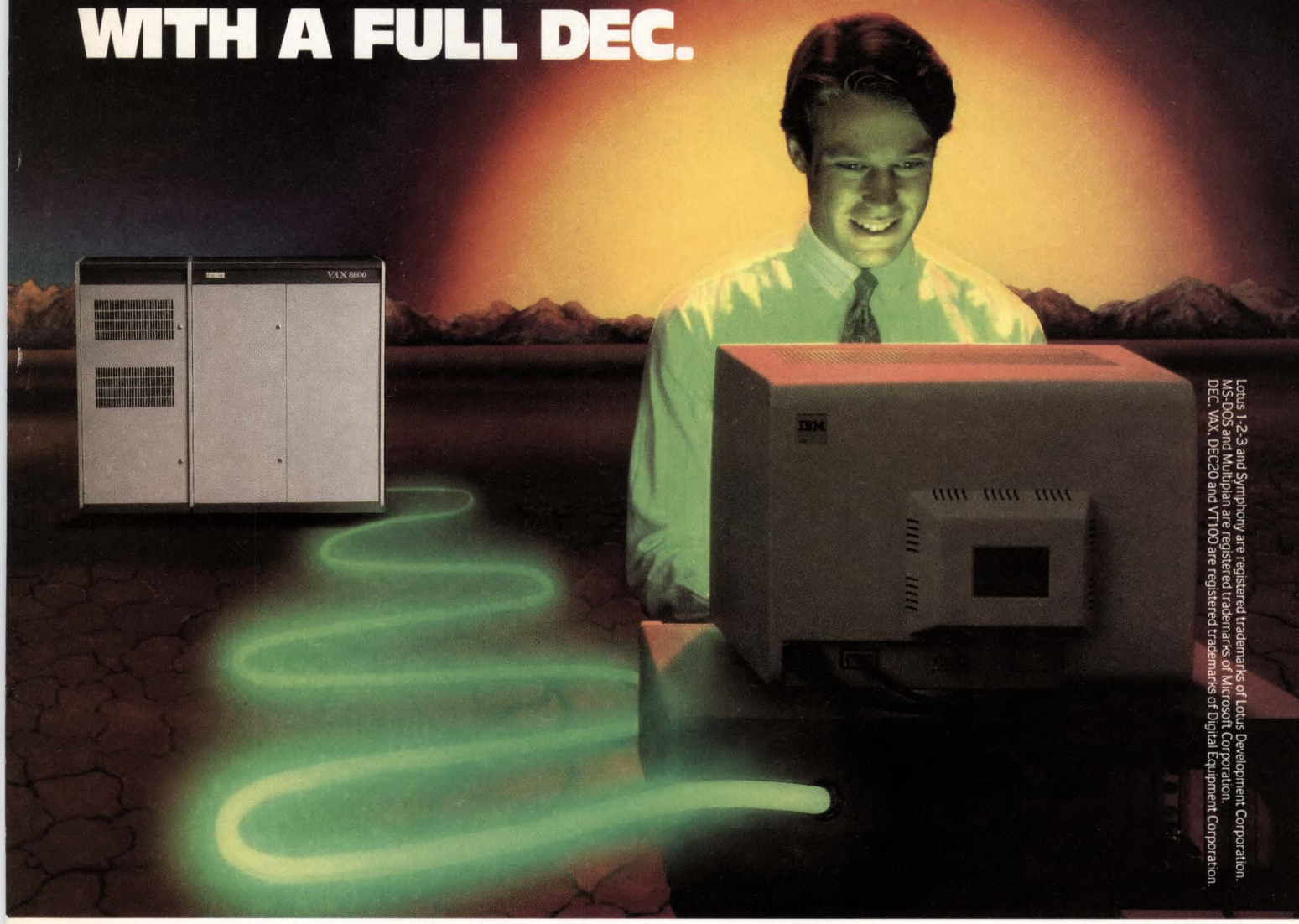

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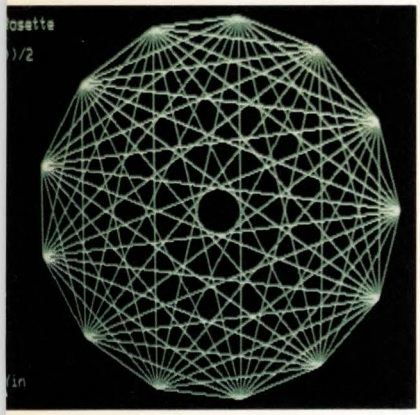

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PROFESSIONAL

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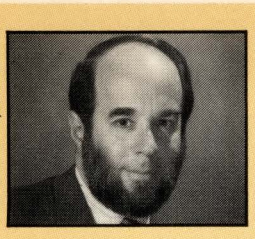

PUBLISHER

Carl Marbach

Because Of You . . .

With this issue we begin our fifth year of publishing the *DEC PROFESSIONAL* magazine for you — our loyal readers. It is because of you that we are where we are today. It is our significantly larger readership that makes us number one. And what a readership it is! Over 48,000 of you have a VAX that is 11/750 sized or larger, while 24,000 have a smaller VAX. Amazingly, over 20,000 of you now operate a MICROVAX, making it the fastest growing VAX ever. The PDP line is well represented with 42,000 Q-bus PDP-11s and just over 54,000 UNIBUS machines.

The most popular VAX is still the venerable VAX 11/780 with 30,006 readers, followed closely by the 11/750 with 26,778. The newest VAX that has reached significant numbers is the VAX 8600 with 9,861 readers reporting that they have one or more.

The PDP 11/70 remains on top of the 16-bit line with 14,866 readers, with the PDP 11/34 not far behind with 14,256. The J-11 based (11/70 on a chip) MICROPDP-11s are catching up with 8,541 11/73 Q-bus machines and 4,135 UNIBUS-based PDP 11/84s.

Microcomputers are well represented with MS-DOS number one, followed closely by CP/M. Even the Professional 300 series has more than 10,000 readers who use them.

VMS leads the operating system sweepstakes with just over 50,000 copies. The closest competitor is RSX with 24,568 users of this popular 16-bit operating system. While the first two aren't a surprise, the third most popular operating system is UNIX with just over 19,000, about 3,500 of whom use the ULTRIX variant from DEC.

Most of you work for large companies with the largest segment, more than 18,000, coming from companies larger than 10,000 employees. Fully 75 percent of you come from companies larger than 100 employees. A large percentage of you come from government, data processing services, manufacturing or education, all with about even participation. More than 12,000 of you are OEMs serving our industry.

> ***"It is because of you that we are where we are today. It is our significantly larger readership that makes us number one. And what a readership it is!"***

The largest number of you, almost 34,000, are in the data processing area of your company, and that is followed closely by engineering and corporate managers.

And do you buy! More of you purchase important products than can be found anywhere else. No one reaches more buyers than the *DEC PROFESSIONAL*. Seventy-nine percent of you are responsible for purchasing computers and systems, 76 percent buy terminals and 72 percent specify printers and other hardcopy output devices. You truly are the people who make our industry go!

Serving you isn't always easy. Our editorial policy states that our articles must teach and make every one of us better at what we do. You don't find rehashed press releases or personal life stories. Through meeting many of you at DECUS and DEXPO, editorial studies, readership surveys and other means, we are always trying to find out how to better serve you. So far you tell us we are doing the job!

When we started publishing DEC-specific magazines more than seven years ago (our first was the *RSTS PROFESSIONAL* back in 1979), I couldn't foresee that today we would have more than 85,000 subscribers along with all this information about all of you in our computers. Reflecting on the past four years, I wonder where we will go in the next four. Like most of you, I plan to stick around to find out. See you in the magazine.

Carl B Marbach

Publisher

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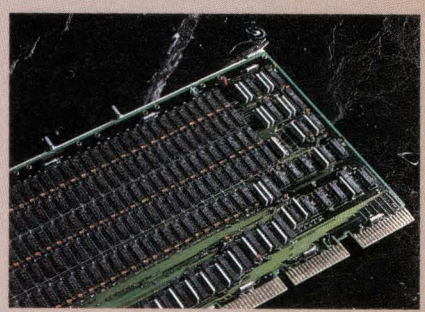
CMX-750/730, Our 1 Megabyte Dynamic Memory Module. Designed to operate in your DEC VAX 11/750-CA or modified 11/750 and VAX 11/730 computer systems, Camintonn's CMX-750/730 provides up to 8 Megabytes of memory on the 11/750 and up to 5 Megabytes on the 11/730. Completely compatible with DEC hardware and software, the CMX-750/730 features an on-line/off-line switch, LED and spare RAM for easy service and maintenance.



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Camintonn's CM-DHV11: 8 Full-Duplex Async Serial Lines On One Dual Card. Three to four times faster than the competition, our CM-DHV11 is a space and power saving dual height DMA multiplexer utilizing high-speed microprocessor-based architecture for excellent reliability, compact size and high performance. It provides full modem support on all lines, with RS-232-C and RS-423-A interface standard. RS-422 interface support (data only)

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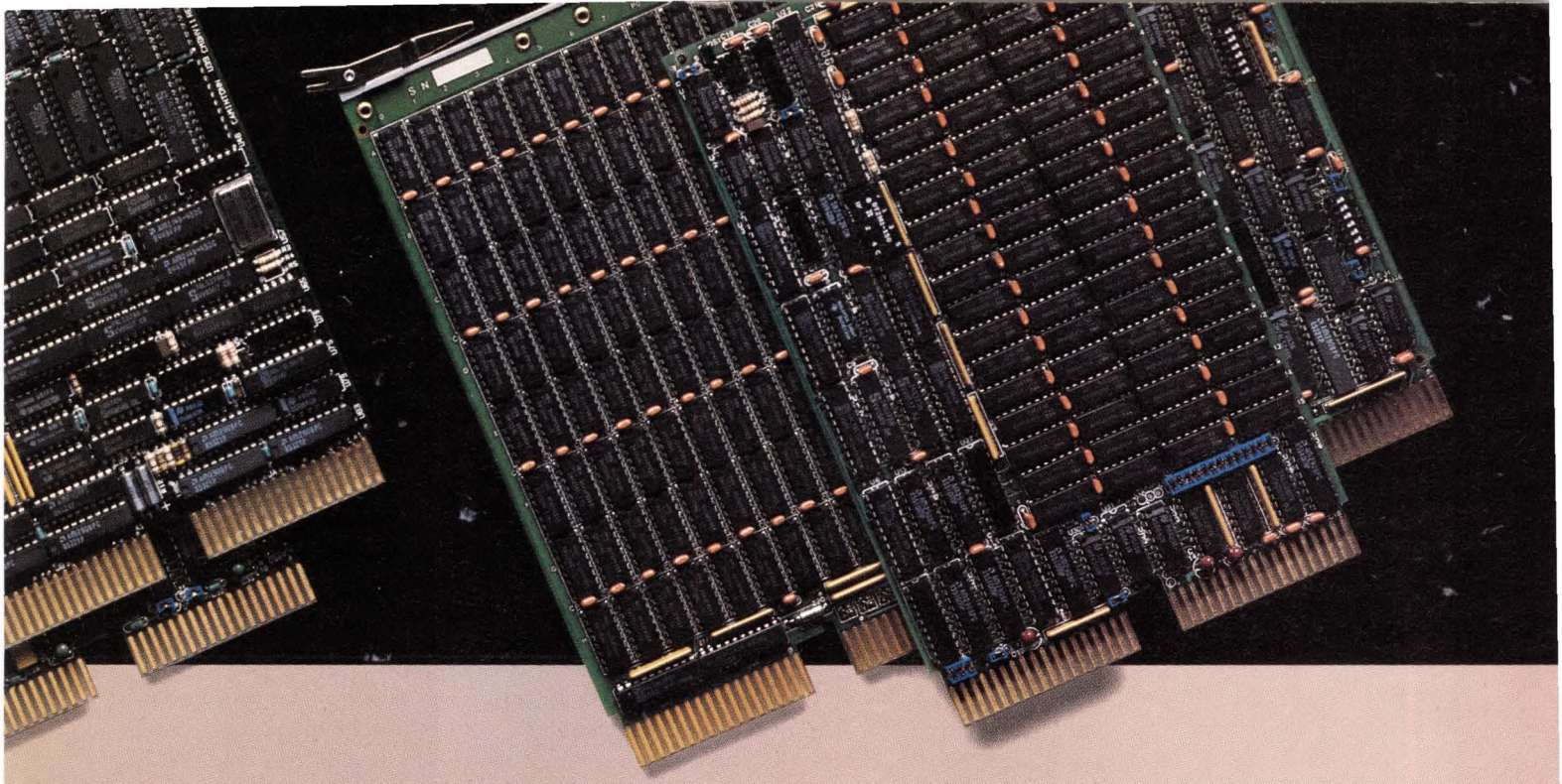

tible Memory and Communications Solutions.

is available on 4 of the lines with our optional cable kit.

Camintonn's CM-DHV11 plugs directly into any standard Q-Bus backplane slot, and is fully hardware and software compatible with DEC's DHV11 product.

CM-DLV11-J: Our 4-Line Serial Port Card. An LSI-11™ bus-compatible interface module, the CM-DLV11-J provides 4 asynchronous serial lines which can be independently configured for RS-422, RS-423 or RS-232-C signal compatibility. Baud rate, number of data bits and stop bits, and parity are switch selectable on a per line basis. Of course, it's fully DEC compatible.

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VAX 11/750 Memory Product:

- ☐ CMX-750 (1MB)

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DU-FLI

DATELINE DEC

Liberty Weekend, DEC Make Perfect Match

Millions in Hardware, Support Donated

When the celebration begins for the completion of the Statue of Liberty restoration on the Fourth of July, DEC computers will be behind the scenes helping to make it all possible. DEC has donated millions of dollars in hardware and service support for Liberty Weekend to insure that the extravaganza is a success. Among the hardware donated for the event are:

One VAX 11/730
One VAX 11/750
Four MICROVAX IIs
16 DECmate IIIs
Nine DECmate IIs
11 DEC Rainbows
Six VT220 terminals
Two LN03 laser printers

The information processing software being used, *Destiny*, from Intelligent Information Systems (IIS) of New York, also was donated. An integrated information processing package for the VAX, *Destiny* features a high level 4GL, a query capability, online recovery, a symbolic debugger, and an integrated data dictionary and program library.

Destiny and the VAXs will be used for the accreditation of visitors and the ticketing of the myriads of well wishers expected to visit the monument for the occasion. It is a large-scale accounting and control system that processes orders for such things as reservations and information mailings, and organizes access to the sites for visiting dignitaries, the press and the general public.

The Rainbows and DECmates will be used for proposal writing, word processing and the full array of personal computer functions necessary to put an operation of this magnitude together. Software for these micros includes *Lotus 1-2-3* and the *WPS-80* and *WPS Plus* word processing software.

The director of the Liberty Weekend computing center is independent Computer Consultant Larry Arnold. According to Arnold, Liberty Weekend is a unique situation, where the user requirements essentially have been unknown. Therefore, the computing staff has tried to keep the operation simple (there is no networking or clustering of the hardware), and to remain flexible and responsive to problems as they arise. His staff recognizes the minimal value of planning for unknown contingencies.

Arnold's staff includes three individuals courtesy of DEC: a systems service specialist who oversees the nuts and bolts operation of the computers, a hardware sales coordinator who finds out what is needed and obtains it, and a DEC Office Systems Group specialist who handles the personnel training and the installation of the systems. In addition, IIS always has one or more representatives present to assist with *Destiny*. The staff is rounded out by two computer specialists who work directly for Arnold.

Liberty Weekend and DEC were brought together through DEC's relationship with the New York-based accounting firm of Arthur Young, which recognized a perfect match when it saw

one. Contact was first made in early March and DEC responded almost immediately; equipment and personnel soon began to swell the New York headquarters. Reportedly, it took approximately one and a half months to get the system fully operational; not a bad time frame considering the unique requirements and large magnitude of the operation.

The Liberty Weekend group officially ceases to exist on July 31st. At that time the hardware and personnel will be returned to DEC and IIS, with gratitude.

ISU Opens Clearinghouse For Academic Software

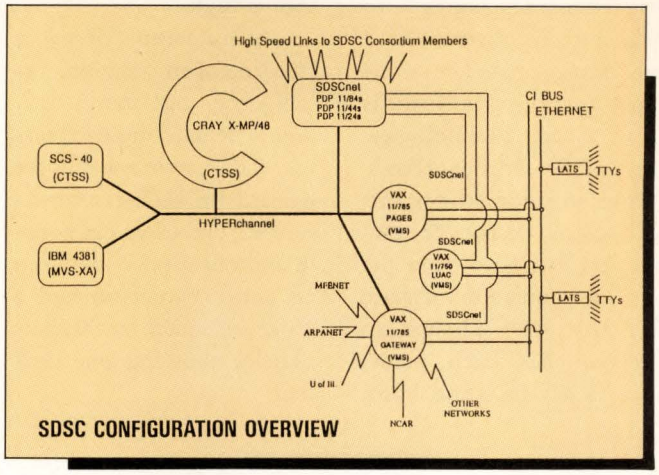
DEC To Act
As Technical Consultant

In response to the need of educators to have a means for sharing academic software, Iowa State University has established the Clearinghouse for Academic Software. The Clearinghouse is a not-for-profit distribution center designed to make academic software and courseware developed for VAX/VMS widely available to educators at a moderate price.

A 25 percent royalty on the licensing of their software through the Clearinghouse will be paid to software owners. The owner retains rights to the software — it is not in the public domain. Software will be site-licensed at moderate prices suggested by the owner.

DEC will act as a technical consultant to ISU in these efforts, while owners of submitted software or courseware must be willing to provide telephone support for their programs. In exchange, the owners will receive royalties and recognition of their efforts by their colleagues.

For more details and a copy of *The Clearinghouse Author's/Owner's Guide*, contact The Clearinghouse, Computation Center, 104 Computer Science Building, Iowa State University, Ames, Iowa 50011; (515) 294-0323.



SDSC CONFIGURATION OVERVIEW

SDSU Opens RUAC

Links University To Supercomputer Center

San Diego State University recently opened its Remote User Acces Center (RUAC). The RUAC gives researchers the capability to access high-speed supercomputing power and a national scientific communications network without leaving their offices or laboratories.

Bringing the power of a supercomputer right into the researcher's own facility, the RUAC links the University with the San Diego Supercomputer Center (SDSC), one of five scientific supercomputing centers established by the National Science Foundation (NSF) to stimulate technology development.

Users at SDSU not only have access to the SDSC, but, through the national network (SDSCnet), they can share data and resources with any of 18 other academic institutions that are consortium members.

Each RUAC is primarily configured with VAX-11/750 and PDP-11/24 systems. Computers and peripheral equipment from DEC at the RUACs are valued at $7 million.

Developing Computerized War Games

VAX 8800 Is Target Hardware

A team of computer scientists at Lawrence Livermore National Laboratory's Conflict Simulation Center recently faced the task of developing war games for the U.S. Army — a multiuser, interactive graphics program for training officers in strategic

operations and military tactics.

The team agreed to beta-test Teamwork/SA, a workstation-based environment for systems analysis from Cadre Technologies, Inc., of Providence, Rhode Island, to automate systems analysis and design. The target hardware to run the combat-simulation software is a VAX 8800. Though no decision has been made, sources say the probability of the war games running on a distributed VAX architecture is high.

Simulations involve close combat, aviation, intelligence, and more, over highly detailed digitized terrain. Trees, river and hills are painted on high-resolution screens, and users can zoom in and out quickly between an entire battlefield and a 10-meter square on that battlefield, showing one tank unit.

ATDC Creates Executive Roundtable

Problems Of Start-up Companies Discussed

A new organization to help executives of start-up companies in high technology industries has been created by Advanced Technology Development Center (ATDC), at the Georgia Institute of Technology, and DEC.

The organization, called the Technology Executive Roundtable, is run by its members — chief executive officers, founders, and other officers of companies with fewer than 300 employees in technology industries. The roundtable meets monthly to discuss problems members face in managing their businesses by participating in peer-based discussion groups.

The Atlanta Roundtable is third in a series of roundtables started by DEC to provide a unique kind of help to increase the growth and survival rates of technology companies.

IEEE Task Force Seeks Members To Develop Protocol Standard

Proposed for Microcontroller System Serial Control Bus

The IEEE Subcommittee on Instrument Computer Interfaces (ICI) currently is forming a task force to develop a standard for a Microcontroller System Serial Control Bus.

The scope of the proposed standard, P1118, is a bit-serial communication protocol optimized for distributed data acquisition systems, control devices, and test and measurement instrumentation. The focus is on OSI layers 1 and 2, medium distances and limited task (application specific) microcontrollers.

If you are interested in this application area and would be willing to participate on, and/or communicate with, the task force, please contact Don Ware, Digital Equipment Corporation, 4 Mount Royal Avenue, Marlboro, MA 01752; (617) 480-4701.

Advisory Board Sets Course For DEXPO East

First Meeting Held At Infomart

l-r: Donna Raimondi, senior writer, *Computerworld*; James Gursha, director of Information Systems, Goldman Sachs and Company; and Carl Marbach, publisher, *DEC PROFESSIONAL*, were among the industry leaders who met at DEXPO South 86. The newly established DEXPO East 86 Conference Advisory Board met to discuss the theme and goals of the Conference, to be held concurrently with DEXPO East 86 at New York's Javits Convention Center, December 17-19.

At the meeting, the Advisory Board established that the conference will address the information needs of executives who use and manage DEC systems. High-level users will find seminars offering management strategies for integrating DEC systems with other computers, disaster recovery, security, networking, and many other issues.

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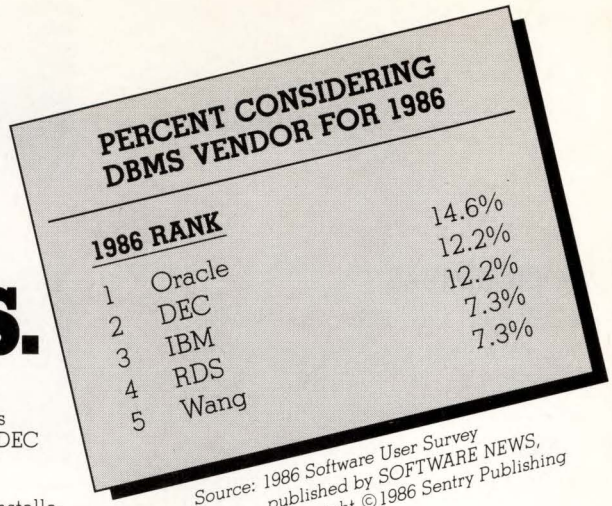

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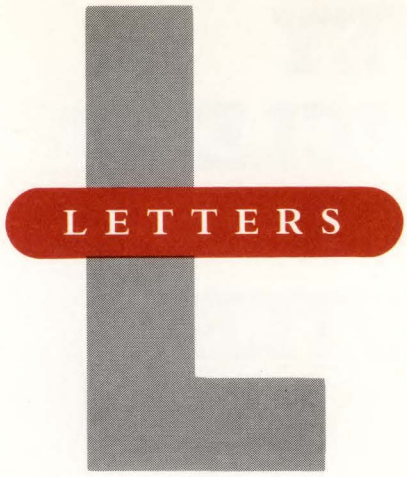

Address letters to the editor to the *DEC PROFESSIONAL* magazine, P. O. Box 503, Spring House, PA 19477-0503. Letters should include the writer's full name, address and daytime telephone number. Letters may be edited for purposes of clarity or space.

MORE ON ADABAS

I am writing this letter to thank you for printing the correction to your review of *Adabas*(VMS). (See "Letters" in the June issue of the *DEC PROFESSIONAL*, Vol. 5, No. 6.) However, there are other inaccuracies that appeared in the article that I wish to address.

The whole point of threads is to provide high-performance for a very large number of simultaneous users. When a user's command is blocked due to an I/O wait state, rather than having the DBMS wait for I/O completion (as many other DBMS products do), *Adabas* can continue processing the next request on another thread.

In addition, the primary goal of timeout processing in the *Adabas* nucleus is to avoid deadlock conditions such as those that can occur when records are locked for update by a program that, for one reason or another, becomes inactive, and as a result, never issues an END or BACKOUT TRANSACTION command.

I believe that most industry consultants consider *Natural* to be a fourth generation language, despite the controversy as to what constitutes a 4GL. In fact, many users consider the *Adabas/Natural* combination to be highly flexible, particularly because the speed of *Adabas* and the convenience of *Natural* promote prototyping during the design of an application. This helps ensure user satisfaction with the resulting application program. A point of note: Both *Natural* examples on p. 97 of Mr. Cini's article (FIND PEOPLE . . .) work equally well with SALARY as a descriptor. In fact, FIND PEOPLE WITH SALARY STARTING FROM 30000 is equivalent to FIND PEOPLE WITH SALARY GE 30000. If salary were not a descriptor, then, as correctly pointed out, but incorrectly illustrated, a different syntax would have been required.

Your review states that Software AG is planning a VMS implementation of its *Supernatural* language that should address inflexibilities reported in the article. Let me clarify that *Supernatural* is actually a menu-driven *Natural* program generator that makes it easy for even the most inexperienced end-user to get information out of the *Adabas* database. It is PREDICT, the data dictionary management facility, that is designed to remove any rigidity or inflexibility that might be experienced with the *Adabas* data dictionary. Beta testing of PREDICT(VMS) is currently under way.

Last, I would like to address Mr. Cini's statement that ". . . probably due to its IBM history, *Adabas* databases must be cylinder-aligned on the disk volumes in which they reside." Cylinder boundary file layout is for performance — an I/O optimization consideration, not a holdover from IBM! While it is true that as a result, anything other than a VMS BACKUP/physical can't be used, the ADABACK utility is a better approach because it can do many things that the VMS backup utility cannot, such as:

1. Automatically back up the entire database, or selectively on a per-file basis — in one pass, regardless of the number of separate physical disks on which the database resides.
2. The database can be backed up while it is online, with concurrent update activity occurring.
3. Only file space with actual data is backed up. Any allocated but unused space is not backed up, thus saving time and tape.
4. The *Adabas* log files are appropriately marked to indicate the occurrence of a backup.

I hope that this information gives readers of the *DEC PROFESSIONAL* magazine a more accurate understanding of *Adabas*(VMS) and *Natural*(VMS.)

David Keller
VMS Products
Marketing Manager
Software AG of
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LEGAL TRENDS

As an attorney, I read with interest Mr. Dvorak's article, "Big Money Awaits the First Who Sue Programmers," in the April 1986 issue. Because a substantial portion of my practice focuses on computer-related legal matters, including computer system acquisitions, software development and licensing contracts, and software-related disputes, I believe it to be appropriate and fair for me to respond to the article.

While I enjoyed the humor with which Mr. Dvorak suggested that programmers, consultants and computer companies will be inevitably deluged with frivolous multimillion dollar lawsuits, I cannot accept this prospect as even a remote possibility. Mr. Dvorak's suggestions and conclusions are fundamentally flawed because they are drawn from a few skewed data points (i.e., the "screwball suits" reported by the press) rather than from a statistically representative sampling of lawsuits. The fact of the matter is that the vast majority of all lawsuits are resolved reasonably and fairly. If there is to be criticism, it should be directed instead at the delay and cost of litigation.

Mr. Dvorak sees great potential for litigation against software companies because of inevitable bugs in their software. Most software companies, however, are effectively protected by carefully drafted contracts, warranties, disclaimers and limitations on liability. The trend among software companies is to seek out experienced and knowledgeable computer lawyers for assistance in these matters, and thus exposure of the industry generally is diminishing (not increasing) with time. In contrast, the typical million dollar lawsuit (e.g., personal injury, antitrust, patent infringement) cannot effectively be protected against through contractural techniques.

Mr. Dvorak's solution to the problem he perceives is to eliminate contingent fees and to turn lawyers toward "public service" through "government regulation." I see elimination of contingent fees as a nonsolution because the nature of computer-related disputes does not generally lend itself to contingent fee arrangements. Furthermore, I believe there is something fundamentally unfair in protecting the computer industry which thrives on unrestrained capitalism and generally champions free market principals, through the imposition of government regulation on lawyers.

Mr. Dvorak maintains that the computer industry has not yet been "plucked" only because most attorneys are technophobes and afraid of computers. I maintain that wholesale "plucking" has not occurred and will not occur because competent and ethical computer professionals (and the companies for which they work) are simply not vulnerable to an impending deluge of frivolous lawsuits.

Jon C. Christiansen
Salt Lake City, Utah

CORRECTION

A line inadvertently was omitted from Appendix 2 of "The 'IN' Foreign Command" by M.E. Nieland and W.J. Haas, Jr., which appeared in the May *DEC PROFESSIONAL*, Vol. 5, No. 5.

Please correct page 67, just above line 140, to read:

```
            ENDO
            WRITE(OUT_UNIT,5050) DIR(OFFSET:DIRLEN)
5050    FORMAT (' ',A)
        ENDIF
140     END
```

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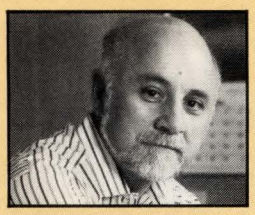

EDITORIAL

Dave Mallery

An Anniversary Celebration!

I feel like the artist at the opening. We have lovingly and carefully redesigned our pride and joy, and today — the *DEC PROFESSIONAL*'s fourth anniversary — we are showing it off!

Our new design is a careful statement in image and form of our long-standing editorial policy:

Our reader is an intelligent, literate professional with a great need to learn. Respect and teach the reader. The rest will follow.

If you look closely, you will see that the changes are more than skin deep. There is continuity from cover image through editorial. We have a new type face. A coherent design rule binds the parts together. None of this is accidental. It has consumed our time for months, and the refinements will continue to do so for months to come.

What we are *not* changing is our content and editorial direction. We will be featuring more hardware reviews in "From the Lab," and plan to add a column covering MICROVAX issues as early as next month. Our new MICROVAX, complementing our two-year-old 11/750, will allow us to share our performance experiences, and also provide you with a wealth of specific hardware and software reviews.

Of course, we will continue to bring you articles from our Networking Editor, the The Resource Executive, the "RSX Clinic," Let's C Now," "The Back End" and other regular departments along with our comprehensive technical articles. Look for a new column, DCL Dialog, and a regular page on DECUS.

And, you won't want to miss a new department: *ARIS*TALK. This is a distillation of the excellent technical discussions that are going on 24 hours a day on our Automated Reader Information Service (ARIS). ARIS is a really exciting creation. You can leave us your comments and suggestions, boos, cheers, or whatever, when you dial in. ARIS is available to all our subscribers. (Remember, you'll need the subscription number from your mailing label to gain access.) Of course, there is no charge for the service beyond the cost of your phone call. Be sure to look for more new features. Next up on ARIS will be an on-line cumulative index of the *DEC PROFESSIONAL*.

Remember that this is *your* magazine. We think that you are going to enjoy our enhanced look. Communicate with us and help us improve it for you.

Editorial Director

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GRAPHICS

STANDARD GRAPHICS?

By Michael Fallon

Progress is slow, but several hopefuls continue to evolve.

Advancing technology and decreasing prices have made computer graphics more affordable and practical. This has led to a proliferation of systems with little or no standardization. The establishment of a graphics standard is entangled in a host of issues, and has been for over a decade. Standards for graphics generally address two areas: data exchange and graphics programming techniques. This article looks primarily at the former, although some standards reviewed address both areas.

The issue of data exchange has the greatest impact in the computer-aided design (CAD) market, although other markets are impacted as well. CAD is one of DEC's largest markets. Efforts to establish standards in this market have an effect on DEC, and DEC's reaction to those efforts can, in turn, effect the evolution of a standard.

Traditionally, standards have evolved in one of four ways:

1. One supplier dominates the market and sets a de facto standard.
2. The government, e.g., the National Bureau of Standards, or the American National Standards Institute (ANSI), imposes a standard.
3. Standards are established by committee.
4. A major user/vendor sets the standard; e.g., Lockheed or General Motors.

Most large computer vendors endorse standards only reluctantly and under user pressure: They'd rather not open up their proprietary systems to a standard that enables their systems to exchange data with those of competing vendors. Vendors prefer to maintain a captive installed base of users for market leverage.

As a result, even when a vendor supports a graphics standard, it is often half-hearted. Graphics standards are complex specifications and also are continually evolving. And, most vendors don't support an entire standard — they support only the set of specifications required for their own products and expand on that. Users need to test and evaluate systems to determine whether the subset offered by a particular vendor is adequate for their applications.

Currently, users are having difficulty exchanging text and data efficiently between the workstations of different vendors because of the lack of established standards. Initial Graphics Exchange Specification (IGES), Electronic Design Interchange Format (EDIF), Graphic Kernel System (GKS), and CORE system are just a few of the proposed graphic standards for data exchange. Even with standards, transparent interchange will not be easily achieved.

PROGRESS CONTINUES with IGES, although somewhat slower than expected. Version 3.0 was scheduled for balloting and publication

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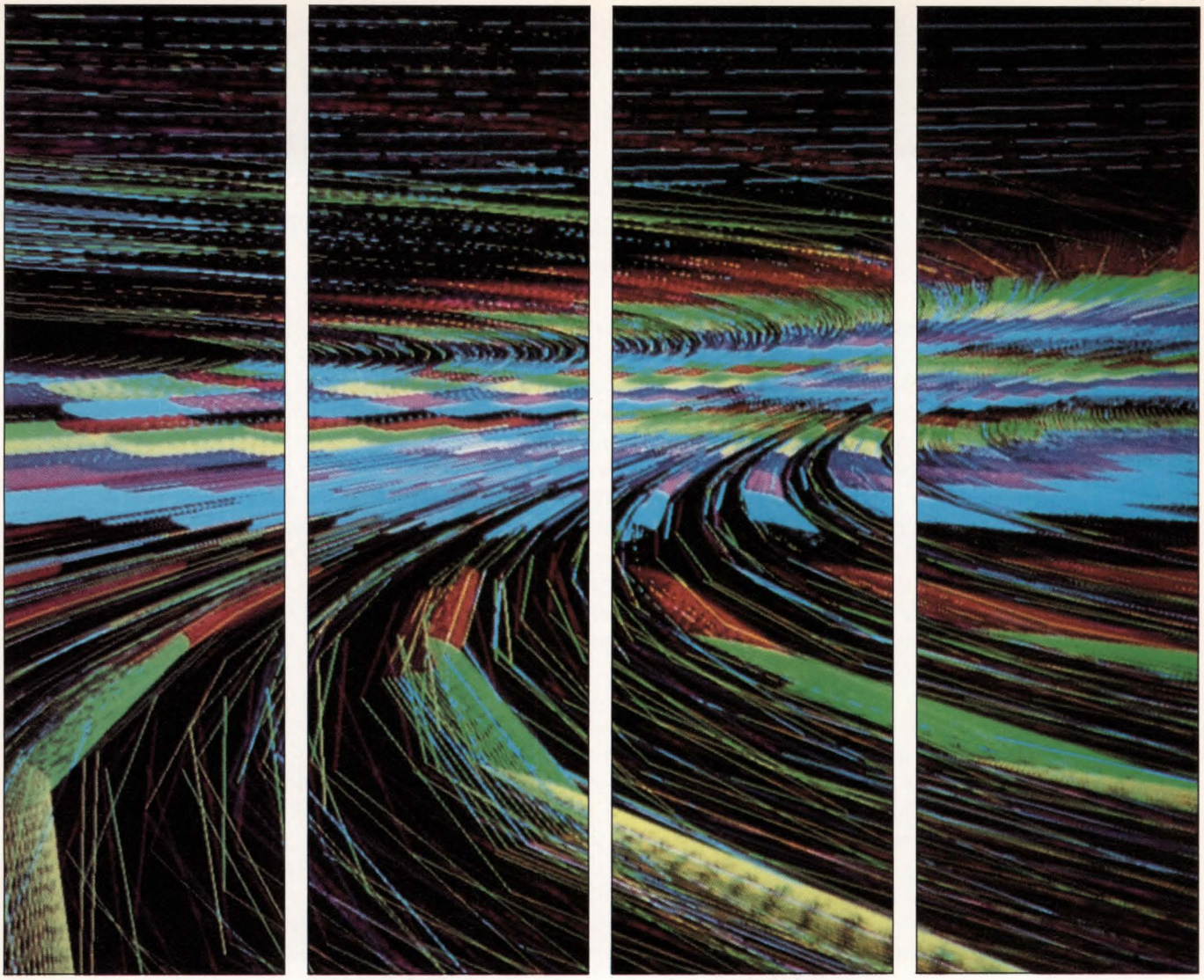


by the National Bureau of Standards in the fall of 1984, but seven additional requests for changes relative to finite element analysis and electronics applications delayed progress. At the time of this writing, balloting is complete and version 3.0 is in its final form, scheduled for imminent release.

IGES defines a device-independent data format for the storage of 3D geometric information and 2D drawing information. It also provides a method of transporting data for design and manufacturing between the CAD systems of different vendors. CAD files are translated through the use of pre- and post-processors, or translators, most often supplied by vendors supporting IGES. The preprocessor translates design data from a proprietary format into IGES format and stores it, usually on magnetic tape. Post-processors then translate the data from the IGES format into the format of the receiving CAD system.

Development of IGES began in 1979 with funding provided by the U.S. Armed Forces and NASA. Additional assistance and personnel were provided by industry users and CAD/CAM vendors. DEC hasn't played a large role in the IGES effort primarily because it is a hardware vendor; data exchange involves software. However, leading CAD vendors, most of them DEC VARs, have been participating in the IGES effort and have been more

Although IGES is not without problems, it currently is under consideration by the International Organization for Standardization.

supportive of IGES than of most other efforts to establish standards. DEC VARs that publicly have demonstrated IGES implementations in intersystem data exchange include Applicon, AutoTrol, Calma Company, Computervision and McDonnell Douglas Information Systems.

Boeing, Sandia and General Motors are using IGES in production. General Motors, the U.S. Navy and Westinghouse are requiring their suppliers to implement certain IGES entities. Many government contracts require the contractor to have CAD systems with IGES capability.

IGES HASN'T GOT it all. Users of CAD systems have made a substantial investment in software for design, analysis and product testing. They have been looking to IGES in a drive to integrate this information into total design and manufacturing systems and as a solution to other problems, including transfer of design files among specific application databases, transfer of files to and from suppliers, and transfer of files from design to manufacturing. For the latter, IGES is but a short-term solution. Eventually, the database issue must be tackled. Work needs to be done on intelligent distributed processing networks and database management systems able to support the large-scale databases that might result from the combination of design and manufacturing files.

Although IGES is a step in the right direction, progress hasn't been without problems: The establishment of IGES as a standard will not eliminate the problems users have communicating with dissimilar systems. The electronics department, the mechanical department, and the facilities department will not be able to buy different systems and exchange data transparently, partly because they look at data differently.

File size is another problem with IGES. Version 3.0 contains an alternative to version 2.0's binary IGES for use when file size is a problem. This format is called Compressed ASCII IGES but it remains to be seen whether this will eliminate the problem.

Although IGES is not without problems, it currently is under consideration by the International Organization for Standardization. DIN, the German standards body, has examined IGES and made several suggestions, including the addition of solid modeling capability, which version 3.0 addresses. DIN also has suggested compatibility with GKS; therefore, while IGES is an American standard, chances of it becoming an international one are good.

In its current form, IGES doesn't solve all the problems of graphics file exchange between dissimilar systems. However, its relatively brief evolution from theory to industrial use, along with its capability for extension to meet the needs of a growing market that has widely accepted it, gives it the most potential of all standards for product data definition exchange.

THE ELECTRONIC DESIGN interface format (EDIF) is a committee effort composed of users and vendors of CAD workstations for electronics applications. Its goal is to foster standards in electronic design software. EDIF should build upon IGES, but there is no communication among the catalyst groups thus far. Version 1.0 was published last year and includes standard interface formats for gate arrays, standard cells, macro cells, full custom integrated circuits and printed circuit boards. Extensions of version 1.0 will address areas of technology like behavioral descriptions, behavioral testing, construction for procedural

EMERGING GRAPHICS STANDARDS

Standard	EDIF	GKS	IGES
Applications	Electronic	Mechanical and commercial	Predominantly mechanical; some electronic
Catalyst Group	User & vendor committee	Worldwide effort	U.S. Air Force NASA
Supporters	Daisy*, Valid Mentor, Motorola, Tektronix, National Semiconductor, Texas Instruments	DEC, IBM, Calma*, Tektronix	+Calma*, Computervision*, Intergraph*, Applicon*, McDonnell Douglas*, Honeywell, Control Data, Autotrol*, Gerber, Hewlett-Packard, IBM
Weaknesses	No rotation capability; data definition	Slow data transfer speed	Large file size; weak communications capability; vendors often support proprietary products only
Standards Body Adoption	None	ANSI, 1985	ANSI, 1981

* DEC VARs
\+ Represents largest companies supporting IGES; some smaller companies also support the IGES effort.

layout and other issues related to designing printed circuit boards.

Six key companies — Daisy Systems, a DEC VAR; Mentor Graphics; Motorola; Tektronix; National Semiconductor; and Texas Instruments — are fully committed to implementing EDIF. About 300 other companies, including DEC, are watching or participating in the development of EDIF. The list includes almost every vendor of computers, workstations, and semiconductors.

EDIF files require substantial debugging before they can be trusted to transfer integrated circuit designs between dissimilar systems. However, EDIF is suitable for sending a design from workstation to foundry. While EDIF files are useful as gateways to other machines and processes, they are less reliable as an established database file structure for different workstations.

Every workstation has its own set of variables to account for. Often, the complex data structures peculiar to each require a great deal of translation before they can be run on another machine. An attempt to standardize workstation file structures would have to encompass the lowest common denominator. This seriously would affect the workstation's performance.

Using graphics as an example, one workstation might use lines and arcs to draw an image, then rotate the image using new coordinates. In contrast, another workstation uses accumulated graphics characters brought together on the display to form shapes and objects. Rotation, though, only is accomplished

by disassembling the object and reassembling it on the screen with different characters. The result is that there is no easy way to establish a uniform file structure between these two dissimilar systems without hampering their abilities. Furthermore, EDIF files must state the orientation of objects on the display, and currently they have no mechanism for handling rotation.

EDIF will evolve further. Currently, there are five subcommittees working on development. An EDIF User's Group has been working out problems and updating version 1.0. (The group usually meets at the Design Automation Conference held in June.)

THE GRAPHIC KERNEL SYSTEM is another trend in workstation and computer software transportability. GKS is an application programmer's interface to graphics that binds graphics utilities to higher level languages, such as FORTRAN and PASCAL, providing a standard software interface for graphics to assure transportability of application software. This is a worldwide cooperative effort to establish a method of transporting graphics applications from one workstation or computer to another. It currently is under examination by ANSI for communication between host computers and workstations.

GKS consists of a collection of graphics utilities that interface the application program to the graphics device. Utilities include polyline, polymarker, text, and drawing primitives, as well as more advanced functions such as transformation, segmentation and workstation control. DEC endorsed GKS early this year as a graphics interface standard for its VAXSTATION II/GPX workstation. Several other companies also are supporting the standard including IBM, Tektronix, Calma, and Hewlett-Packard. GKS offers an opportunity to minimize future development costs for users. The advantage is in purchasing GKS-compatible software from multiple vendors and third-party software suppliers. As GKS and IGES evolve, standard software should allow GKS to talk to IGES.

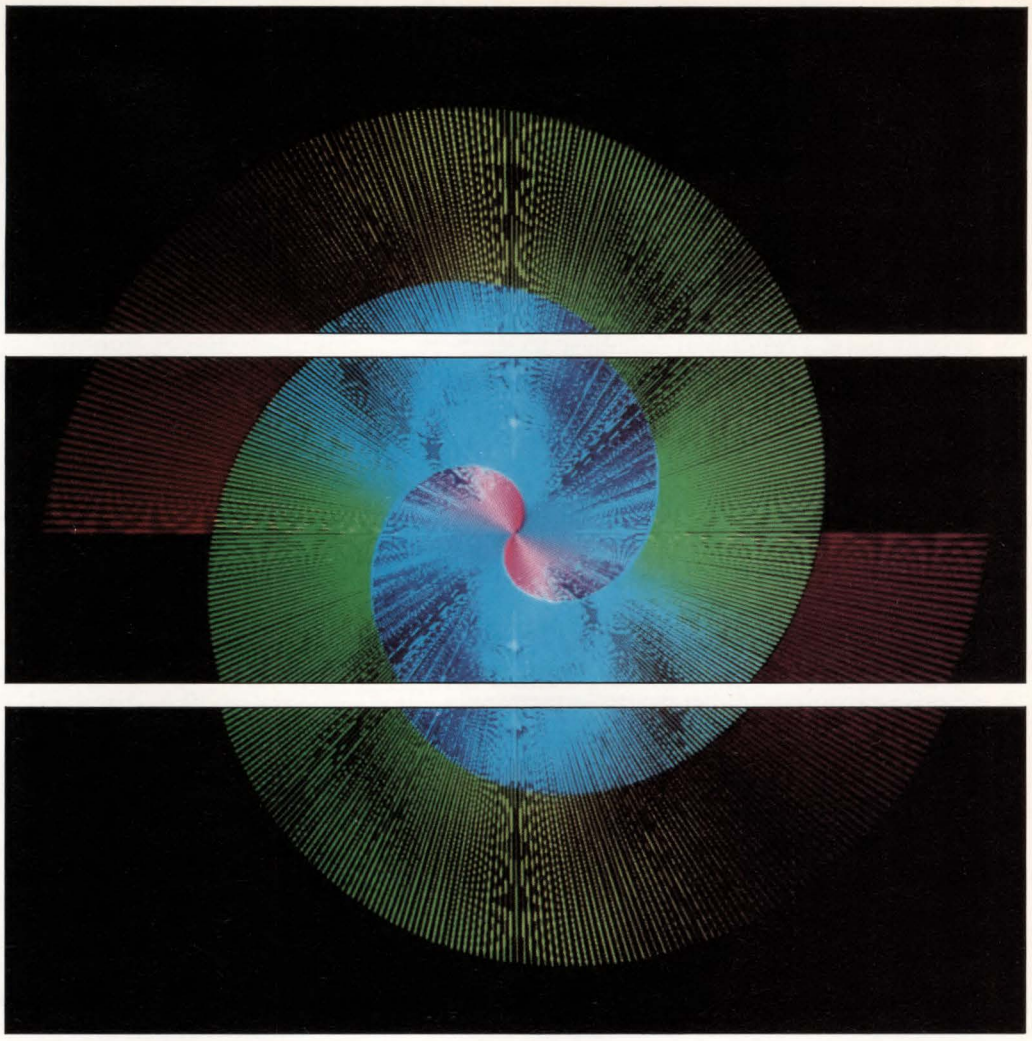
However, GKS may be too slow for high-performance graphics applications common to CAD. In the future, workstations will increase in speed and the applicability of GKS to CAD and other technical markets will decrease. GKS hasn't addressed solid modeling thus far, and only is beginning to address 3D. It may be a more suitable standard for business graphics. However, it is likely that IGES will wind up supporting GKS compatibility. (3D extensions are likely to be provided by another system, PHIGS, Physical Hierarchical Interactive System, a graphics programming technique developed by the committee X3H3 that operates under the rules and procedures of ANSI.) The use of hierarchies will allow "segments" that impose structure on graphics primitives to be placed inside other segments and linked with associated data.

CORE, A COMPETITOR to GKS, originated from work begun in 1974 by the American Computer Manufacturers (ACM) SIGGRAPH workshop on machine independent graphics. Some time later, a SIGGRAPH Graphic Standard Planning Committee was formed. In 1977 the committee presented a draft proposal for a graphics software standard known as the CORE system. A revised proposal with several important extensions was presented at SIGGRAPH 79. The CORE system has had influence with some vendors in the computer graphics industry, Apollo Computer, in particular, offering CORE or CORE-like systems.

CORE's purpose is to assure portability of graphics programs across a wide variety of input and output devices, as well as portability of graphics programmers from one system to the next. This approach protects software and staff investment and speeds up development for new applications. CORE is a set of 160 graphics programming subroutines proposed as a standard. These high-level tools permit the rapid development of structured applications that are more maintainable than programs not using standard graphics subroutines, and lead to a corresponding increase in programmer productivity.

CORE has addressed mechanical applications for 2D and 3D viewing and image transformation. It provides a device-independent means for rotating, scaling and translating 2D

Courtesy of Megatek Corp.



and 3D images. CORE subroutines can be called from FORTRAN 77, PASCAL, and C language programs.

CORE is competing with GKS as a standard for programmer interface, however, despite limitations for technical applications, GKS has garnered far more support from standards organizations and vendors, and, therefore, is much more likely to become a standard than CORE.

STANDARDS HAVE SHORTCOMINGS, TOO. The proliferation of different standards for graphics is an indication that a widely accepted standard is some time off. Of those discussed, IGES and EDIF hold the most promise both because of the amount of attention received from vendors and mounting pressure from the user community. Most of the competing companies in the computer graphics market have developed their own proprietary systems, so the acceptance of any standard is a long way off. Even with all of the activity surrounding standards, they will evolve slowly, and the market potential will lag as a result.

While graphics standards are a good thing overall, they must be viewed in the proper context. Strict adherence to standards can lead to product stagnation. Standards should be an available option, not the foundation from which products are built. Too often accepted standards remain static while technology advances.

Michael Fallon is a free lance writer based in New York.

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GRAPHICS

RAINBOW ReGIS

Dr. Khin Maung Yin

A color graphics tool for the Rainbow.

Rainbow ReGIS (Remote Graphic Instruction Set) is a color graphics tool for programmers who like to create color graphics displays on the Rainbow. Operationally, ReGIS is an interpreter that accepts ASCII codes and translates them into graphics primitives. The ReGIS output primitives produce various graphics display elements on the graphics video screen. The input ASCII codes must, of course, be meaningful and unique to the interpreter. The series or groups of ASCII characters understandable to ReGIS are called the ReGIS graphics protocols. The ReGIS protocols must be sent to the input buffer of the ReGIS interpreter. This can be achieved in three ways:

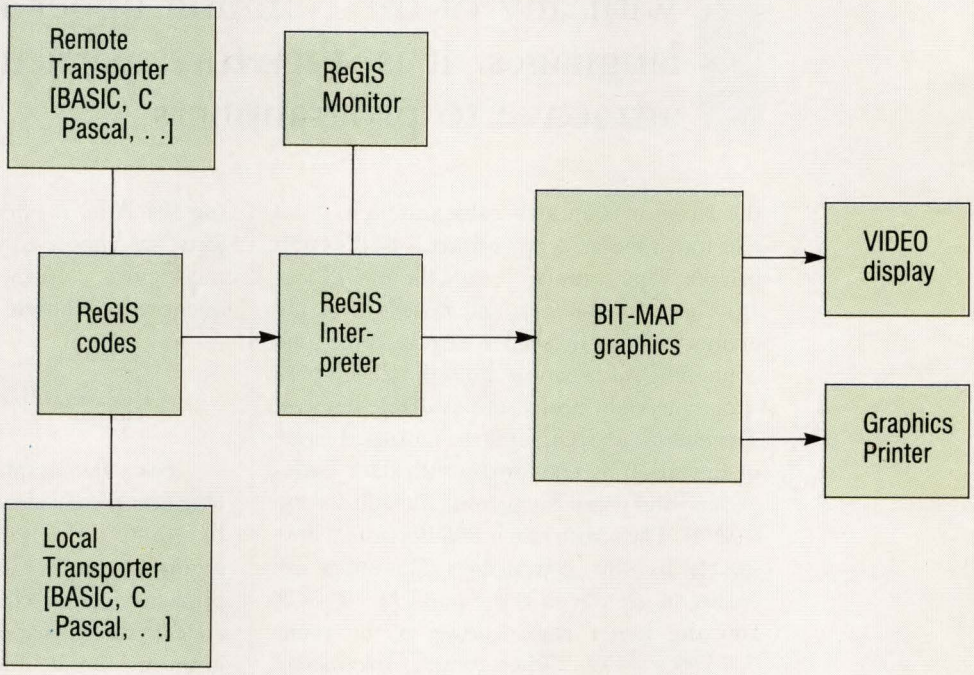
1. You can send the protocols from a running task on a remote computer, like a VAX/VMS or PDP-11/RSTS system.
2. The ReGIS protocols can be sent from a program running on the local Rainbow computer.
3. A Rainbow user can create a disk file that contains the series of ReGIS protocols and "type" the disk file for display on the video monitor.

THE ReGIS PROTOCOL SUPPORTS have existed on several DEC systems and terminals for some time. The ReGIS name became well known when DEC first introduced the GIGI graphics keyboard and a third party color monitor, constituting a remote graphics terminal for the VAX and PDP systems. The VT125 is a graphics terminal that utilizes the ReGIS graphics set. Then came the VT240 series terminals which have ReGIS already installed. Now ReGIS is available for the Rainbow. The GIGI keyboard is no longer available from DEC, although support for the existing GIGI carries on, a well known DEC tradition.

Although the ReGIS instruction set is supported on different systems and terminals, not all ReGIS sets are the same. Rainbow ReGIS is an application product from Polygon Associates, Inc., St. Louis, Missouri, and is distributed by DEC (order #QA743-C3). The RX50 distribution disk contains two versions of ReGIS, one to be installed and run under the CP/M-86/80 operating system and the other under the MS-DOS operating system environment. Figure 1 shows the Rainbow configuration with the ReGIS interpreter installed under the CP/M-86/80 system environment. When installed, it occupies a portion of the TPA. It intercepts and interprets all of the ASCII codes coming to the bit-map/video display system. The results of the interpretation constitute graphics control statements. When the graphics instructions are executed, a video graphics display image appears on the monitor. The video monitor can be an RGB monitor such as DEC's VR241, or a black and white monitor like the VR201. The Rainbow system must have the bit-map extention graphics board to work with the ReGIS interpreter.

The ReGIS protocols (a series of ASCII codes) can be transported to the input buffer of the ReGIS interpreter in several ways. One

FIGURE 1.



Rainbow ReGIS configuration on the Rainbow.

is to send them from the host system (VAX/VMS or PDP/RSTS) to the running Rainbow by hard-wired line or via a public switching network. A remote transporter from a VAX system could be a running BASIC+2 or VAX-11 Pascal. All upper level languages developed by DEC are transporters of ReGIS protocols. Since the ReGIS Graphic Library (RGL) is available for VAX and PDP systems, a running remote program can use the RGL for ease and efficiency. In these cases, the size of the running program can be large and is limited by the available memory on the remote VAX or PDP system. The Rainbow is used only as a graphics display terminal. Another way is to "type" the disk data file that contains ReGIS protocols. A more flexible way is to include opening and closing of the ReGIS protocol data files in the running program. This approach is good for displays of fixed picture files on the remote systems.

You can generate ReGIS displays using an upper level language available for the Rainbow. For example, you can use the MBASIC-86 available under CP/M-86/80. To create displays, an MBASIC-86 program that transports ReGIS codes to the ReGIS interpreter is written. Since the size of an MBASIC-86 work is set at about 60 KB, the graphics memory reservation must be within the set limit. This memory limit is adequate for typical business presentation graphics displays. For a longer sequence of displays or more involved displays, a programmer should write short programs and chain them as desired.

TO USE ReGIS CODES, the ReGIS interpreter must be installed. First, boot the Rainbow using CP/M-86/80 or MS-DOS. Use drive A. Then install ReGIS by issuing this command: REGIS COLOR LA50. COLOR tells ReGIS that

ReGIS's flexibility allows it to be used with any of the common upper level languages. It is, therefore, particularly attractive to programmers. . . .

the monitor is an RGB color monitor. LA50 tells it that the hardcopy printer is DEC's LA50 printer. This command reads the ReGIS image file from the disk and installs it in the memory. When finished, it displays a message containing information about the ReGIS version, copyright notice and available devices. The interpreter recognizes the initialized mode of operation as text mode with dark background and green foreground (default for the VR241). The screen size is 800 horizontal dots (pixels) by 480 vertical dots. The upper left corner of the screen is the point (x = 0,y = 0) and the lower right corner is the point (x = 799,y = 479). Other graphics parameters also are set at this stage. Now, you may install an upper level language for writing graphics display programs.

As an example, display the text line "WE ARE THE CHILDREN" starting at the point (225,230), and draw a circle around the text. The sequence of ReGIS codes needed is:

```
p[225,230]t(s2h5)'WE ARE THE CHILDREN'
p[400,240]c(a+360)[+180]
```

On the first line, the instruction p[225,230] selects the beginning point as (x = 225,y = 230). The instruction t(s2h5) indicates that a line of text is to be written with horizontal size 2 and vertical size 5. The actual text value is WE ARE THE CHILDREN. On the second line, the point (400,240) is selected as the new (current) point. The circle command c is followed by two arguments: (a + 360) tells that the circle has 360 degrees in extent (a complete circle); [+ 180] tells that the length of the radius is 180 absolute pixels. These instructions are to be carried out in the graphics mode. Since the initial mode is text mode, you need to change to graphics mode. The code for this is <escape>Pp. Also, it is a good idea to clear the screen by pressing s(e). After the display of the graphics objects, we choose to change back to the text mode with <escape> \ . The complete sequence is as shown:

```
<escape>Pp
s(e)
p[225,230]t(s2h5)'WE ARE THE CHILDREN'
p[400,240]c(a+360)[+180]
<escape>\
```

For video graphics display, you need to transport these codes to the ReGIS interpreter. In BASIC, the PRINT statement prints arguments on the video monitor. So, you use print statements to transport the above ReGIS codes to the video monitor. The complete program in MBASIC under CP/M-86/80 is:

```
100 PRINT CHR$(27)+"Pp"
120 PRINT "s(e)"
140 PRINT "p[225,230]t(s2h5)'WE ARE THE CHILDREN'"
160 PRINT "p[400,240]c(a+360)[+180]"
180 PRINT CHR$(27)+"\"
200 END
```

This program produces the desired graphics display. Notice that there are no color selection statements, so the text and the circle are written in the default color: green on the RGB monitor. The above codes also can be transported to the screen using PASCAL. For example, the TURBO PASCAL program for this task is simple:

```
Program REGISSHOW(input,output);
begin
  writeln (CHR(27)+'Pp');
  writeln ('s(e)');
  writeln ('p[225,230]t(s2h5)"WE ARE THE CHILDREN"');
  writeln ('p[400,240]c(a+360)[+180]');
  writeln (CHR(27)+'\');
end.
```

ReGIS's flexibility allows it to be used with any of the common upper level languages. It is, therefore, particularly attractive

FIGURE 2.

Command	Function
p[]	reset pattern memory
p[col,row]	move to the point (col,row)
p(b)	save current position
p(e)	move to last save location
v[]	draw dot at current position
v[col,row]	draw a vector to (col,row)
v(b)	save current position
v(e)	draw to last saved position
c[col,row]	draw a circle with center at current position circumfrence at (col,row)
c(c)[col,row]	draw a circle with center at (row,col), circumference at current position
c(ad)[col,row]	draw an arc with center at current position, starting at (col,row) for d-degrees
c(adc)[col,row]	draw an arc with center at (col,row) starting at current position for d-degrees
c(b)[col1,row1] [col2,row2]..[coln,rown](e)	draw a closed curve passing through the sequence of positions
c(s)[][col1,row1] [col2,row2]..[coln,rown][](e)	draw an open curve passing through the sequence of positions
t(s<size>h<height>)	print text with size <size> and height <height>
t(d<angle>)	print text in the angular direction
t(d<string tilt>s<size> d<char tilt>)	print text with the chosen values of parameters
t(a<pattern set number>)	print text with the selected pattern number
w(s0)	turn shading off
w(s1)	turn shading on

— more —

to programmers who are experts in any of these languages.

THERE ARE NINE COMMANDS in Rainbow ReGIS:

1. P for position command
2. V for vector (line) drawing command
3. C for curve drawing command
4. T for text writing command
5. W for writing control command
6. S for screen control command
7. @ for macrograph command
8. L for character cell control command
9. R for report command

Each of these commands has several forms of arguments to perform variations for display construction (See Figure 2).

In addition to the nine commands, Rainbow ReGIS also supports communication and graphics protocol commands. When first installed, ReGIS is in the text mode. All input text characters (ASCII) to the interpreter are output as text characters for displays. To change to the graphics mode, the escape sequence to be issued to the interpreter is <escape>p. To change back to the text mode, the required escape sequence is <escape>\. To send the screen cursor to home, the escape sequence used is <escape>[H.

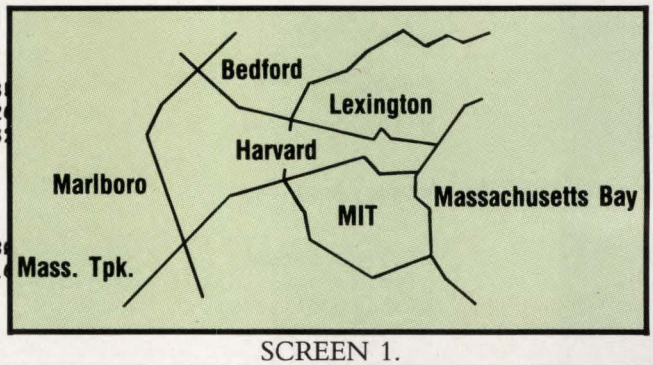
To make a hardcopy of the image on the screen, use this ReGIS screen control com-

Each of the Rainbow ReGIS commands has several forms of arguments. The commands and functions partially illustrated in Figure 2 are available in their entirety on ARIS.

PROGRAM 1.

```
' To draw Boston High Tech area map using Rainbow ReGIS graphics
'
'    Program-id.                                BOSTONHT.BAS
'
  PRINT CHR$(27)+"Pp" : PRINT "s(E)"
'
' draw State Route 1
'
     PRINT "p[520,180]w(I3)"
     PRINT "v[][510,184][490,215][475,235][470,250]"
     PRINT "[480,265][480,282][485,296][490,308][512,330]"
'
' draw US Route 95
'
     PRINT "p[475,235]"
     PRINT "V[][455,235][445,235][43
     PRINT "[370,240][330,250][320,2
     PRINT "[295,285][285,292][260,3
'
' draw State Route 128
'
     PRINT "p[530,130]"
     PRINT "v[][505,140][495,135][48
     PRINT "[455,132][438,148][405,1
```

— more —



SCREEN 1.

Program 1, shown here in part, creates the map shown in Screen 1. It is available, in full, on ARIS.

mand: s(h[0,0][799,479]) for copying the whole screen. All colored areas on the image will appear black on the hardcopy, such as those obtained on the LA50 printer.

THREE ReGIS TRANSPORT PROGRAMS written in MBASIC-86 are BOSTONHT.BAS (Program 1), ROSETTE.BAS (Program 2) and BARGRAPH.BAS (Program 3). These programs show the uses of common ReGIS commands in composing graphics displays. Program 1 creates a map of the Boston high tech area, as shown in Screen 1. The map consists of segments of five routes around Boston, names of routes and establishments. The routes are constructed using position and vector (line) commands. The positions are determined in terms of the x-y pairs and can be designed on graph paper. There is no explicit mention of the color of the lines, so they are written in green, the default color. Writing of text is done using the position text and writing control commands. The use of w(i2) specifically selects color value 2, which indicates red. Rainbow ReGIS can display up to four colors simultaneously.

Program 2 is designed to draw a 13-point rosette. It uses position and line commands to draw lines to and from the 13 vertices, as shown in Screen 2. It also utilizes macrographs to draw the rosette. A macrograph is a sequence of ReGIS codes that performs a complete graphics display task. The command sequence: @:X <the ReGIS code sequence>@; defines a macrograph. Physically, the ReGIS code sequence is stored in the memory. The command to execute the macrographic code sequence is @X. The 13 macrographs B,C,D,E,F,G,H,I,J,K,L,M,N define the lines adjoining the vertices. The macrograph A is built using these 13 macrographs. A macrograph must be complete and executable. That is, it can not contain variable names. Macrographs are used when we want to use certain code sequences repeatedly in a program. A running program can reserve about 5,000 characters of memory space and up to 26

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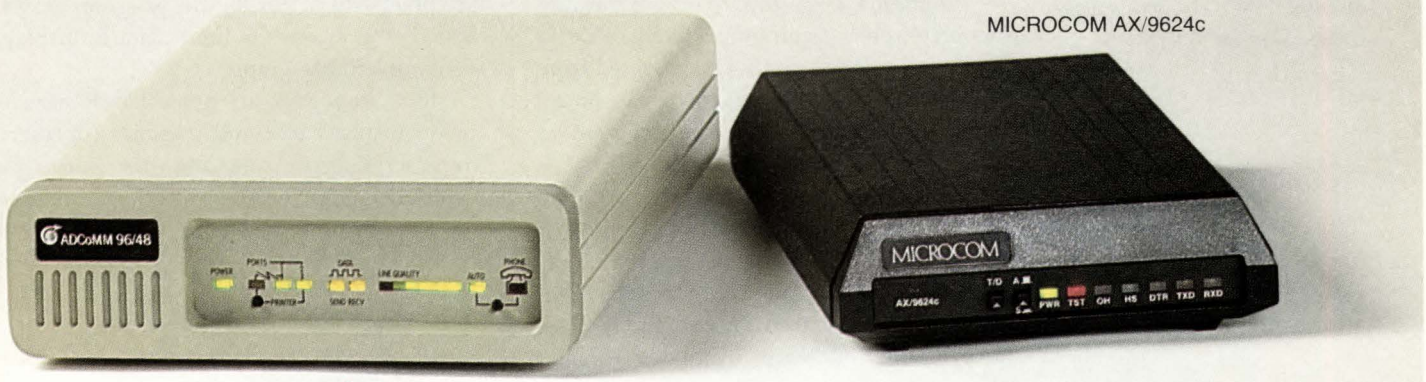

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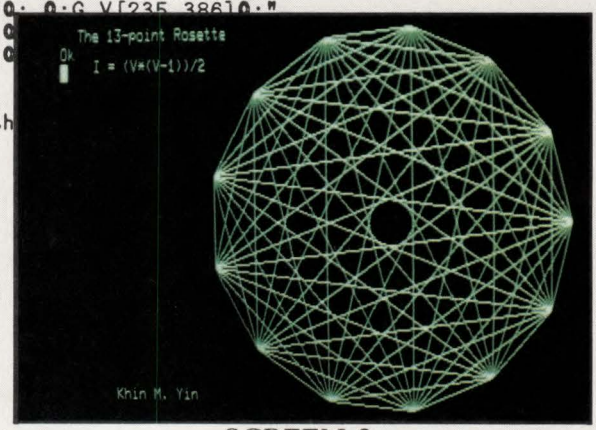
PROGRAM 2.

```
' To draw a 13-point rosette using Rainbow ReGIS graphics
'
'    Program-id.                          ROSETTE.BAS
'
' Purpose: to show the uses of ReGIS macrographs
'
  PRINT CHR$(27)+"Pp"                 ' enter graphic mode
'
  PRINT "s(e)"                        ' erase the screen
'
  PRINT "@."                          ' erase previous macrographs
'
  PRINT "w(r,i(g),p1,n0,a0,s0)"       ' set writing mode
'
  PRINT "t(a0,d0,i0,s2)"              ' choose size 2 characters
'
  PRINT "p[10,10]t(s2h2) 'A 13-POINT ROSETTE'"  ' print title
'
  PRINT "p[40,55]t(s1h2) 'I = (V*(V-1))/2'"     ' print formula
'
  PRINT "p[60,430]t(s1h2) 'Khin M. Yin'"        ' print name
'
' Define 13 macrographs: B,C,D,E,F,G,H,I,J,K,L,M,N
  PRINT "@:B V[620,240]@; @:C V[595,342]@; @:D V[525,421]@;"
  PRINT "@:E V[427,458]@; @:F V[322,446]@; @:G V[235,386]@;"
  PRINT "@:H V[186,293]@; @:I V[186,187]@
  PRINT "@:K V[322, 34]@; @:L V[427, 22]@
  PRINT "@:N V[595,138]@;"
'
' Define macrograph A in terms of the oth
  PRINT "@:A P[620,240]"
  PRINT "@C@D@E@F@G@H@I@J@K@L@M@N@B"
  PRINT "@D@F@H@J@L@N@C@E@G@I@K@M@B"
  PRINT "@E@H@K@N@D@G@J@M@C@F@I@L@B"
  PRINT "@F@J@N@E@I@M@D@H@L@C@G@K@B"
  PRINT "@G@L@D@I@N@F@K@C@H@M@E@J@B"
  PRINT "@H@N@G@M@F@L@E@K@D@J@C@I@B@;"
```



SCREEN 2.

— more —

The 13-point rosette shown in Screen 2 was created by Program 2, which is a available in its entirety on ARIS.

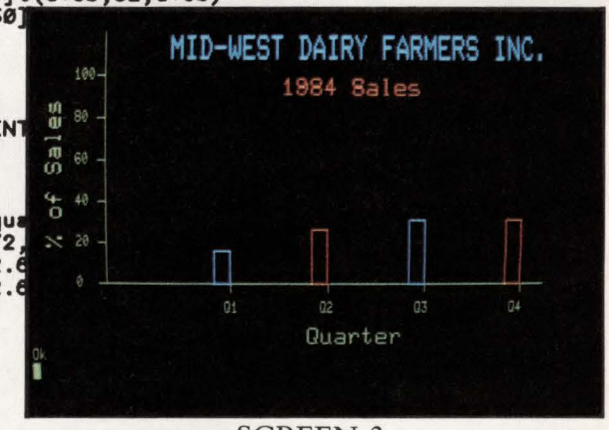
macrographs to use @ to erase previous macrographs.

Program 3 is designed to draw a business presentation bar graph interactively. That is, the needed data for plotting is accepted from the keyboard. For convenience, six control operations are defined in the program as "command strings." Then the axis frame is defined as a macrograph A. The program executes the macrograph for display before prompting for the input data, then it requests the numeric data for plotting. Since the input data can be accepted in the text mode only, the program first exits from the graphics mode. In this program, the data values are percent values; then they are converted (scaled) into pixel values. Finally, the program draws the axis frame and the input data to display the complete bar graph.

It is important to note that Rainbow ReGIS displays text and graphics together. Thus, scrolling, erasing, and other forms of manipulating text or graphics affect both text

PROGRAM 3.

```
' To draw a bar graph using Rainbow ReGIS graphics
'
'    Program-id.                              BARGRAPH.BAS
'
' Purpose: to draw a business bar graph intractively
'
' Define control operations
'
    E$ = CHR$(27)                             ' escape character
    GON$ = E$ + "Pp"                          ' turn graphics on
    GOFF$ = E$ + "\"                          ' turn graphics off
    HOME$ = E$ + "[H"                         ' home cursor
    CLEARSCREEN$ = "s(e)"                     ' clear screen
    PRINTSCREEN$ = "s(h[0,0][799,479])"       ' print screen
'
' Define axis frame macrograph
'
  PRINT GON$ : PRINT CLEARSCREEN$
  PRINT "@:T v[-10]p[+10,+50]@;"
  PRINT "@:M v[,+10]p[+125,-10]@;"
  PRINT "@:A w(p1I3)p[100,100]v[,+300][+560]p[100,150]@T@T@T@T@T@T"
  PRINT "p[100,100][60,140]t(s1I0)'100'p[60,+50]t'80'p[60,+50]t'60'"
  PRINT "p[60,+50]t'40'p[60,+50]t'20'p[60,+50]t'0'p[255,400]"
  PRINT "@M@M@Mv[,+10]p[255,400][-10,+20]t'Q1'p[+105]t'Q2'p[+105]t'Q3'"
  PRINT "p[+105]t'Q4'p[40,160][-20,+200]t(d+90,s2,d+90)"
  PRINT "'% of Sales'p[225,400][+125,+50]
  PRINT GOFF$
'
' Display axis frame
'
  PRINT GON$ : PRINT CLEARSCREEN$ : PRINT
'
' Request data for plotting
'
  PRINT "Please enter % values of the qua
  INPUT "for example: 25,25,25,25";Y1,Y2,
  Y1 = INT(400-2.6*Y1) : Y2 = INT(400-2.6
  Y3 = INT(400-2.6*Y3) : Y4 = INT(400-2.6
```



— more —

SCREEN 3.

and graphics. This means that an interactive program must utilize display refreshes for screen changes and updates.

The use of Rainbow ReGIS requires you to write programs to transport ReGIS codes to the video screen or to the hardcopy graphics printer. For the forms and sequences of graphics displays, the programmer develops appropriate algorithms and chooses suitable transport languages. For the Rainbow computer, these languages are several BASIC interpreters and compilers,Pascal compilers and C compilers. With communication software (like *poly-COM* from Polygon Associates, Inc.), the Rainbow can serve as a remote ReGIS terminal. In this way, many ReGIS transport programs running on the mainframes (VAX/VMS, PDP-11/RSTS, etc.) can use the Rainbow computer as a color graphics display station.

Khin Maung Yin is an associate professor in Computer Science and Technology at Kent State University, Burton, Ohio.

The bar graph in Screen 3 was drawn interactively with Program 3. The complete program is available on ARIS.

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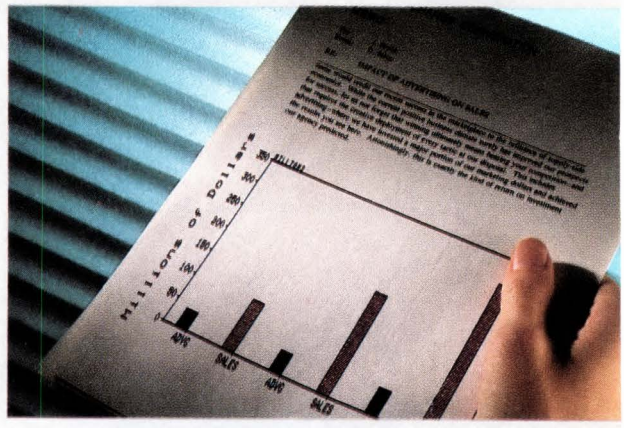

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GRAPHICS

PROVE IT WITH A PICTURE!

By Al Cini

Mapping with *SPSS Graphics.*

Welcome to the world of Forensic Data Processing — computing to make a point. These days, business success depends on timely but thoroughly considered decisions. When you have five minutes at the 3:00 p.m. board meeting to prove that the company's South African sales operation is losing money and should be sold off, save your breath and prove it with a picture.

Today's personal computing tools make the routine forensic graphics job pretty easy. A Southern politician can enter a dozen or so numbers into an IBM PC, and within minutes stand ready to lobby the U. S. Congress for revenue subsidies, using a pie or bar chart. To demonstrate the recent oil-slicked slide in per-capita Texas tax revenues, though, how about drawing a map showing each of the lesser 47 contiguous states raised or lowered with respect to each other, and an especially deep, dark hole where the Lone Star State used to be? Such truly special effects might make the difference between a ho-hum close win and a two-thirds majority presidential veto-buster!

Enter: *SPSS Graphics*!

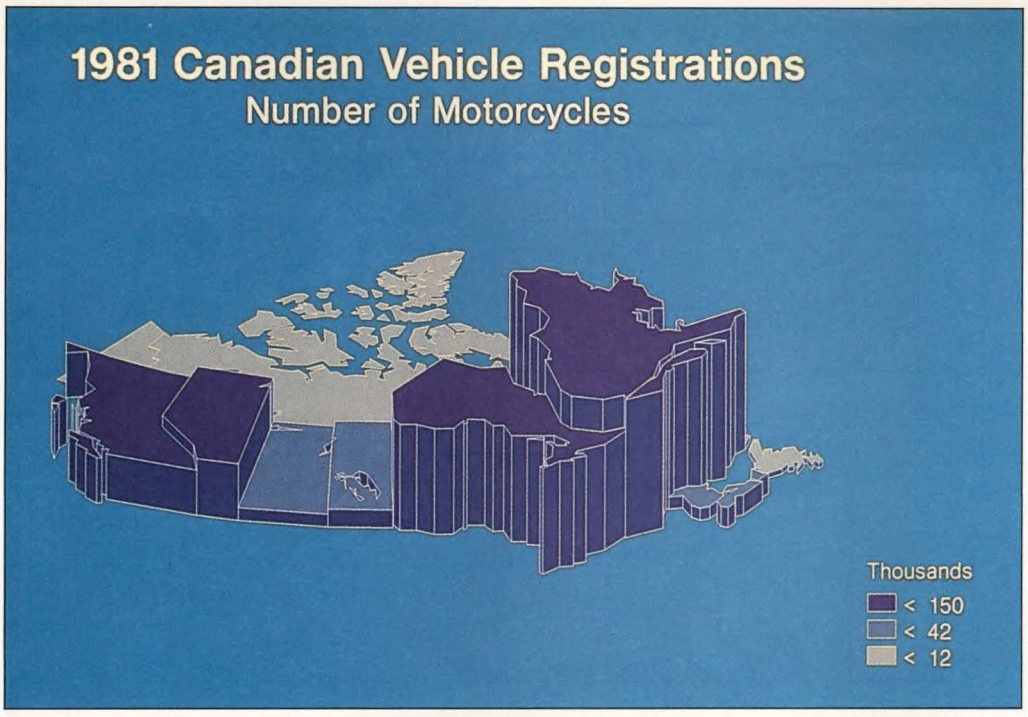
ASKING A VAX TO DRAW a pie chart is like commissioning Andrew Wyeth to paint a traffic sign. A VAX system's enormous computing capacity, equipped with sufficiently powerful software, clearly is capable of a great deal more. SPSS Inc.'s *SPSS Graphics* package can take your VAX beyond the ordinary scatter, line, or bar chart and into statistical map-making.

Recalling high school geography, the earth's surface is divided into arbitrary areas such as continents and countries that can be projected onto a flat piece of paper to make a map.

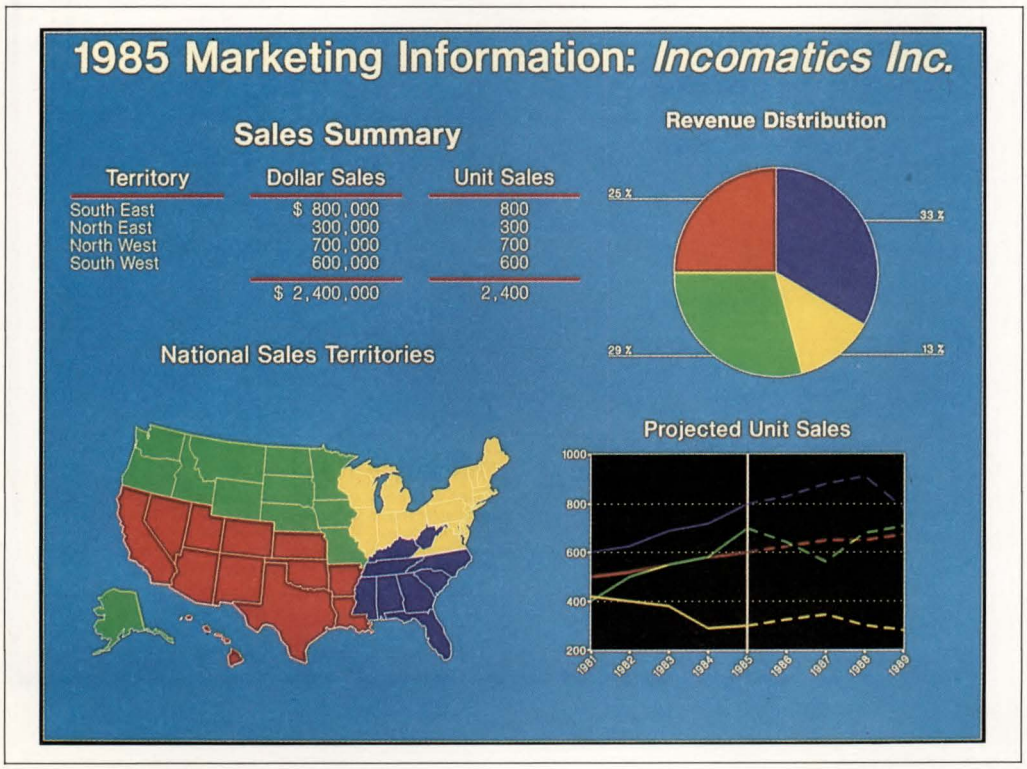
Maps, in turn, can be subdivided into smaller regions like states and counties and, depending on information about these regions (per-capita income or Libertarian voter registration, for example), we can color them differently as we draw them. Complex political or economic facts about a nation's citizenry can be discerned at a glance from such a map, while a corresponding, more traditional bar chart might require hours of study before inspiring similar conclusions.

Getting a computer to draw a map is no small job. First, the boundaries of each map region (potentially thousands) somehow must be identified, quantified and stored. Next, the problem of projecting parts of the earth's spherical surface onto a flat sheet of paper or computer screen must be addressed to everyone's satisfaction. Finally, a reasonably simple control protocol must be developed, enabling nontechnical people to merge summary statistics with geographic parameters to create the maps they need.

SPSS GRAPHICS COMES complete with a very large (several thousand disk block) database of the earth's geography, organized into countries, U.S. states, U.S. counties, and Canadian provinces. Each geographic map region is identified by its numeric



This prism map of Canada demonstrates statistical differences among its provinces, in three dimensions.

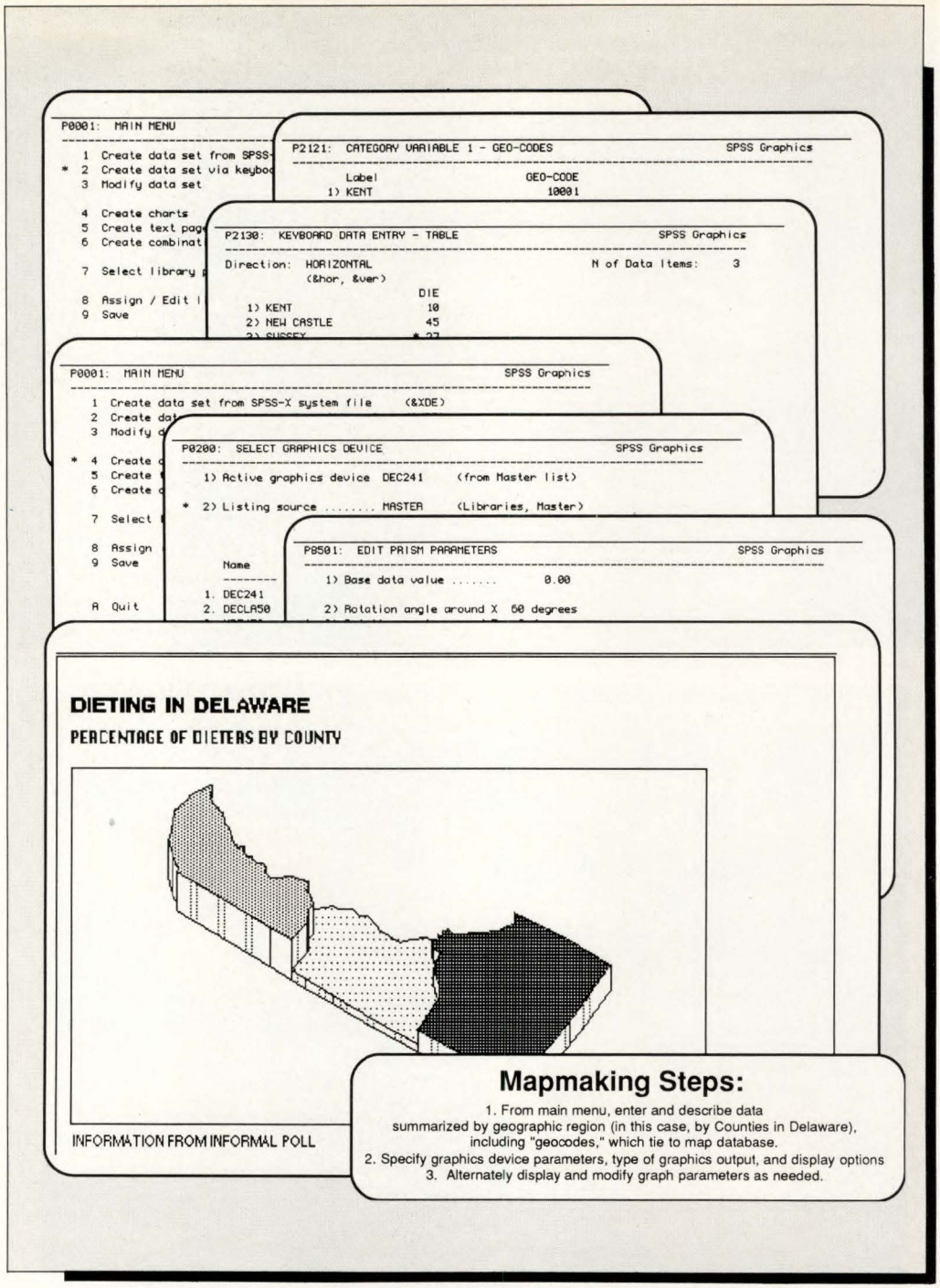


Map, tabular, and other graphic material can be assembled into composite pictures.

geocode, and all you need to do to draw almost any kind of map is pair a geocode with an associated statistical value. To *SPSS Graphics*, a map of the United States simply is 50 pairs of numbers: a geocode to identify the state and a number (average per-capita income, percentage of business failures, or whatever) that describes the state in some way.

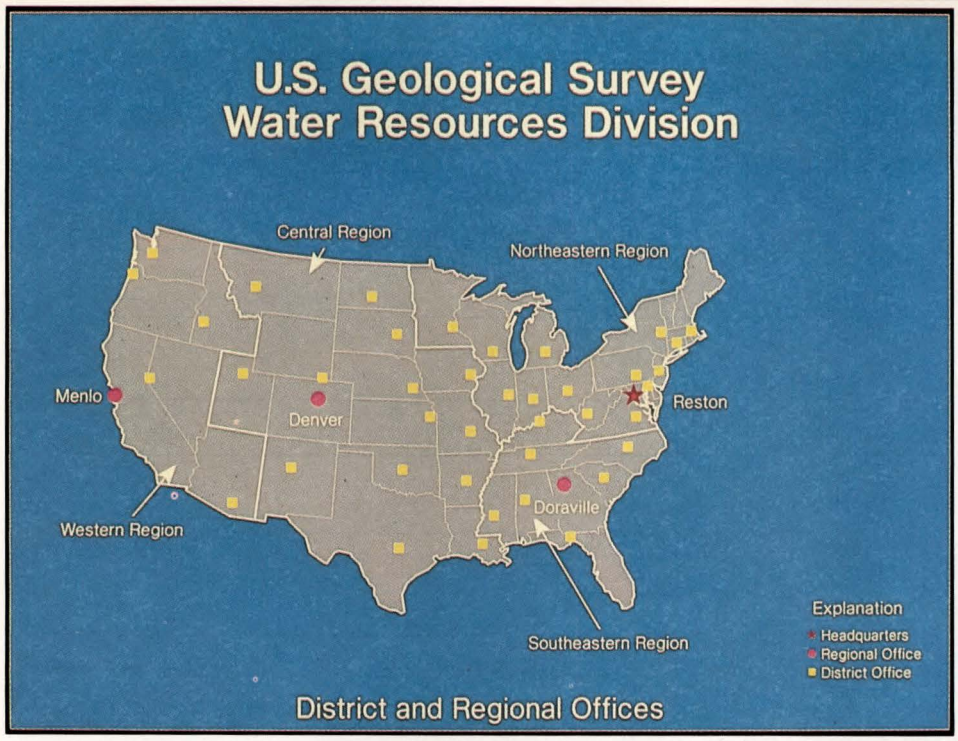
SPSS statistical maps come in two basic forms: A *choropleth* map projects a two-dimensional frontal view of the mapped territory with regions colored or shaded differently depending on their

A series of menus allows you to enter data, specify data, specify various charting options and draw the results.



statistical values; a *prism* map presents a three-dimensional map with regions raised or lowered with respect to each other, dramatizing relative differences.

SPSS Graphics automatically will orient and scale your map within boundaries defined by the size of the output from your plotting or graphics display device. If preferred, you manually can tilt, rotate, or reshade your map to enhance its effect. Since map drawing speed is reasonably quick, the product encourages experimentation with different display options. It took only a few minutes to draw a map on our lowly 750 (we used a VT241 at 1200 baud to review the product).



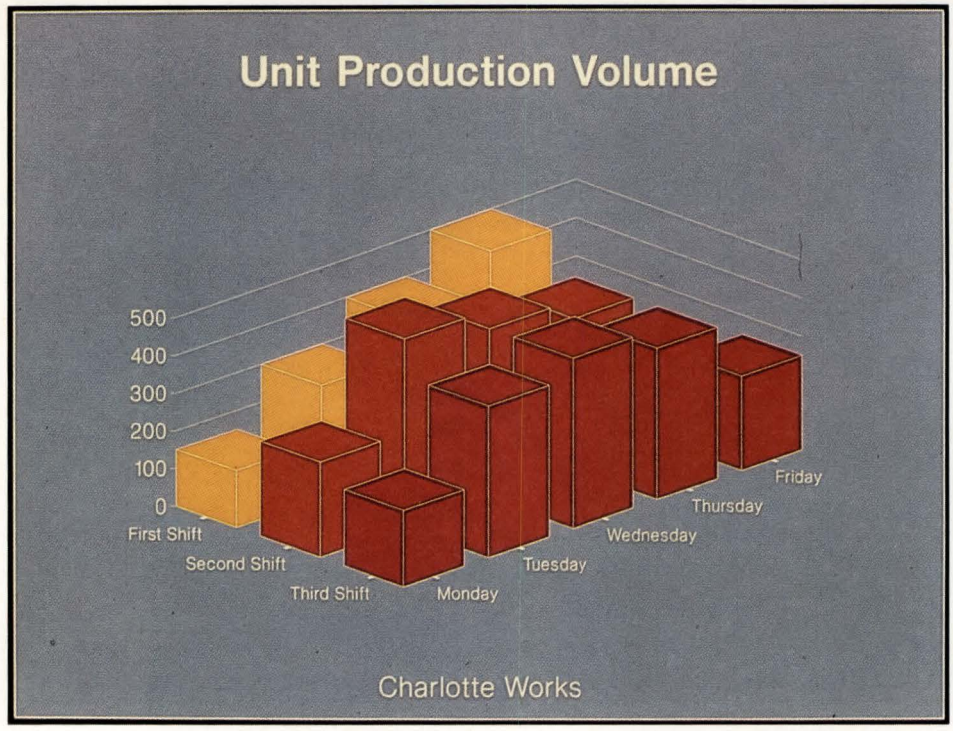
An SPSS Graphics *symbol map of the United States.*

If you're into maps, you're probably familiar with the many techniques of representing the earth's curved surface in two dimensions. Converting the globe's spherical longitude and latitude coordinate system into something more Euclidean is called map projection, and *SPSS Graphics* allows you to specify almost every imaginable flavor (Albers, sinusoidal, Miller's, transverse mercatur, polar, Lambert's azimuthal and conformal conic, and several more). Each projection introduces specific area or angular distortion, but among them you're pretty sure to find one that minimizes it for your particular requirements.

Among several recently added version 1.1 mapping options, *SPSS Graphics* now allows you to draw maps with symbols representing cities, natural formations or other geographical points of interest, as well as straight or curved lines connecting them. Airlines can use this facility to draw route maps, geologists can show faults in the earth's crust, and military strategists can sketch battle plans.

With utilities provided in the package, bold map makers can define their own "super map" regions, consisting of aggregations of smaller areas. If you like to think of the earth in terms of hemispheres, or of the United States in terms of the North and the South, you can collect the geocodes of the necessary component countries or states, to form and draw them. For the especially courageous who would like to map the Moon or Mars, the floor of the Pacific Ocean, or the streets of San Francisco, the documentation includes descriptions of the map database format and general instructions on how to write your own coordinates. Be warned, however: This is no small intellectual challenge! For all but the simplest map definitions, be prepared to invest in expensive digitizing equipment and probably to spend a lot of time on the support line to SPSS.

A USER NAVIGATES through *SPSS Graphics* by following a series of menus to define and enter data, specify various charting options, and draw the results (see figure). Menu options are selected by entering a command keyword or by TABing to the desired function and pressing the F1 "Select" key. It takes an hour or so to become familiar with the product's use of function keys (Unfortunately, the numeric keypad always is in "keypad" mode, so numeric data must be entered from the less convenient main keyboard). Also requiring learning



A 3D block diagram.

time are the procedure for moving from field to field during data entry (a little different from FMS or TDMS), the error and informational messages, and the general flow of the menus. On-line help is limited, so be sure to keep the manual nearby.

Variables defined in *SPSS-X*, the company's statistical package, can be imported easily into *SPSS Graphics*, as can properly formatted "flat" RMS files from *Datatrieve* or similar application programs. The current release of the product offers no "batch" mode of operation, so the periodic production of graphics, to include in weekly or monthly reports, perhaps, can't be "canned" as a command procedure (the vendor reports this to be fixed in an imminent release).

FOR MUNDANE REPORTS of revenue vs. expenses, by month, or the earned run averages of major league pitchers by team, *SPSS Graphics* also can draw the usual pie, bar, line and scatter charts, as well as dramatic 3D column charts. For pie charts where one or two slices represent such a small percentage of the whole that they would be hard to see in the traditional pie format, the package offers an unusual looking but very effective "radial pie" chart: The slices each sweep equal angles through the circle, but their radius lengths are relatively elongated or shortened based on their statistical values.

Text pages (available in several type fonts and sizes) also can be produced with the package, and composite pages, consisting of several separate text and drawing elements superimposed together in a single display, can be assembled easily.

SPSS Graphics is configurable almost for every imaginable graphics terminal and plotter, but, as always, you should check with the vendor before buying, for use with a specific device.

THIS PACKAGE IS AS PRICEY as it is powerful: yours for a mere $8000 ($4000 for a MICROVAX) and a $4000 annual renewal fee (including updates—especially important for users of the map database—and telephone support). SPSS Inc. offers discounts to educational institutions and to existing users of their *SPSS-X* statistical package. Clearly, potential purchasers who need to draw no more than routine business charts can find less expensive VAX or PC-based solutions. For ambitious chart makers and statistical cartographers with big-time graphics requirements, however, the power and flexibility of *SPSS Graphics* warrants a close look.

SPSS Graphics
SPSS, Inc.
444 N. Michigan Ave.
Chicago, IL 60611
(312) 329-2400

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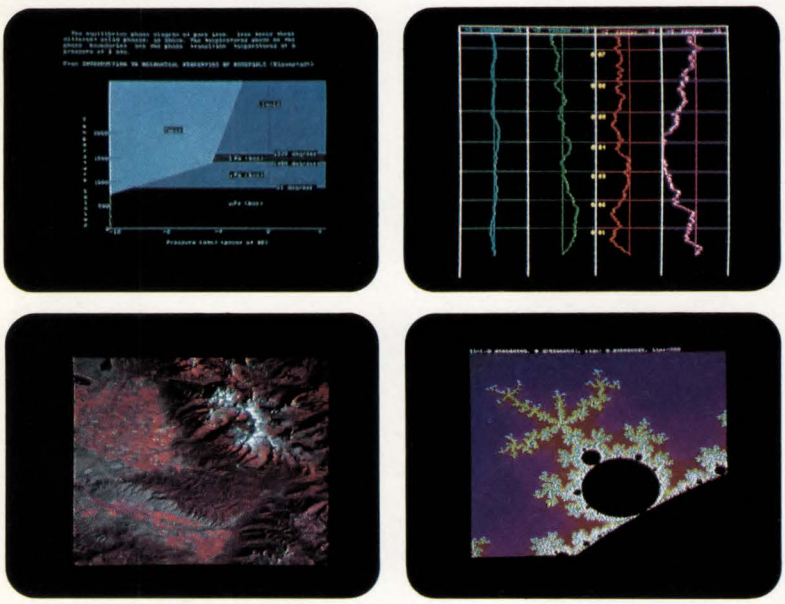

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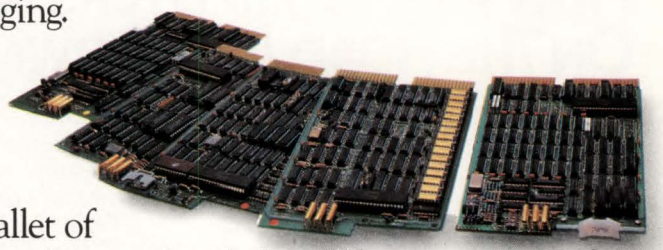

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PROGRAMMING

USING @DATE

By Dr. Fritz H. Grupe

How to use this helpful, simple function in *Lotus 1-2-3*.

When I first saw that *Lotus 1-2-3* had an @DATE function built in, I didn't see much use for it.

Sometime later, I worked with administrative aides who had created several worksheets with over 1,000 records, each of which included many date fields. The aides were dismayed to find that the records could not be sorted on any of the date fields. The fields had been typed with an apostrophe as a label prefix character. The character string, '6/15/85, could not be used without the label prefix because *Lotus* then would have considered the entry to be six, divided by 15, divided by 85, giving a result that is quite unusable as a date.

The string '6/15/85, on the other hand, can be entered directly as a label, readable by humans as a meaningful date. Computers generally will find this date to be useless, however. For example, character strings in *Lotus* all are treated mathematically as zeros. So, it is impossible to compare reliably two dates and determine which is the earlier or later one. More important, there is no way to determine how many days have elapsed between two dates entered in this way.

Another major reason to avoid the use of dates entered as character strings is the problems created in sorting. Dates entered as characters will lead to a sorted list in which the first month may appear as expected, but the next month to appear will be the month 10, followed by month 11, followed by month 12, followed by months two through nine. This is because sorting is carried out by comparing first letters first. Ties among the first letters are broken by comparing the second letters. Further ties involve continuing comparisons through the length of the strings. Since all ones precede the numbers two through nine, the "missortings" take place. This problem is compounded by missortings within days. It is worsened further by inconsistencies in data entry when months or days of one digit are inconsistently preceded by a zero.

THE @DATE FUNCTION is the remedy for this dilemma. It is a simple function to use. Although @DATE may require you to take somewhat more time to enter data, the dates become eminently more useful. The syntax: @DATE(YY,MM,DD)

indicates that you must type the function symbol and name, followed by one or two numbers for the year, month and day, in that order. Parentheses enclose the numbers composing the date. The entering of @DATE(85,11,1) to a cell creates and displays the number 31352, which represents the number of days that have passed since January 1, 1900. Since all dates entered in this way will create similar numbers, dates logically may be compared as being equal or unequal, greater (later) or lesser (earlier). Further, by subtraction, the precise number of days separating two dates can be determined. You will be reassured to know that *Lotus* correctly accounts for leap years, too.

If the numbers created by @DATE are more useful to the computer, they are certainly less intelligible to humans. Again, *Lotus* to

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FIGURE 1.

EARLY RETIREMENT BONUS PROGRAM

Today > 15-Oct-85

Name	Date Birth	Date Age	Years Hire	Service	Eligibility
Jones, Barry	14-Mar-30	56	15-Mar-75	11	1
Sitwell, Martha	04-Apr-54	32	10-Feb-73	13	0
Kastwell, Richard	16-May-28	57	01-Dec-80	50	0
Brainey, William	02-Oct-52	33	07-Nov-79	6	0
Baker, Mary	10-Dec-30	55	24-Nov-73	12	0
Cranston, Frank	01-Jan-25	61	13-May-55	30	1
Elton, Earle	12-Sep-60	25	24-Feb-77	9	0
Barnes, Verne	17-Aug-64	21	16-Mar-85	1	0
Peters, Paul	12-May-59	26	05-Apr-80	6	0
Reeves, Nathan	03-Jan-56	30	12-Dec-77	8	0

the rescue. The command / Range Format Date will allow you to select any of three date formats that would make the example given above appear as any of the following:

01-Nov-85	Option D1
01-Nov	Option D2
Nov-85	Option D3

Symphony allows two more formatting options that display:

11/1/85	Option D4
11/1	Option D5

The related functions, @TODAY in *Lotus*, or @NOW in *Symphony*, access the current date from DOS and return the numerical equivalent of today's date. This date can be compared with @DATE created numbers. These numbers are also formatted with the options cited.

AS AN EXAMPLE, let's look at one worksheet that makes effective use of @DATE.

Many organizations are giving consideration to early retirement, "buy-out" contract plans. The basic idea on which such plans are based is that it is cheaper to pay an employee a bonus to retire early than it is to continue to pay the salary of a highly paid individual any longer than is necessary. If a person chooses to retire early, upward mobility is provided for other employees and the organization can hire replacements at lower salaries for many of the changing positions. The lowering of the average salary more than offsets the bonuses paid to the retirees.

Suppose that a large corporation decided that it needed to evaluate an early retirement plan for all persons who met both of two criteria. First, they should have worked for the organization at least 10 years. Second, they must be at least 55 years old.

Imagine turning the problem of determining who would be eligible over to a personnel department. Someone would have to compare each individual's birth date with today's date to see who is 55 or older. Then he would have to see if those employees have worked for the organization at least 10 years. Given hundreds, perhaps thousands of employees, the task is subject to errors galore. And, if "today" changes to a day next month or next year, the list becomes rapidly obsolete. If the criteria for evaluation change to 60 years old and 12 years with the organization, the list again becomes outdated.

How might a worksheet be set up to produce such a list accurately and quickly? A sample worksheet displaying an eligibility evaluation is shown in Figure 1 and is set up as follows:

1. Worksheet Heading. The main title of the worksheet has been entered as a label in cell B1.
2. Today's Date. Today's date is created by entering the @TODAY function in cell B3. It is formatted as / Range Format Date 1 to display the day, month and year for the current view of the list of eligible employees. It is important that the correct date be entered while in DOS. Otherwise, the DOS default of January 1, 1980, appears, which will produce incorrect results, including negative values for the years of service.
3. Column Headings. The two rows of column headings are entered as labels. It might seem as though the two date labels might have been vertically reversed. Placing "BIRTH" above "DATE," and "HIRE" above "DATE" might read somewhat easier. If you are taking the trouble to create a worksheet such as this, it may be that the labels will

Names, dates of birth and dates of hire must be entered manually. The formulas may be copied down each of the columns. Let *Lotus* do the rest.

be used in other contexts. If you wish to employ the powerful database commands found in *Lotus* and *Symphony*, for instance, the column labels must be unique. Placing "DATE" above two columns would mean that duplicate labels would prevent you from extracting, sorting and querying the database created.

A row of equal signs or minuses could be entered between the column headings and the first record for visual aesthetics. However, these also would detract from the utility of database operations.

FOR INDIVIDUAL RECORDS the names of employees are entered as labels. You may wish to subdivide such an entry into three separate columns for last, first and middle names.

The dates of birth and hire are entered using the @DATE function. The first employee had @DATE(30,3,14) entered in cell D8 and @DATE(54,4,15) entered in D7. Other records are created similarly.

In cell C7, the first individual's age is computed. The person's birth date is subtracted from today's date and this number is divided by 365 to determine the number of years that have passed since the birth date. The complete formula for doing this is:
@INT(B3-C7)/365)

The @INT function is used to truncate fractional portions of years. Without this function, rounding may occur that would give persons credit for time not yet completed with the company. The @ROUND function will give misleading information of this nature, as will some formatting options.

Parentheses enclose the subtraction operation in order to force this operation to precede division by 365.

The address of today's date has been made absolute. When the formula is copied down the column, the reference to the address B3 will be retained in all copies.

The years of service are computed similarly.

Determination of eligibility is computed with the use of the @IF function. Cell F7, for instance, contains the formula:
@IF(C7>=55#AND#E7>=10,1,0)

This can be read as, "If it is true that the person's age (cell C7) is greater than or equal to 55, and if it also is true that the person has served for a length of time (cell E7) that is greater than or equal to 10, then enter a zero in cell F7; otherwise, enter a one." Therefore, if column F contains a one, the person is eligible for the early retirement option.

Symphony will allow the entry of characters to the cell, so in this package the formula can be altered to:
@IF(C7>=55#AND#E7>=10,"*"," ")

which would flag each eligible person's record with an asterisk. Non-eligible persons would have a blank placed next to their records.

Names, dates of birth and dates of hire must be entered manually. The formulas may be copied down each of the columns. Let *Lotus* do the rest!

FIGURE 2.

MACRO \A - ENTERS A COLUMN OF DATES

```
'/XLARE THERE MORE DATES TO ENTER?~T1~     Ctrl-Brk terminates
'@DATE({?})~                               Enter dates & commas
'/RFD1~                                    Format the cell
'{DOWN}                                    Goto next cell down
'/XG\A~                                    Re-call the macro
```

FIGURE 3.

MACRO DATE — FOR ENTERING COLUMNS OF DATES

```
'{GETLABEL MORE DATES TO ENTER?,T1}        Ctrl-break terminates
'@DATE ({?})~                              Enter nos. & commas
'{MENU}FD1~                                Format the cell
'{DOWN}                                    Goto next cell
'{BRANCH DATE}                             Re-call the macro
```

The entry of any significant number of dates can be tedious since each cell must contain much the same information with only the specific numbers to represent the year, month and day changing. A keyboard macro can speed up the entry process considerably. A *Lotus* macro to do this is shown in Figure 2.

The label identifying macro \A is a visual identifier for the programmer that simply shows where the macro is, if analysis is required. Also, the comments to the right of the actual macro commands explain what is happening so that debugging will be facilitated, if necessary.

The first macro line uses the built-in \XG, or "go to," macro which places the prompt "ARE THERE MORE DATES TO ENTER?" on the third line of the control panel. If there are more dates, any character followed by the enter key (or simply an enter) may be input. If there are none, the simultaneous keying of the control and break keys will terminate the macro. The selection of cell T1 as the storage location for the keystroke entered is arbitrary. Be sure that placing responses there does not destroy any useful data that is already there.

Note that on each line an apostrophe is used to keep *Lotus* from evaluating the characters as commands immediately.

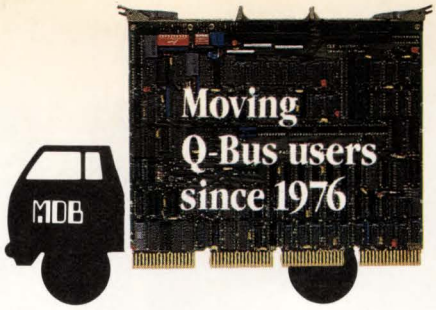
The second macro line enters the letters composing "@DATE(" on to the entry line of the control panel. *Lotus* then pauses to wait for you to type the numbers and the commas. Entry is completed with the entry key. Then the closing parenthesis is entered. The tilde completing the macro line is interpreted to be the macro's command to insert the entry into the current cell.

Control passes to the next line of the macro which formats the cell as a date of type D1. Finally, the cell pointer moves down and the macro calls itself. The process is continued until the list of dates is completed. Completion occurs when you type Ctrl-Break.

A comparable macro in *Symphony* might look like Figure 3.

The @DATE function is an important feature not found in some integrated software packages. It should be taken advantage of whenever possible. Failure to enter dates properly can lead to many hours of editing incorrectly entered dates. Do it right the first time!

Dr. Fritz H. Grupe is Campus Computing Services coordinator at the University of Nevada, Reno, Nevada.



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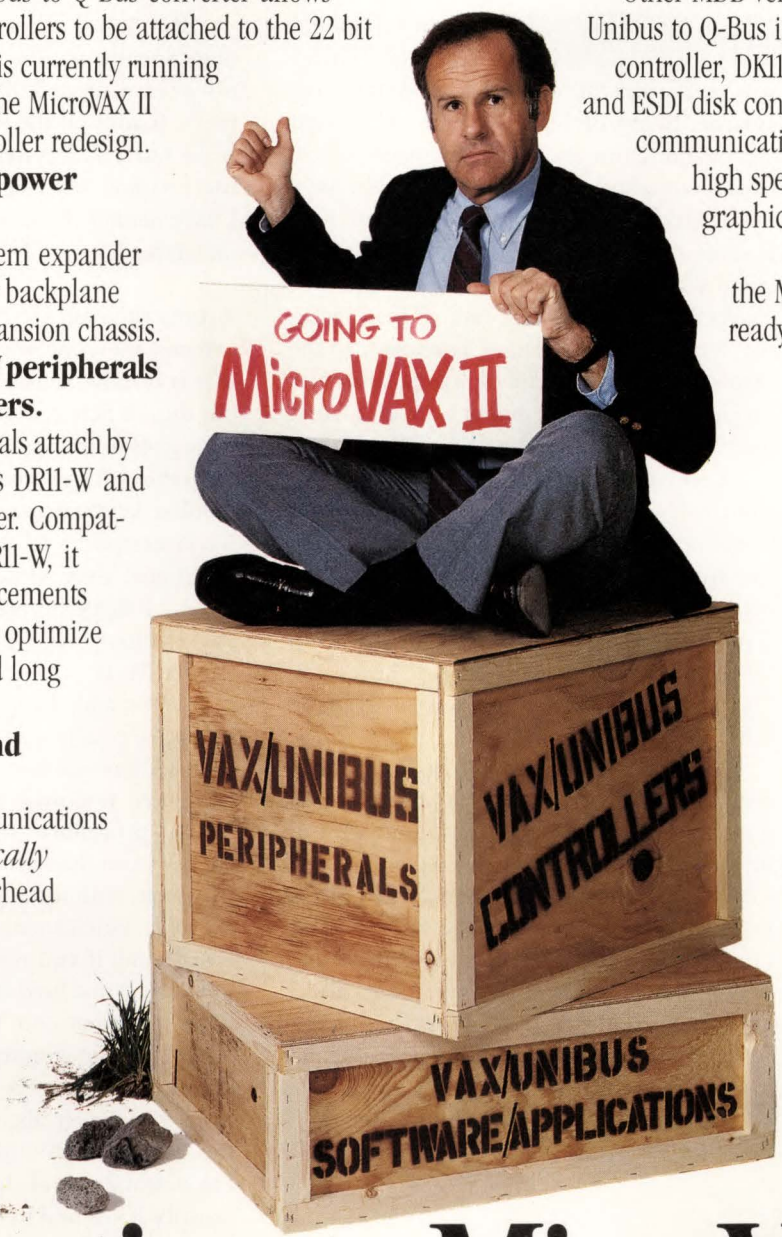

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TSX

WARDEN

By Jan Messersmith

A policeman for TSX+ Priorities.

About a thousand years ago, when I was young and callow, I fancied becoming an aviator. Being of limited means, it seemed clever enough to allow my beneficent Uncle Sam to enlighten me in the ways of the skymen. This eventually brought me to Fort Rucker, Alabama, where I encountered a singularly sadistic warrant officer who was charged with the odious task of instructing me, a runny-nosed second lieutenant, in the manner of hurling a wildly gyrating helicopter through impenetrable vapors under Instrument Flight Rules.

Lest I digress too far from the subject, I'll simply say that the sign that he invariably hung over the magnetic compass immediately on mounting our craft never fails to remind me of what I like best about TSX+. It exclaimed, tersely, "KISS." When I was no longer able to subdue my curiosity, he replied, "It's a message from me to you: Keep it SIMPLE, stupid!"

TSX+ does everything I need it to do. It even can do some things I don't presently need done, but might someday. It can do a lot of things that I don't really understand yet, but I don't let that intimidate me any more than I'm already intimidated by the six fat vulgar orange binders of RT-11 documentation that sit two feet from my head every day. I feel vaguely uncomfortable knowing that there's so much stuff in there that might leap out and bite me someday, and I wouldn't even know what it was.

But TSX+ is not at all intimidating. All of its documentation comes in one binder and it's even a nice, dull beige, nothing brassy there. It adds all the right things to RT-11 to make our 11/73 system useful for five or six users without burying me in complexities that I have neither the time nor the inclination to understand.

WHAT'S NICE ABOUT TSX+ is that it logically extends the concepts with which an RT-11 user is already familiar. Logical disks are there, but they're better, not more complicated. The same goes for things like the single-line editor, the indirect file processor and almost all of the familiar keyboard commands. In fact, if an RT-11 user were to enter a room containing a terminal that already was running under TSX+, I think he probably could use it all day without even suspecting that it wasn't vanilla RT-11.

TSX+ adds to RT-11 the things that are necessary to allow several users to compete, in an orderly manner, for the resources of one computer. It allows, but does not demand, a log-on procedure. In other words, if you choose to set the system up to allow everyone to use it without logging on to a specific account, you can do it that way. On the other hand, if you want the system to police who uses it and how they get charged for use, you can do that, too. It allows you to restrict use of specific commands, devices and storage to certain users and give other users carte blanche. It also allows you to specify the rate at which a specific user or program can demand use of the CPU. This is called a priority level, and brings us to the subject of this article.

FIGURE 1.

```
;------------------------------
; Line definitions
;
; The TBLDEF macro call requires four arguments:
;  1. The number of real (physical) timesharing lines on machine.
;  2. The number of virtual timesharing lines desired.
;  3. The number of detached job lines to be generated.
;  4. The number of dedicated CL lines.
;
     TBLDEF 5.,4.,1.,1.   ; Real,  Virtual,  Detached,  CL lines
```

FIGURE 2.

```
; Use the "DETACH" macro here to declare any start-up command
; files to be run as detached jobs.
;
   DETACH WARDEN
;
```

If you want to protect your innocent KED users, for instance, from being savaged by someone who is running a program that gobbles CPU time as if it were suffering history's most monumental Big Mac attack, you could force the program to run from a command file that would set the priority of the program below the PRILOW level. This range, simply stated, allows the program only the leftovers; the main course goes to the programs that run in the PRILOW to PRIHI range. The programs that run at PRIHI or higher get what they want, whenever they want it.

What can happen, though, is that someone starts perusing the documentation and discovers that he can alter his priority. So, he gets sneaky and, instead of typing TREK, which causes a command file called TREK.COM to execute, he types:

```
SET PRI 90

R TREK
```

which gives him an outrageous priority and causes his program to execute directly, bypassing your command file. Of course, what the command file was supposed to do was:

```
SET PRI 20

R TREK
```

which would have given him a priority more in line with the "work" he is doing. I should point out that if you are using the security and access features of TSX+, you can specify a maximum allowed priority for each account. The moral of this is, "Never cross the system boss!"

If you want to see a TSX+ system come crashing to its knees, just watch some clown log on, set his priority to 127, the highest level (if he's privileged to do so), and then run a program that munches the CPU like there's no tomorrow AND does a lot of single character input. There are some things that you just can't ask a machine to do. Everyone else on the system might as well take a nap.

AN AUTOMATED STOOL PIGEON is needed that can check priorities in general, and also those specific programs that you would like to see running on the back burners. It just so happens that I have one for you.

A lot of the code is a direct lift from the examples in the TSX+ manual, and I guess if they didn't want anyone to use it, they wouldn't have put it there. All I really did was glue it all together with some examples from the RT-11 documentation and comment on it. I am not, and probably never will be, a competent MACRO-11 programmer, so if there are gross inelegancies and ludicrous inefficiencies in the code, please don't rain on my parade by pointing them out to me. I know it's not GREAT, it just WORKS (so far).

To get WARDEN on the job, follow these steps.

1. First, modify the source code, WARDEN.MAC, to suit your situation. Assemble it with MACRO and LINK it. You'll end up, of course, with WARDEN.SAV, which you then should copy to SY:.
2. To use WARDEN as I originally designed it to be used, you'll need to regenerate your TSX+ system. In your TSGEN.MAC file, be sure to do the following:
   a. In the LINE DEFINITIONS section, be sure you allow at least one (or one ADDITIONAL, if such is the case) detached line on which WARDEN can run as a detached job. Figure 1 shows the area of code I'm talking about.
   b. Now go to the end of the user modifiable area of TSGEN and add the line "DETACH WARDEN", as shown in Figure 2.

Use MACRO to assemble your modified TSGEN.MAC and execute the TSXLNK.COM command file to link it, generating your new TSX+ system as described in the TSX+ documentation. Don't forget that you have to go back to RT-11 before you copy the new system to your system device.

3. Now, create the following command file, "WARDEN.COM" on SY:

```
R/LOCK WARDEN
```

Theoretically, when you start up TSX+ and ask WHO?, you should see WARDEN sitting there in a detached slot at priority 127, just waiting to pounce on some unsuspecting ne'er-do-well.

Jan Messersmith, at the time of this writing, was a systems analyst for Pioneer Bible Translators, Madang, Papua, New Guinea.

```
        .TITLE  WARDEN - POLICE TSX PRIORITIES  V01
        .IDENT  /01/
        .ENABL  LC

;       WRITTEN BY:     Jan Messersmith, Pioneer Bible Translators
;       DATE:           17-NOV-84

        .SBTTL  SYNOPSIS
;       This program checks each line periodically to see if any job is
;       running at a priority level higher than a maximum specified level.
;       It also checks a list of specific programs and their accociated
;       maximum priorities to see if any are in violation.  If it finds a
;       violation of either case it blanks the screen of the offender, prints
;       a short message on the line, warning the user of the violation and
;       informs the system manager that someone is hogging resources.

        .SBTTL  IMPLEMENTATION NOTES
;       Should be run from a detached line (sets its own priority at 127).

        .SBTTL  DEBUG INFORMATION & AIDS
;       Set DEBUG = 1 for debugging conveniences.
DEBUG   = 0
.IF     NZ      DEBUG
        .GLOBL  START   ;Make START address a global, in case we are in ODT.
        .ENABL  AMA     ;Cause relative addresses to be assembled as absolute.
        .DSABL  GBL     ;Make sure any undefined lables are not treated as
.ENDC                   ;default globals, we want an error message instead.

        .SBTTL  DIRECT ASSIGNMENTS (EQUATES)
; ***************************************************************************
; *****                   program 'equates'                             *****
; ***************************************************************************
;       These equates may be changed to alter operating characteristics.
MYPRI   = 127.  ;Priority at which this program (WARDEN) will be run.
MAXPRI  = 70.   ;Maximum priority at which any OTHER job is allowed to run.
NAP     = 1     ;Number of minutes to sleep between priority checks.
WARDEN  = 1     ;Line number to receive tattle-tale message (usually console).
;       These equates must not be altered.
ERRBYT  =: 52   ;EMT error code location
STACO   =: 0    ;JSTAT subfunction code to get staus of line.
PRGNAM  =: 5    ;JSTAT subfunction code to get program name.
GETPRI  =: 8.   ;JSTAT subfunction code to get current job priority.
OFFSET  =: 6    ;Number of bytes in each program name table entry.
UNAME   =: 147  ;EMT function code for obtaining user name.
STAT    =: 144  ;EMT function for job status.
SETSIZ  =: 141  ;EMT function code for setting job size.
PSET    =: 150  ;EMT function code for obtaining current job priority.
MESSAG  =: 127  ;EMT junction code for sending a message to a specific line.
CR      =: 15   ;ASCII carriage return.
LF      =: 12   ;ASCII line feed.
BELL    =: 7    ;ASCII bell.
ESC     =: 33   ;ASCII escape.

        .SBTTL  MACRO CALLS
; ***************************************************************************
; *****                       macro calls                               *****
; ***************************************************************************
        .MCALL  .TWAIT,.EXIT
        .PAGE

        .SBTTL  MAIN PROGRAM
; ***************************************************************************
; ***************************************************************************
; *****                       program                                   *****
; ***************************************************************************
; ***************************************************************************

;               ************************************************************
;               ********** make this job set its own memory size *************
;               ************************************************************

START:  MOV     #MEMTOP,R0      ;Point to EMT argument block to set
        EMT     375             ;job size.
        CMP     R0,#HILIM       ;See if we got what we wanted.
        BHIS    MAKPRI          ;Go on, if so,
        .EXIT                   ;else quit (can't disp err msg from det line).

;               ************************************************************
;               ************* set priority for this job ********************
;               ************************************************************

MAKPRI: MOV     #PRISET,R0      ;Point to EMT argument block to set priority.
        EMT     375             ;Do it.

;               ************************************************************
;               ********************** main loop ***************************
;               ************************************************************

AGAIN:  MOVB    #1,LINE         ;Put 1 into the argument block for the EMT's
        MOVB    #1,LINEX        ;we are using at the address which indicates
        MOVB    #1,LINEZ        ;the line number on which the operation is
                                ;performed. (Always start with line 1.)
CHECK:  MOV     #PTABLE,R1      ;Use R1 to point to first program in PTABLE.
CHNEXT: MOV     #NMCHK,R0       ;First, check to see if WARDEN is running on
        EMT     375             ;this line. (JSTAT also returns an error code,
        BCS     ERRTYP          ;carry indicates line error, go process it.)
        CMP     NAME,#^RWAR     ;If the 1st 3 characters are NOT 'WAR',
        BNE     NOTWAR          ;then we know it can't be WARDEN, so go on.
        CMP     NAME+2,#^RDEN   ;If the next 3 are 'DEN' then it's WARDEN, so
        BEQ     NEXTLN          ;we might as well go check the next line.
                                ;Since we want to be able to run LOGON at a
                                ;higher priority than MAXPRI, we must check to
                                ;see if LOGON is running on this line and,if
                                ;so, ignore it.
NOTWAR: CMP     NAME,#^RLOG     ;If the 1st 3 characters are NOT 'LOG',
        BNE     NOTLOG          ;then we know it can't be LOGON, so go on.
        CMP     NAME+2,#^RON    ;If the next 2 are 'ON' then it's LOGON, so
        BEQ     NEXTLN          ;we might as well go check the next line.

NOTLOG: MOV     #PRICHK,R0      ;It's not WARDEN or LOGON, so see if job is
        EMT     375             ;running less than the legal maximum
        CMP     PRIRTY,#MAXPRI  ;determined by MAXPRI.  If it's the same or
        BLOS    OKPRI           ;lower, it's a good priority (so far),
        JSR     PC,HARASS       ;otherwise, we'll HARASS the user and
        BR      NEXTLN          ;go on to check the next line.
        .PAGE
```

—Program follows on p.171—

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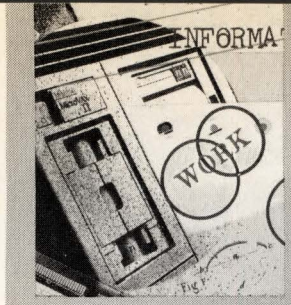

VAX

MANAGING FILES

By William W. Hastings

The creating of subdirectories allows for easy VMS file organization and management.

This article describes various uses of subdirectories. By creating subdirectories, you may organize your files in a hierarchical structure. By collecting a group of related files in a separate subdirectory, you will find it easier to find and manage these files.

The easiest subdirectory to create and use is one for your mail. You may direct the MAIL utility to place all of your mail files in a subdirectory with the following mail command:
MAIL>SET MAIL__DIRECTORY [.MAIL]

Henceforth, all of your mail files will be contained in the directory [USER.MAIL] (replace "USER" with your own username). The MAIL utility remembers the name of this directory; so, you can use MAIL without being aware of where your mail files are stored.

Creating Subdirectories

Before continuing, let's discuss file specifications. A full file specification has several "fields" in the form:
node::device:[directory]filename.type;version

Usually you specify only the filename and type fields. VMS provides defaults for any omitted fields (except filename). The default for the node is the VAX you are using. The default for the version is the highest numbered version.

The defaults for the device and directory are initially determined at login. These initial defaults normally specify the disk and the directory on that disk assigned to you for your files. The value of the logical name SYS$LOGIN is your "login" directory (and device). To display its value give the command:
$ SHOW LOGICAL SYS$LOGIN

You may change the "current default" device and/or directory by using the SET DEFAULT command. (See the examples below.) The SHOW DEFAULT command displays the current default. I will assume that all files of interest are on the same disk (called DISK$USER) and that your login directory is [USER].

You create a subdirectory for report files with the command:
$ CREATE/DIRECTORY [USER.REPORTS]

If the current default directory is [USER], this command may be abbreviated to:
$ CR/D [.REPORTS]

The period in the directory specification indicates a parent-child hierarchical relationship.

Suppose that you want to subdivide your report files into technical reports and sales reports. Then you could create two subdirectories of your report's subdirectory as follows:
$ SET DEFAULT [.REPORTS]
$ CREATE/DIRECTORY [.TECH]
$ CREATE/DIRECTORY [.SALES]

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FIGURE 1.

```
$! Change the default device and directory and change the DCL prompt
$! to show the new directory.  See further comments at end.
$       IF P1 .EQS. "" THEN -
                INQUIRE P1 "Enter new directory specifications"
$       OLD_DEFAULT=F$ENVIRONMENT("DEFAULT")
$       SET DEFAULT 'P1
$! Does the new default directory exist?
$       IF F$PARSE("*.*") .EQS. "" THEN GOTO NO_DIRECTORY
$! Check whether P1 is a logical name:
$       IF F$TRNLNM(P1) .NES. "" THEN GOTO LOGICAL_NAME
$FIND_PROMPT:
$       NEW_DEFAULT=F$DIRECTORY()
$       DIR=NEW_DEFAULT - "[" - "]"
$!If the next five commands are deleted, then the DCL prompt would
$!be set to the new default directory (without the square brackets)
$       IF F$LOCATE(".",DIR) .EQ. F$LENGTH(DIR) THEN GOTO SET_PROMPT
$       SET DEFAULT [-]
$       DEL_STRING=F$DIRECTORY() - "]" - "["
$       SET DEFAULT 'NEW_DEFAULT
$       DIR=DIR - DEL_STRING - "." !Remove parent directory name
$SET_PROMPT:
$       SET PROMPT="''DIR'>"
$       EXIT
$LOGICAL_NAME: ! P1 is a logical name
$       NAME=P1
$LOOP: !Iteratively translate P1, looking for a search list.
$       IF F$TRNLNM(NAME,,,,"MAX_INDEX") .GT. 0 THEN GOTO USE_P1
$       NEXT=F$TRNLNM(NAME)
$       IF NEXT .EQS. "" THEN GOTO CHECK_LOGICAL
$       NAME=NEXT
$       GOTO LOOP
$CHECK_LOGICAL: !Does the translation of P1 include a directory?
$       IF F$LOCATE("[",NAME) .EQ. F$LENGTH(NAME) THEN -
                GOTO FIND_PROMPT
$USE_P1: !P1 translates to a search list or a directory spec.
$       SET PROMPT="''P1'>"
$       EXIT
$NO_DIRECTORY: ! P1 does not specify an existing directory
$       SET DEFAULT 'OLD_DEFAULT
$       WRITE SYS$OUTPUT "^G**** No such directory"
$       EXIT
$! The parameter P1 is either a directory specification (possibly
$! with a device name) or a logical name.  This procedure starts
$! with SET DEFAULT 'P1.  If P1 is a logical name whose translations
$! include a directory specification or if P1 is a search list, then
$! the DCL prompt is set to 'P1'>.  Otherwise, the DCL prompt is
$! changed to the name of the lowest subdirectory of the new default
$! directory.  For example, if the current default is
$! DISK$USER:[USER.REPORTS], then the command @SD [.MAY] will change
$! the default to DISK$USER:[USER.REPORTS.MAY] and set the DCL
$! prompt to "MAY>" .  The command @SD SYS$MANAGER will change the
$! default and set the prompt to "SYS$MANAGER>".
```

This creates the two directories [USER.REPORTS.TECH] and [USER.REPORTS.SALES]. (Since the default directory is changed to [USER.REPORTS], the directory specification [.TECH] is an abbreviation for [USER.REPORTS.TECH].) To see the names of all of the subdirectories of the report subdirectory, give the command:

$ DIRECTORY *.DIR

(assuming that the current default is [USER.REPORTS]).

To see the entire subdirectory hierarchy, give the command:

$ DIRECTORY [USER . . .]*.DIR

If the current default is [USER], then this may be abbreviated to:

$ DIR [. . .].DIR

The file specification [USER . . .]*.DIR includes every file of type ".DIR" in directory [USER] or any subdirectory in the hierarchy of directories headed by [USER]. If "*.DIR" were omitted from this command, every file in every subdirectory would be listed.

If you want to work on technical reports, first give the command:

$ SET DEFAULT [USER.REPORTS.TECH]

This command tells VMS that files that are referenced without a directory specification can be found in the directory [USER.REPORTS.TECH].

Keeping Track

An important problem with using subdirectories is the difficulty of remembering which subdirectory contains a particular file. One way to find the file JUNE_SALES.RPT is to issue the command:

$ DIRECTORY [USER . . .]JUNE_SALES.RPT

which will display every subdirectory containing a file JUNE_SALES.RPT. Another problem is keeping track of which subdirectory is currently the default.

These problems are addressed by the command procedures shown in Figures 1 and 2. To use these procedures you might include in your LOGIN.COM file the following definitions:

$ SD :== @SYS$LOGIN:SD
$ HOME :== SD SYS$LOGIN
$ FIND :== @SYS$LOGIN:FIND

(This assumes that the command procedures are in the files SD.COM and FIND.COM in your login directory.)

The first procedure takes one argument that must be a device and/or directory specification (or a logical name that translates to such a specification). The command procedure starts by changing the default directory just as the SET DEFAULT command would. In addition, the DCL prompt string is changed to reflect the new default. For example, if the current default is [USER]:

$ SD [.REPORTS.TECH]

has the same effect as

$ SET DEFAULT [.REPORTS.TECH]
$ SET PROMPT="TECH>"

FIGURE 2.

```
$! Command procedure to find the directory containing the file 'P1.
$! The default is changed to this directory using SD.COM
$       IF P1 .EQS. "" THEN -
                INQUIRE P1 "Enter new directory specifications"
$       DISK=F$TRNLNM("SYS$DISK") !Current default device name
$LOOP: !Keep translating until a physical device is found
$       NEXT=F$TRNLNM(DISK-":")
$       IF NEXT .EQS. "" THEN GOTO CHECK_ROOT
$       DISK=NEXT
$       GOTO LOOP
$CHECK_ROOT: !Is the current default rooted?
$       IF F$LOCATE(".]",DISK) .NE. F$LENGTH(DISK) THEN GOTO ROOTED

$! Extract from the current default the highest level directory.
$! Add "..." to allow a search of subdirectories.

$       OLD_DEFAULT=F$ENVIRONMENT("DEFAULT")
$       LEN=F$LOCATE(".",OLD_DEFAULT)
$       IF LEN .EQ. F$LENGTH(OLD_DEFAULT) THEN LEN=LEN-1
$       DEFAULTS=F$EXTRACT(0,LEN,OLD_DEFAULT)+"...]*.*;*"
$FIND_FILE:
$       SEARCH_NAME=F$PARSE(P1,DEFAULTS)
$       FULL_NAME=F$SEARCH(SEARCH_NAME)
$       IF FULL_NAME .EQS. "" THEN GOTO NO_FILE
$       NEW_DEFAULT=F$EXTRACT(0,F$LOCATE("]",FULL_NAME)+1,FULL_NAME)
$       @SYS$LOGIN:SD 'NEW_DEFAULT
$       EXIT
$ROOTED: !Allow search of entire rooted directory hierarchy.
$       DEFAULTS:=SYS$DISK:[*...]*.*;*
$       GOTO FIND_FILE
$NO_FILE: !File could not be found
$       IF SEARCH_NAME .EQS. "" THEN GOTO NO_DIRECTORY
$       WRITE SYS$OUTPUT "%Grrr File not found"
$       EXIT
$NO_DIRECTORY: !A nonexistent directory was specified
$       WRITE SYS$OUTPUT "%Grrr No such directory"
$       EXIT
$! The parameter P1 is a file specification (see the DCL Dictionary,
$! page 33) with (possibly) some fields missing.  A search for this
$! file is performed.  If no directory is specified, then an entire
$! directory tree is searched.  The root of this tree is the top
$! level directory in the current default (as displayed by the
$! SHOW DEFAULT command).  The first directory (subdirectory) found
$! to contain the file P1 becomes the default directory.  The
$! default and the DCL prompt are changed by invoking the command
$! procedure SD.COM.  For example, if the current default is
$! DISK$USER:[USER.REPORTS], the command @FIND JUNE12 will invoke a
$! search for the file DISK$USER:[USER...]JUNE12.*;* .  The first
$! directory found to contain a file named JUNE12 will become the
$! default.
```

Some users at our site prefer the prompt to show the entire default directory. To achieve this, five lines of the command procedure should be deleted as indicated in the command procedure listing.

The command procedure in Figure 2 can be used to locate a directory containing the file that is given as the argument to the procedure. For example, the command:

$ SD JUNE_SALES.RPT

invokes a search for the file [USER . . .]JUNE_SALES.RPT. The first directory found to contain a file JUNE_SALES.RPT becomes the default and the prompt is changed as above. When the argument is a file specification without a directory field, then the hierarchy of directories searched is the one that is headed by the highest level directory in the current default. For example, if the current default is [USER.PROGS.EXE], then the directories [USER . . .] are searched. This feature facilitates lateral movement among subdirectories.

Rooted directories also facilitate movement among subdirectories. For example, suppose you keep most of your files in subdirectories. Then you could make the [USER] directory a "root directory" and access your subdirectories as top level directories. To achieve this, you could invoke the command procedure shown in Figure 3 from LOGIN.COM. If you want to work in subdirectory [USER.REPORTS], you would set the default to BASE:[REPORTS]. To run the program MY_PROG in [USER.EXE], you use the file specification [EXE]MY_PROG

With this scheme, directory [USER] serves as the master file directory for BASE: . Thus, directory [USER] is also directory BASE:[000000].

The procedure in Figure 3 defines a "rooted-device logical name" which established the current default directory as a "root directory." See *Guide To VAX/VMS File Applications*, pages 5-18 through 5-24. The procedure will work even if the current default already contains a root directory. Obviously, this procedure could be shortened if such generality is not needed. The important point is to use a physical device name in the DEFINE command.

File Security

Another important use of subdirectories involves file security. You easily could allow full access to all files in one subdirectory and limit access to all files in another subdirectory. For example, you could limit access to all files in the subdirectory [USER.SECURE] with the following command:

$ SET PROTECTION = (GROUP,WORLD)
  [USER]SECURE.DIR

(By the way, in spite of all the fuss about increased security, this is, ultimately, the most restrictive file protection available to a nonprivileged user. Further protection requires changing the owner of the file or restricting logins under username USER, but that's another story.)

Now that access to this directory has been denied to all other nonprivileged users, you selectively can allow cer-

FIGURE 3.

```
$!Make the current default directory a root directory and define
$!the logical 'P1 to be the associated rooted-device logical name.
$!If no parameter is specified, then BASE is used.
$       IF P1 .EQS. "" THEN P1:=BASE
$       NAME=F$TRNLNM("SYS$DISK")
$LOOP: !Keep translating until a physical device name is found
$       NEXT=F$TRNLNM(NAME-":")
$       IF NEXT .EQS. "" THEN GOTO CHECK_ROOT
$       NAME=NEXT
$       GOTO LOOP

$CHECK_ROOT: !Is the current default already rooted?
$       IF F$LOCATE(".]",NAME) .NE. F$LENGTH(NAME) THEN GOTO ROOTED
$       NAME=NAME+F$DIRECTORY()-"]"+".]"
$DEF_LOG:
$       DEFINE/TRANSLATION_ATTRIBUTES=CONCEALED 'P1 'NAME
$       EXIT
$ROOTED: !Current default has a rooted logical device
$       DIR_NAME=F$DIRECTORY()-"[]"
$       IF DIR_NAME .EQS. "000000" THEN GOTO DEF_LOG
$       NAME=NAME-"]"+DIR_NAME+".]"
$       GOTO DEF_LOG
```

tain users access by using an Access Control List (ACL). In an ACL you may specify individual users or classes of users with "identifiers." Normally, each username is an identifier. In addition, your system manager may establish other identifiers that are assigned to appropriate users.

For example, the system manager might assign the PERSONNEL identifier to all users who require access to personnel files. You could allow any user with the PERSONNEL identifier to read the files created in [USER.STAFF] with the commands:

```
$ SET DIRECTORY/ACL=(ID= PERSONNEL,
  ACCESS=EXECUTE) [USER]
$ SET DIRECTORY/ACL=(ID= PERSONNEL,
  ACCESS=READ) [USER.STAFF]
$ SET DIR/ACL=(ID= PERSONNEL,
  OPTIONS=DEFAULT, ACCESS=READ)
  [USER.STAFF]
```

(I am assuming that WORLD access is normally denied.) Suppose user JONES is a nonprivileged user in a group different from yours and has the identifier PERSONNEL assigned to him. Then the first command above allows JONES to reference files in directory [USER] by name only. If JONES gives the command:

```
$ DIRECTORY [USER]
```

he will get an error message, but the command:

```
$ DIRECTORY [USER.STAFF]
```

indeed will list the files in this directory. The third command with the OPTIONS=DEFAULT field causes the ACL to be attached to any file created in this directory. To attach this ACL to all files previously existing in this directory, give the command:

```
$ SET FILE/ACL/DEFAULT [USER.STAFF]*.*;*
```

Search Lists

It is often convenient to be able to reference two or more subdirectories simultaneously. We already have seen one way to do this with the notation, for example, [USER...]. Wild cards also may be used, as in [USER.REPORTS.*], which references directories that are immediate descendants of [USER.REPORTS].

A more general mechanism is provided by search lists. A search list is simply a logical name with more than one equivalence string. For example, the commands:

```
$ DEFINE LIST [USER.REPORTS], [USER.PROGS.DOC]
$ DIRECTORY LIST:.TXT
```

will display the files of type ".TXT" in the two named directories. When a search string is used in a context where wildcards are allowed, each equivalence string is used in succession. If wildcards are not allowed, then the first "match" is used. For example:

```
$ CREATE LIST:JUNE_SALES.RPT
```

will create a new file in the directory [USER.REPORTS].

On the other hand, if the command:

```
$ EDIT LIST:JUNE_SALES.RPT
```

is given, the file edited will be:

[USER.REPORTS]JUNE_SALES.RPT

if such a file exits; otherwise, it will be:

[USER.PROGS.DOC]JUNE_SALES.RPT

(whether or not such a file exists).

A search list also may be the argument to the SET DEFAULT command. In this case, however, each

. . . you may want to move files from one directory to another.

equivalence string must contain a device field. For example, the commands:

```
$ DEFINE LIST DISK$USER:[USER.REPORTS],
  DISK$USER:[USER.PROGS.DOC]
$ SET DEFAULT LIST
$ PRINT *.RPT
```

will print the files of type ".RPT" in the two directories. Note that if LIST is used as the argument to the command procedure in Figure 1, the prompt is set to "LIST>" rather than the directory determined by one of the equivalence strings.

Moving Files

Finally, you may want to move files from one directory to another. The easiest way to do this, assuming that both directories are on the same disk, is to use the RENAME command. For example:

```
$ RENAME JUNE_SALES.RPT
  [USER.REPORTS.SALES]
```

will move the file JUNE_SALES.RPT from the current default directory to [USER.REPORTS.SALES]. Note that if the file to be moved is not in the current default directory, you must specify a directory in each of the two arguments to the RENAME command.

Dr. William W. Hastings is an associate professor in the Department of Mathematics at Fordham University, Bronx, New York.

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ONLINE

TRAVEL BY COMPUTER

By Sylvia Helm

Plug in and save.

Would you like to make your own air travel arrangements — the best flight for your schedule at the best price — saving hours of time and hundreds of dollars in fares? Would you like to multiply that by the number of business trips made in your company each year? How much would you save? Consider this: air fares can vary as much as 400 percent in the same travel market.

The potential savings are available to you if you plug into the electronic editions of the Official Airline Guide (OAG). Long the bible of flight information, OAG hardcopies the size of the Manhattan phone book used to grace corporate offices and travel agencies, thumbed through by bleary-eyed clerks searching the fine print for the right flight. Unfortunately, the OAG was not necessarily accurate due to the age of the book — although it was updated monthly — and the constant changes in the airline industry. Today, your computer can offer more up-to-date information than a travel agent.

The OAG, which leases its flight information to airlines which, in turn, provide it to travel agents via SABRE, Apollo, or PARS, offers you the same information, direct and undiluted. You can browse through travel information on The Source, CompuServe or other information utilities and can create your own in-house travel database. DEC, for example, has developed a database of hotels and motels near DEC facilities, organized by state.

An online travel service can include hotel listings, airline flight information, car rentals, restaurants, sporting events and related information such as weather. In general, you can dial these services via a local phone number on the carriers Telenet, Tymnet, or Uninet in the U.S. and Datapac in Canada.

The services we will look at are Delphi, The Source and CompuServe. These so-called "information utilities" usually have a membership fee and hourly online charges, broken down per minute of use. Once you join, you receive a password and account number that verify your access to the service.

The OAG
Official Airline Guides Inc. (OAG)
OAG Electronic Edition
Oak Brook, IL 60521
(800) 323-3537

The same service used by your travel agent — whether SABRE, Apollo or PARS — is available on your own computer.

The OAG, which is leased to airlines and by them to travel agents through the above

three reservation systems, has been online since May, 1983. The electronic division is on Telenet, Tymnet, Uninet and Dunsnet, and through services like CompuServe and The Source.

Your use is billed directly for easy inquiry, an average of $3.15 according to company officials. Fifteen other systems carry OAG information, including The Source and CompuServe (see below). About 100,000 travelers use it. Because the OAG issues the updates itself, the information is more current than some travel agencies can offer.

Fares are shown in ascending order, from least to most expensive, and updated every 24 hours. Schedules are listed in chronological order based on departure time (see Figure 1). Reservations and seat availability are to be added.

CompuServe
5000 Arlington Centre Blvd.
P.O. Box 20212
Columbus, OH 43220
(800) 848-8199

CompuServe has Trans World Airlines' PARS reservations systems in an online offering called Travelshopper. Direct access to TWA's reservation system has been available since February 1985. It has over 5,000 users according to TWA. You can book *any* airline and determine the lowest fare and most convenient arrival and departure time as well as make a reservation. Tickets then are issued by a travel agency, mailed to you or picked up at the ticket counter.

The service has information on domestic and international flights from every published airline schedule in the world (more than 100,000 city pairs) and over three million fares with basic booking rules for each fare.

BROWSING IS FREE and available to anyone on CompuServe, but to make a flight reservation you must be enrolled in Travelshopper. Enrollment also gives subscribers membership in TWA's Frequent Flight Bonus program, and bonuses for TWA flights. The format is menu

FIGURE 1.

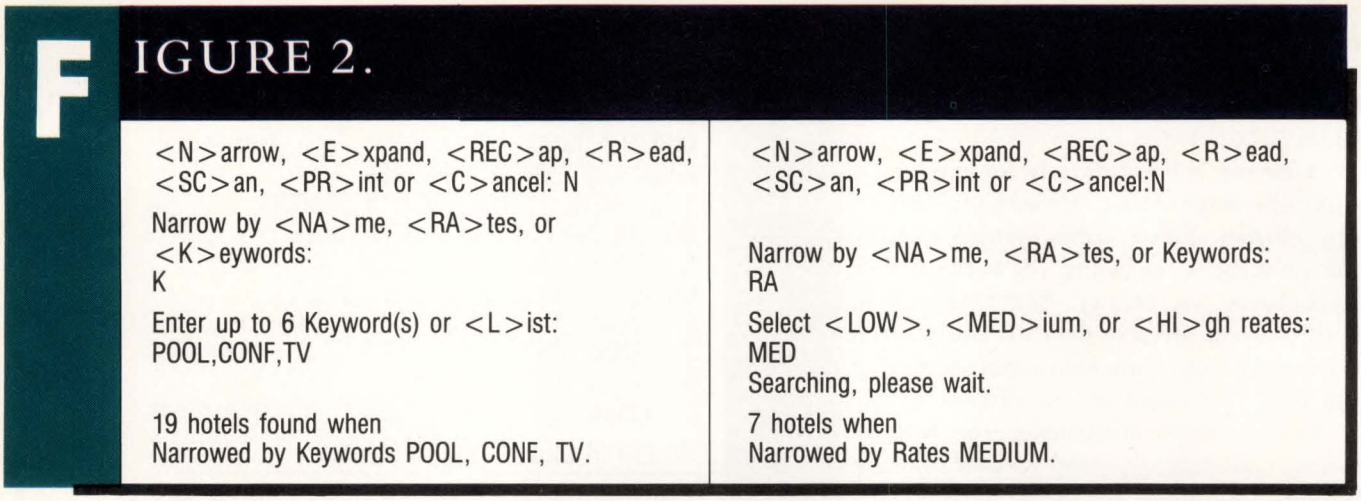
```
DIRECT FLIGHTS                                  THU-01 SEP
FROM LOS ANGELES, CA, USA
# TO—NEW YORK, NY,USA/LA GUARDIA
NO EARLIER DIRECT FLIGHT SERVICE
1   700A  BUR  417P  LGA  CO  462  *     B  1
CO 462 725-DEN-727
2   725A  ONT  459P  LGA  TW  114  72S   B  1
3   900A  LAX  640P  LGA  UA  162  767   B  1
4   925A  ONT  851P  LGA  AA  140  72S   B  3
5  1330A  LAX  900P  LGA  RC  304  72S   L  1
NO LATER DIRECT FLIGHT SERVICE
```

```
FARES IN US DOLLARS                             THU-01 SEP
SELECTED FOR BUR-CO 462 LGA
#ONE-WAY RND-TRIP ARLN/CLASS FARECODE
NO LOWER FARES IN CATEGORY
1*              398.00    CO/M    ME77
2*              419.00    CO/B    BE70
3      239.00   478.00    CO/M    M
4*              499.00    CO/M    ME70
5*     399.00   798.00    CO/Q    Q
6      423.00   846.00    CO/Y    Y
7      508.00  1016.00    CO/F    F
NO HIGHER FARES IN CATEGORY
*ENTER L# TO VIEW LIMITATIONS
ENTER L#,X#,S,RS              (# = LINE NUMBER)
L1 ENTER
```

```
LAX-NYC CO CLASS M                              THU-01 SEP
398.00 US DOLLARS                               ROUND-TRIP
LIMITATIONS FOR FARE CODE ME77
MINIMUM STAY REQUIRED IS 7 DAYS
MAXIMUM STAY ALLOWED IS 14 DAYS
 PURCHASE TICKET FOR TRAVEL NO LATER THAN
7 DAYS BEFORE DEPARTURE
*END OF LIMITATIONS DISPLAY*
ENTER F TO RETURN TO FARE DISPLAY
ENTER S TO RETURN TO SCHEDULE DISPLAY
F ENTER
```

CompuServe OAG Electronic Edition. *Direct flights from Los Angeles to La Guardia, New York.*

FIGURE 2.



The Source's Travel Service/A-Z Hotel Guide. *Asking for hotels in Miami, Florida, yielded 41 names, which are limited here through the <N>arrow option. We have then chosen to narrow by <K>eywords: pool, conf(conference facilities),TV. That yields 19 hotels. The second screen shows a further winnowing, this time by <RA>tes. Asking for MED(ium) rates trims the list of hotels to seven names.*

driven and uses prompts with simple commands.

The system also carries the OAG electronic edition which is updated weekly for schedules; fares are updated daily. You can request the Airline Guide from CompuServe's Executive Information Service Main Menu, or skip the time-consuming menus and simply type "Go OAG" at the prompt.

Restrictions are explained at your request (see Figure 1) such as "You must stay at least 7 and no more than 14 days, and purchase your ticket at least a week prior to departure." The service is available 24 hours a day.

According to CompuServe officials, hotel and car reservations will be next, and shows, theatre, recreational activities and weather will be added soon.

Costs: Subscription to CompuServe is $39.95. Prime time charges, (8 a.m. to 6 p.m. weekdays, are $12.50 per hour, $6 per hour for non-prime time. Travelshopper incurs an additional $20 per hour prime and $15 per hour non-prime time surcharge — that's 33 cents and 25 cents per minute. Using the OAG via CompuServe adds $32 and $20 per hour prime and non-prime time respectively.

The Source
Source Telecomputing Corporation
1616 Anderson Road
McLean, VA 22102
(800) 336-3366

The Source's travel services include air schedules and fares, a hotel and restaurant guide, agency services and a travel bulletin board.

The Source is a gateway to OAG, switching you into the OAG's database. The OAG has more than a million flight schedules and 650 national and international flights. Fare information is available for direct and connecting flights for North America, including Canada, Mexico and the Caribbean.

The commands are similar to the ones on Compuserve.

The Source's A-Z Travel Service and Mobil Hotel Guide have a comprehensive listing of thousands of hotels in the U.S. as well as the name and address of international hotels, accommodations, special facilities such as restaurants, conference and convention centers, sports and leisure services, how to contact them (telex or toll-free telephone number), and rates. Hotel information is updated monthly. Hotel, car rental and airline reservations can be made through The Source by First World Travel of San Diego, California.

You can find a hotel by name or chain, city, room rate or services. A typical search would start with the name of the city and state. You then can narrow the search by specifying facilities. The list of 41 hotels in Miami, Florida, will be narrowed to 19 if you ask for a selection with a pool, conference facil-

FIGURE 3.

FARES IN US DOLLARS
SELECTED FOR BOS-MIA

#	One-Way	RND-TRIP	ARLN/CLASS	FARECODE
1*	119.00	238.00	NI/Y	YL
2*	129.00	258.00	PI/Q	Q
3	139.00	278.00	QH/K	K
4	172.00	344.00	QH/Y	Y28
5	290.00	580.00	PI/Y	Y
6	314.00	628.00	QH/Y	Y
7	321.00	642.00	DL/Y	Y
8	321.00	642.00	EA/Y	Y

DIRECT FLIGHTS
FROM-BOSTON,MA,USA
TO-MIAMI,FL,USA
NO EARLIER DIRECT FLIGHT SERVICE

1	700A	BOS	1152A	MIAEA	7	L10	B
2	715A	BOS	1125A	MIAQH	161	73S	B
3	910A	BOS	1225P	MIAEA	41	757	B
4	918A	BOS	1225P	MIADL	131	72S	B
5	1030A	BOS	255P	MIANI	202	D98	
6	1155A	BOS	459P	MIAPI	77	72S	L

Delphi's OAG Electronic Edition. *As you can see, your trip from Boston to Miami could cost anywhere from $238 (No. 1 on the list) to $642 round trip. If fare is your only consideration, the choice is clear. But what if the time is of the essence? Leaving at 7:15 gets you there a half hour ahead of the flight that leaves at 7:00 a.m.—and still saves you money.*

ities and television. Specifying medium rates will narrow that group to seven hotels (See Figure 2).

Tutorials on The Source are free of online charges. Four 20-minute lessons on how to use The Source include a guided tour of Travel. Each lesson provides hands-on practice with shortcuts for locating information.

The Source, prime time weekdays, 7 a.m. to 6 p.m., costs 36 cents, 43 cents and 46 cents per minute for 300, 1200 and 2400 baud respectively. OAG is 75, 85, and 90 cents per minute prime time for the same speeds. Off-peak charges are approximately 20 cents less in each case. Rates from Alaska and Hawaii are slightly higher. Canadian rates are the same during prime, and slightly higher non-prime time.

Membership in The Source is $49.95. Basic hourly fees are $20.75 weekdays and $7.75 all other times, with a $10 monthly minimum.

Delphi
OAG Electronic Edition
General Videotex Corporation
3 Blackstone St.
Cambridge, MA 02139
(617) 491-3393

Delphi is one of the services that offers OAG direct and undiluted. It has the schedules of over 650 airlines worldwide: 1.5 million direct and connecting schedules, and 290,000 North American fares. Fares are updated daily, and schedules weekly.

You also can use Delphi to check price and availability of rental cars in the U.S. and worldwide hotel room prices and availability. You can make reservations for cars, planes and hotel rooms.

On Delphi's OAG, fares are listed in ascending order from least to most expensive. Schedule information includes departure and arrival times, airline and flight number, aircraft type, meal service and number of stops (see Figure 3). You can select flight by schedule or by fare; i.e., you can select the least expensive fare and then view all the flights available at that fare and determine your schedule accordingly, or you can select by schedule first and then determine the best fare at the time you want. Limitations and restrictions are explained; i.e., advance purchase requirements, etc.

Delphi costs $49.95 to sign up. After that, you pay on a per-use basis, figured at $13 to $17 per hour from 8 a.m. to 6 p.m. (includes Telenet charge). Evenings and weekends are from $6 to $17 per hour, depending on the service.

I'M DEC, FLY ME! DEC has developed its own in-house travel service, accessible from any terminal in the company.

Employees traveling to the corporate headquarters in Maynard, Massachusetts, or any other facility, can check the information they need to make appropriate reservations.

Instead of calling colleagues in the destination office for a recommendation (usually someone local who rarely if ever has a reason to use a local hotel, and who has to go to the phone book to look up phone numbers), the traveler can access the relevant information directly.

The databases are put up with regional help from DEC employees, and are listed under "Hotel Guide" on the DEC system's menu.

Any DEC employee with the proper passwords can use the videotex system. From Australia ("Aussi-tex" is the name of the videotex in Australia) to Hartford, anyone with access to a local DEC system can dial up and hop in on the international network — just select "videotex" on the local system, then specify travel, and that request goes across the DEC network.

DEC's network connects 49 countries and 5000 computers.

Mail can be sent to anyone on the network, and any videotex database on the network can be accessed. Computers are linked through Ethernet, a microwave, satellite dish and/or telephone lines.

Through the system, you can look at a videotex page from Scotland, Ireland, Geneva or Australia — all places where DEC has videotex databases. You can log on and see what they're serving for lunch in Scotland, or you can get marketing information.

The convenience and cost savings of planning your own flights, whether personal or business, obviously makes a look at one of these services worth your while. How much, depends on how often you (or your company) travel, and which service you join, since costs do vary. Additionally, if you use a service like CompuServe, Delphi or The Source for purposes other than travel, the travel features are icing on the cake.

Sylvia Helm is a free-lance writer based in New York City.

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SOFTWARE

LOOK

Integrated Presentation Graphics Software for the Rainbow.

By Victor J. Chorney

The *LOOK* manual has the following statement on the cover: *Integrated Presentation Graphics, Graphics Communication and Terminal Emulation for the Rainbow 100 Using CP/M-86/80.* That's quite a mouthful and a rather boastful claim to boot. In fact, however, *LOOK* is a superior, menu-driven package for generating graphics displays, including x,y plots, bar graphs, and pie charts. In addition, *LOOK* provides graphics file transfer from a host, and also VT100 terminal emulation.

Documentation

The manual is quite complete (though not typeset — a minor distraction) even to the point of including references to the Rainbow SETUP documentation and LA50/100 switch settings.

Two formats are used in describing the actual operation of the software. One is a script-like presentation, telling you both what to type on the left-hand side of the page, and the system's response or "translation" of the entry implications on the right-hand side. The other presentation is a conversational dialogue with abundant use of examples and (screen) illustrations. In each case I found the explanation to be both understandable and useful. Although there is no keyword index, the table of contents is detailed enough for locating the desired reference.

Operation

By following the instructions, I was able to create various graphics displays in short order. The only time I got into trouble was when I tried to type ahead before stopping to read the screen. As a result, I lost time waiting for the system to return to the point where I could do what was intended. And, that raises another issue: This is not a fast system. I was expecting significantly greater speed, but, on reflection, realized that *LOOK*'s capabilities were so great that something had to be sacrificed. If there is a negative to the package, it's the performance speed.

If your system contains the graphics and color options, *LOOK* allows you to take full advantage of them for preview: You are given full control over color and shading, different angles of cross-hatching, "tick mark" intervals, etc.

Since *LOOK* has the ability to save and retrieve plots, it is quite practical to prepare and store a presentation on one system and transfer it to another for viewing by a different audience.

An important point: This is a true menu-driven system. Progress in developing a chart is made by moving from one menu to another. Available options are clearly stated and, when viewed in context (and with occasional help

If you need a package capable of taking data generated by a variety of sources and presenting it in various graphics formats, *LOOK* will do the job.

from the manual), should cause no difficulty in understanding what the next step should be.

Communications

Included is a simple communications package that enables use of the more powerful *LOOK* capabilities for on-line VT-100 emulation and, if more complex plotting is to be done, Tektronix Vector graphics also is supported. File transfer, both to and from the host, easily can be initiated, with captured files being available for future examination and plotting by *LOOK* when desired.

Since I rarely use CP/M, reviewing a package like this becomes more of a mental than practical exercise, but there is a public domain program called AME-86 that allows the execution of CP/M-86 programs under MS-DOS. Using RDCPM, I loaded the *LOOK* programs onto my MS-DOS system and tried it. Of course there was no way to preview the output on the screen, but what came from my LA50 was just fine. As far as *LOOK* was concerned, I still might as well have been operating under CP/M. So now I've added a powerful graphics presentation package to my MS-DOS library as well.

Recommendation

If you need a package capable of taking data generated by a variety of sources and presenting it in various graphics formats, *LOOK* will do the job. The fact that you can generate such output without the necessity of investing in a graphics board makes *LOOK* all the more attractive. Finally, your existing data-generating software, whether CP/M or (as indicted earlier) MS-DOS, may be used to build the graphics in the environment of your choice.

LOOK
Fauske & Associates, Inc.
Software Products Division
16W070 West 83rd Street
Burr Ridge, IL 65021
(312) 323-8750

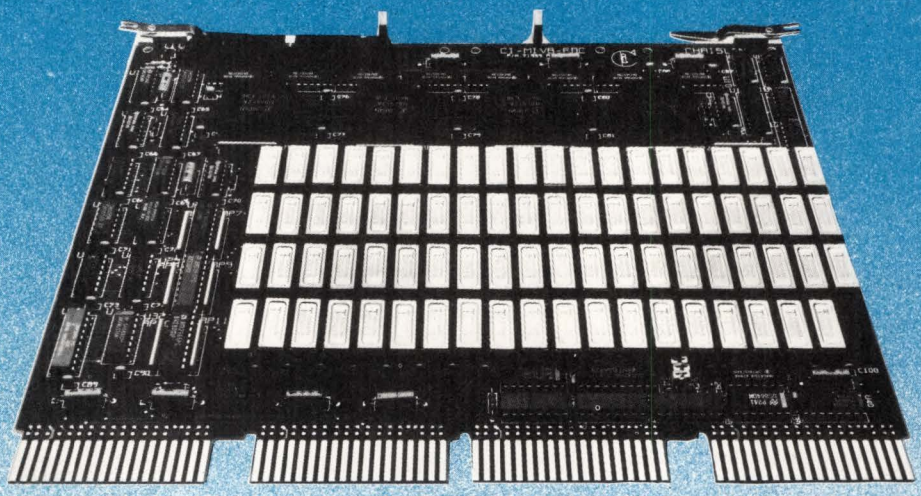
Equipment: Rainbow with 256K memory CP/M-86/80 LA50, LA100, or compatible printer

Optional: GSX software and DEC graphics board GSX supported plotter modem (for host communication)

Price: $200.00

Victor J. Chorney is an independent consultant based in Overbrook Hills, Pennsylvania.

MICROVAX II MEMORY
with
VAX PERFORMANCE



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SOFTWARE

THE ALISA CONNECTION

By Dave Mallery

A Lazy Man's Delight?

Alisa Connection is a gateway program that connects the VAX/VMS MAIL facility with Western Union's *Easylink* service. With *Alisa*, you can send Telex (domestic and international), Mailgrams, express documents and telegrams to multiple addresses, without ever leaving your terminal.

The package consists of two jobs that run on the VAX. One is the recipient of VAX/VMS MAIL addressed to "*Easylink*"; the other manages a dial-out phone line. The system will call your local *Easylink* number(s) at stated intervals, with outbound traffic. It also will check for inbound material on every connection, as well as dial for it at other stated intervals. You can adjust these (and many other) parameters according to the needs of your site.

Installation is relatively simple, as long as you have a proper dial-out modem on a line (Hayes or DEC protocol) and previously have tested the modem and circuit as follows:

```
set host/dte txan:
atdt. . . etc. . .
```

The above sequence will verify that the modem is properly installed and the cables have the correct persuasion.

You can have multiple phone lines with mixed protocols, as well as multiple phone numbers, for access to *Easylink*. The folks at *Alisa* were most helpful with installation questions and stuck with us through several problems. One unexpected difficulty, after sorting out the cable, was that our rather old *Easylink* number had been disconnected! Hmmm.

Once installed, you can restrict the sending of MAIL to a select group of users. Unauthorized users will recieve a polite MAIL message to that effect, and the intercept operator (manager?) will be notified of the attempt.

The intercept operator is a designated user receiving all incoming MAIL not clearly identified for distribution. In addition, any notification of hardware and transmission errors generated by the system are sent to this individual. Then, the operator simply uses MAIL to forward the traffic to the proper user at the installation.

The simplest example of *Alisa* at work with a domestic telex message is shown in Figure 1. (See Figures 2-3 for additional addressing options.) You will receive a MAIL message back from *Alisa* within a few minutes, either confirming the acceptance of your message by *Easylink*, or giving the reason for its rejection.

Messages can be prepared for transmission in other ways, like using the editor of choice in conjunction with the MAIL utility:

```
mail> send/edit. . .
```

Or, you can prepare a message with your

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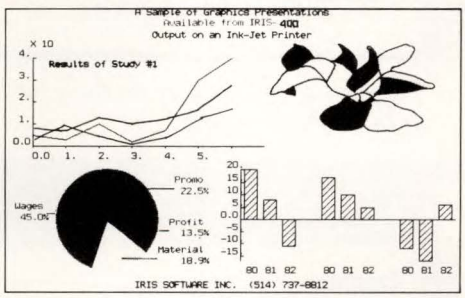

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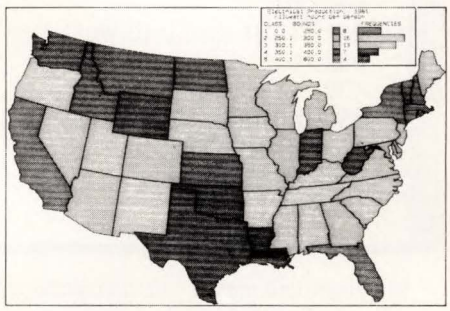

MORE TO FOLLOW...

DAYLANN

1827 Woodward Drive, Ottowa, Ontario K2COP4 (613) 727-1120 (514) 737-8812 Telex: 961000

ENTER 157 ON READER CARD

FIGURE 1.

```
$ MAIL
MAIL>SEND
To:  EASYLINK
Subj:  Sample Telex
Enter your message below. Press CTRL/Z when complete, or CTRL/C to quit
EasyLink
123456+                    Address
Message
TO:       JOHN KEEFER — UK SLS MGR
FROM:     CARLA BURKE — MFG PLANNER
RE:       FENWICK ORDER

PLEASE ADVISE ON STATUS OF FENWICK ORDER 9876-543
FOR 1000 SETS TYPE 4 MAG WHEEL.

MAIL>EXIT
$
```

The simplest kind of address is a Telex number followed by a plus sign.

FIGURE 2.

Example

```
EasyLink
/PMS JOHN DOE                  Delivery address
123 MAIN STREET
RYE NY 10000+                  Plus here. No commas
Message
TELEPHONE: (914) 555-1212              Required in body
```

Telegrams are delivered by telephone, with a written copy sent by mail at the receiver's request.

FIGURE 3.

Example

```
EasyLink
9105431234 (SWCO GNVA)         Primary Addr
/ALT                           Alternate Addr
/ZIP
SMALL WATCH COMPANY
1234 MAIN STREET
GENEVA NY 100000+              Plus goes here
Message
```

Easylink *will make eight attempts to reach your original address. If the number is unreachable,* Easylink *will deliver to the "Alternate Address," which includes domestic Telex numbers, including* Easylink *Telex numbers, worldwide Telex numbers, and* Easylink *numbers.*

favorite word processor, move it to an ASCII text file and enter:

```
$mail outfile.doc easylink
```

Some word processors (MASS-11 version 6A or later, for example) have built-in options for sending MAIL from its menus. In addition, if your addressee is another MASS-11 user on your VAX, DECnet or *Easylink*, you can send fully editable documents.

The documentation for *Alisa* is quite good. In addition to the manual, there is a complete help file facility that you can (should) install. It makes everything you ever wanted to know about Easylink available via:

```
$help easylink
```

The *Alisa Connection* is a lazy man's (me) delight. I used to have to get up and muck about with the laser printer, find envelopes and send my mail. Now, I just zap them out as Mailgrams (people always open Mailgrams)!

We had been *Easylink* subscribers before, but never really used it because of the cryptic connect sequences and the difficulty of locating a dial-out terminal when we wanted one. In addition, we never got to edit the messages fully before sending them.

The *Alisa Connection* neatly fixes all those problems.

ALISA CONNECTION V4.0
Alisa Systems, Inc.
234 E. Colorado Blvd.
Pasadena, CA 91101
(818) 792-9474
Environment: VAX/VMS V4.0 and later
Price: $1,850

Editor's note: As we go to press, we have learned that the Alisa Connection *will be available for ITT Data Bridge, the front end of ITT's worldwide Telex network.*

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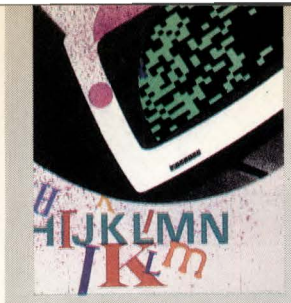

HARDWARE

RAINBOW GATEWAY

By Victor J. Chorney

RB LINK jr gives the Rainbow a new lease on life.

I have to give up my hard disk! Not the internal 10 meg; the external 20 meg that sits in a little box off to the side with a double-sided, double density, floppy drive (which lets me read and write the OTHER guy's format).

I've been testing *RB LINK jr* for quite a while now and I really hate to give it up. Having that extra storage has been invaluable in doing evaluations, writing software, doing back-ups, etc., etc., etc.

This is a real live piece of hardware, and even Digital recognizes its value: One was set up as part of the DEC exhibition at DECUS. By now I should have your undivided attention, so let me tell you how I came to become engrossed with this product.

A couple of months ago, the president of Disk Tech One, Dr. Mohammed Shaikh, made a presentation to the Delaware Valley Rainbow Users Group on *RB LINK jr*. (Yes, there is an *RB LINK sr* and an *RB LINK*; more about them later.) Since *RB LINK jr* was going into production first, I asked Dr. Shaikh for an evaluation unit. And here's what I got:

1. A circuit board
2. A foot-long heavy-duty flat cable with two DB-25 connectors
3. A diskette
4. A power cord
5. A box measuring 14 inches wide by 11½ inches deep by 5½ inches high
6. A set of scanty instructions (six pages, not completely filled, including one technical diagram)

[NOTE: I later received the latest version of the documentation for *RB LINK jr*. There is a detailed table of contents indicating that the manual covers such items as:

a. A technical description of the hardware and software
b. Installation procedures
c. Troubleshooting
d. Warranty and service policies

As far as the installation instructions go, about the only thing missing is pictures (and I'm going to suggest that to them).]

Let me affirm that I am NOT a hardware guru. I was (and still am) more than a little nervous about taking my Rainbow apart, shoving a new (especially non-Digital) circuit board into it, plugging it in, and then turning it on, praying all the while. However, since I ultimately was successful, my apprehension really was not very well founded.

THE *RB LINK* FAMILY hardware provides a gateway to the Rainbow's closed architecture. By inserting a circuit card in the J4/J5 position of the system board, the gateway is established. (Again, the J4/J5 position is the same connector into which the hard disk controller is inserted.) The connector cable attaches to the circuit board at one end and to *LINK* at the other. *LINK*'s 8088 microprocessor controls bus activity through the individual device controllers.

Of course, software drivers are required to let MS-DOS "know" about *LINK*. These are included on the distribution diskette and must be copied onto the boot disk. Then they are identified to the system by including their assignment in the system configuration file.

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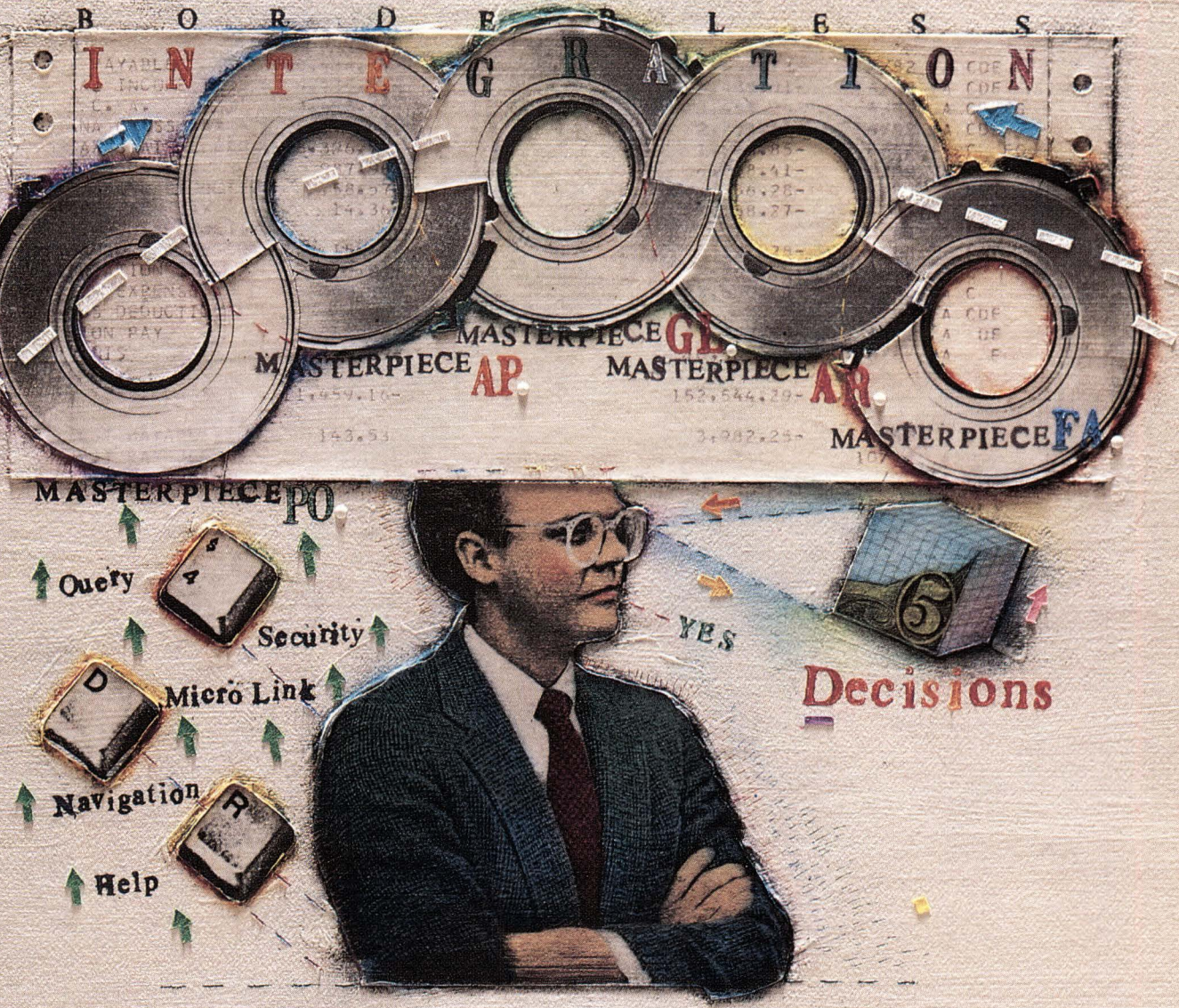

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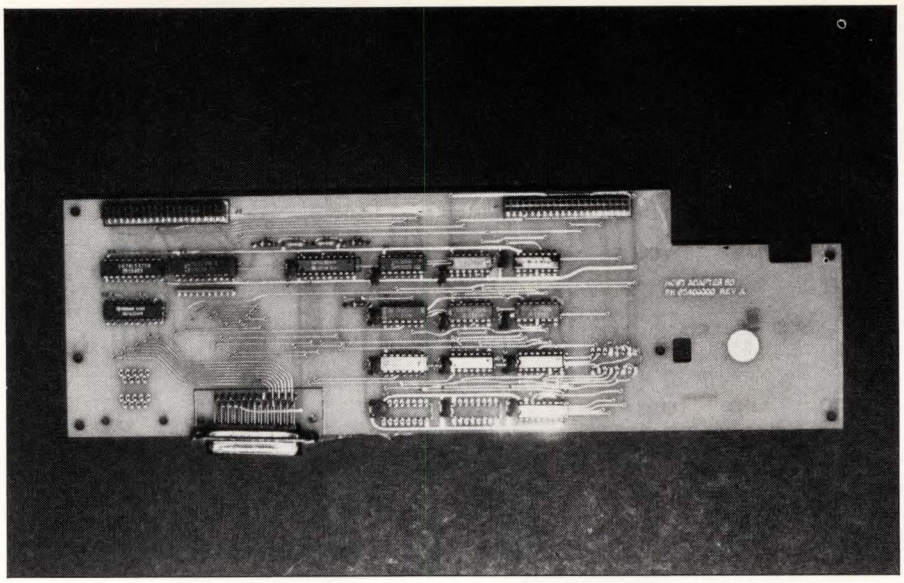
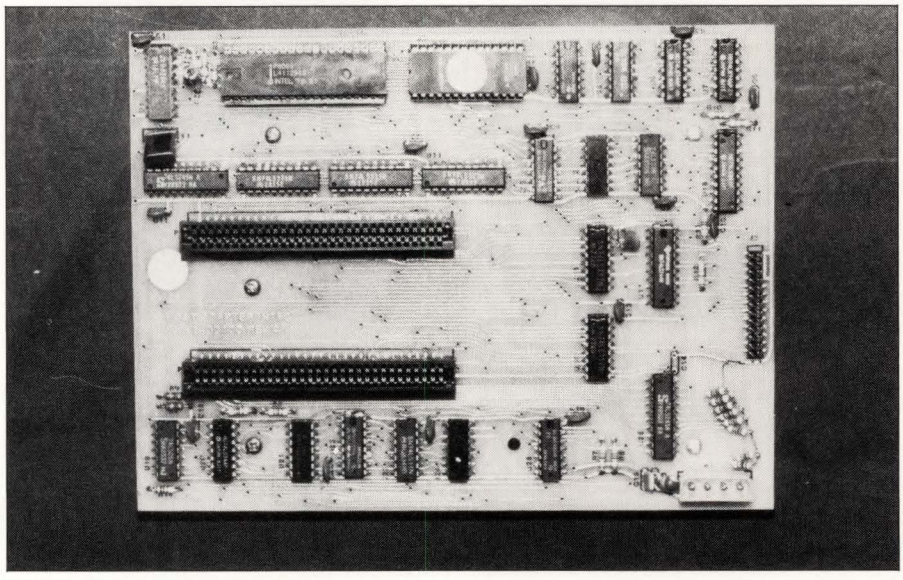


RB Link jr *host adapter board.*



RB Link jr *host adapter interface ("mother") board.*

Since the software must be loaded into the first 64K of RAM on the 100A or the first 128K of RAM on the 100B, for this particular *RB LINK jr*, I included the following statements at the beginning of CONFIG.SYS:

DEVICE = RBR.SYS (this is for *LINK* itself)
DEVICE = RBR1.SYS (this is for the hard disk)

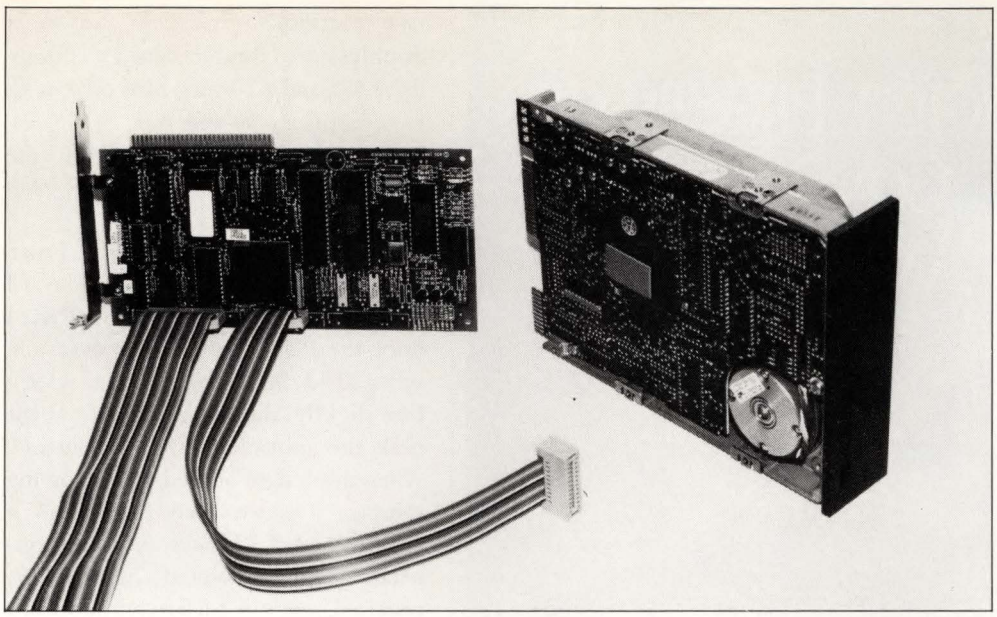
THE INSTALLATION PROCESS will be familiar to anyone who has installed the hard-disk option, but since two boards will be placed where only one was before, a little conservatism is advisable.

First, I discharged any static electricity before touching anything — including the keyboard. So, in this case, I was doubly sure that I was grounded. I cleared a work area large enough to hold the system board, plus the additional circuit board (and the hard disk controller board).

Next, I removed my boot floppy, closed the drive doors, disconnected the power cord and removed the chassis cover.

Then, after disconnecting the floppy drive cable, the power supply cable and the hard disk connector, I released the screws at the back of the chassis and slid out the system board, carrying it over to my work area.

Since I have an internal hard drive, you may deduce that the controller board (when present) plugs into (on top of) the *RB LINK* board. Therefore, the hard disk controller board had to be re-



Hard disk drive with controller and cables.

moved before proceeding. I lifted the board and worked with each stand-off (those little posts) until they released and the board came free.

Next came something different. As I faced the rear of the system board, I saw that there is a 4½-inch wide panel starting ½ inch in from the right side, and when sufficient pressure was applied, that panel slid/snapped upward and off, leaving two holes in the metal frame, obviously for connectors.

At this point, I was ready to insert the *LINK* circuit board into the J4/J5 position. I gently set the board in place and then walked around the work area, checking the alignment of pins and stand-offs at eye-level. Once I was sure that the alignment was correct, I pressed down firmly on the board atop the connector. Since there are some rather sharp little points of solder there, I doubled over a small piece of paper to act as a cushion before pushing down.

Then I had to replace the hard disk controller board. The alignment here is also tricky, so, just as before, I positioned the board — sliding the connector through the larger of the holes uncovered (described above) — and checked pin alignment at eye-level. This board is on top of the *LINK* board and more care is required when pressing down because there is a lack of support for the *LINK* board at the left side (viewed from the rear).

I picked up the system board and slid it into the guides of the chassis. Then things got a little tight. With the extra height from the *LINK* board, the hard disk controller board required a little gentle downward persuasion to slip under the frame. Finally, the board was back in place and I reinserted all the connectors (the hard disk connector was a tight fit because it was so close to the frame) and tightened the screws.

The final step in the hardware installation process was to insert one end of the flat cable into the new connector at the rear of the Rainbow, and the other end into the connector at the rear of the *RB LINK jr.*

Only one step remained — to modify the CONFIG.SYS file on my boot diskette and copy the drivers from the distribution diskette. I inserted the boot disk, turned on the power and went about the modification and copy tasks. Then I turned the system off.

Then came the acid test: I turned on the *RB LINK jr*, waited until the hard drive "chirped" that it was ready, turned on the Rainbow and booted the system. After the MS-DOS messages, a copyright message from Disk Tech One appeared, and then:

RB LINK jr FLOPPY INSTALLED AS DRIVE G
RB LINK jr HARD DISK INSTALLED AS DRIVE H

and then the rest of my start-up procedure.

The only thing left to do was to partition and format the hard drive. First, I invoked the PLINK program which I had copied from the distribution disk, and requested two partitions of 10 megs each. Then I ran FLINK on each partition to format them. Then I rebooted and found that the notice had changed to:

RB LINK jr FLOPPY INSTALLED AS DRIVE G
RB LINK jr HARD DISK INSTALLED AS DRIVES H AND I

Now my system consists of two single-sided, quad-density floppy drives (A and B), one 10-meg hard drive with

two partitions (drives E and F), a double-side, double-density floppy drive (G), and a 20-meg hard drive with two partitions (H and I).

I am happy to say that, despite the workout I've been giving it, *LINK jr* has been working like a champ.

If I'm going to need *LINK*, I turn it on first, then the Rainbow. Once I hear the double "beep" from *LINK*, I boot the Rainbow. On one occasion, when I had shifted the Rainbow system box slightly, due to the tight fit at the desk, the connector cable came out and, when the system booted, the following message was displayed: "*RB LINK jr* NOT READY." I looked at all the connectors and discovered the problem, restarted, and was back in business. The same message appears if I decide not to use *LINK* and don't turn its power on.

LINK's drives are treated like any other direct access device and, if there is any difference in speed, it is unnoticeable. Other than the fan, which is somewhat noisy, the system operates very quietly, especially the floppy drive, which is mute compared to the Rainbow's.

RB LINK jr comes in a variety of flavors, so you pretty well can build the system that fits your particular requirements.

The base price for *RB LINK jr* is $800. What follows are the add-ons, any one of which may be included in the box. All drives include the appropriate controller.

1. 20-meg hard disk, $600.
2. 40-meg hard disk, $900.
3. 10-meg removable hard disk, $1000.
4. 48-TPI floppy disk drive, $115.

AS I MENTIONED earlier, *RB LINK jr* has two "big brothers": *RB LINK* and *RB LINK sr*. *RB LINK* does everything that *LINK jr* does plus — and it's a BIG plus — provides an IBM-PC motherboard (actually, its an XT) with 256K of RAM, floppy drive, controller, host adaptor, power supply, cables, and connectors. Of the eight expansion slots, one is used for the floppy drive controller card; a second is used for a color graphics card. Independent processing can take place — since they are, in fact, two separate computers — simultaneously on both systems, and control of each system is established by toggling between them, keyboard and monitor being "shared" by each system.

RB LINK sr is basically the same, structurally, as *RB LINK*. Three expansion slots are used for the standard configuration: a color graphics card, a 40-meg hard disk, and a floppy drive. It also comes with 640K of memory.

I am immensely pleased with this product and its support and am looking forward to seeing and working with the rest of the family. Here are some questions that won't be answered in the affirmative by dialing DECdirect (or anyone else, for that matter):

1. Can you provide a 20-meg hard disk upgrade for the Rainbow for $1500?
2. Can you provide an 80-meg system for the Rainbow?
3. Can you provide an additional hard disk drive for the Rainbow?
4. Can you provide a formatting program for anything over a 20-meg hard disk for the Rainbow?

RB LINK jr
Disk Tech One, Inc.
849 Ward Drive
Santa Barbara, CA 93111
(805) 964-3535

ENVIRONMENT: Rainbow, MS-DOS

PRICE: RB LINK jr- varies with configuration; RB LINK sr- $2800; RB LINK-$1450. (includes a color graphics card)

A "yes" answer to all these questions is available from Disk Tech One. In fact, by the time you read this, the formatting program will be on any number of FIDOnet bulletin boards around the country.

What DEC does not provide, Disk Tech One does.

Victor J. Chorney is an independent consultant based in Overbrook Hills, Pennsylvania.

HARDWARE

SUITABLE SOLUTION'S *IDRIVE*

By N. Jay Bassin

Rainbow/IBM diskette compatibility made easy.

You don't need to read this article to know that the Rainbow's RX-50-formatted floppy diskettes, along with any data recorded on them, are incompatible with the IBM-PC standard of dual-sided 360-KB storage. At first, I was pretty smug about telling my PC-using friends (there are one or two) that my Rainbow could pack more data on one side than their PCs could on two. Alas, I soon became frustrated by my inability to provide data or public domain software to IBM users. This was critical in my business applications, where clients wanted data and text "on disk"—and they didn't mean on an RX-50. Incidentally, the Rainbow has no problem reading a single-sided-format IBM-PC floppy; you just can't go the other way.

There are four potential solutions to this compatibility problem:

1. Electronic transfer through the serial communications ports.
2. Commercial disk conversion services.
3. Software programs that enable the Rainbow's floppy disk controller to emulate a "foreign" drive.
4. Plugging in a PC-compatible disk drive.

Electronic transfer with a modem or direct connection certainly will work, but it is suitable only for occasional use. It's slow and tedious, requires compatible communications software for error-checking, and ties up both computers. Commercial disk conversion is terrific for unusual requirements, such as to/from tape, standalone word processors or odd-sized disks, but costs at least $50 per disk. For PC to PC, it's not practical.

A couple of programs do exist that will enable the Rainbow to read, write and format a variety of PC formats. For under $100, they offer nearly complete data interchangeabilty, as long as everything will fit on one side of a PC disk (about 180 KB). They use the RX-50 drives, laying down a 96-TPI track "double-spaced" so that there are only 40 instead of the 80 tracks on the diskette. They are limited only by the 180 KB of space available on a single IBM side. A major drawback, though, is that they are available for the Rainbow only in CP/M-86/80 (although they can read/write/format MS-DOS and PC-DOS) because they must use the Z80 processor, which acts as the disk controller only under CP/M. The only solution that offers affordable, practical, full IBM-PC data compatibility for the Rainbow entails attaching an external 40-track, dual-sided disk drive to the Rainbow, which brings us to the subject of this review.

Suitable Solutions, Inc., a firm that recognizes a market when it sees one, recently introduced *IDRIVE*, a small, neat box with one IBM-PC-compatible floppy drive, power supply, cables, and software for the Rainbow.

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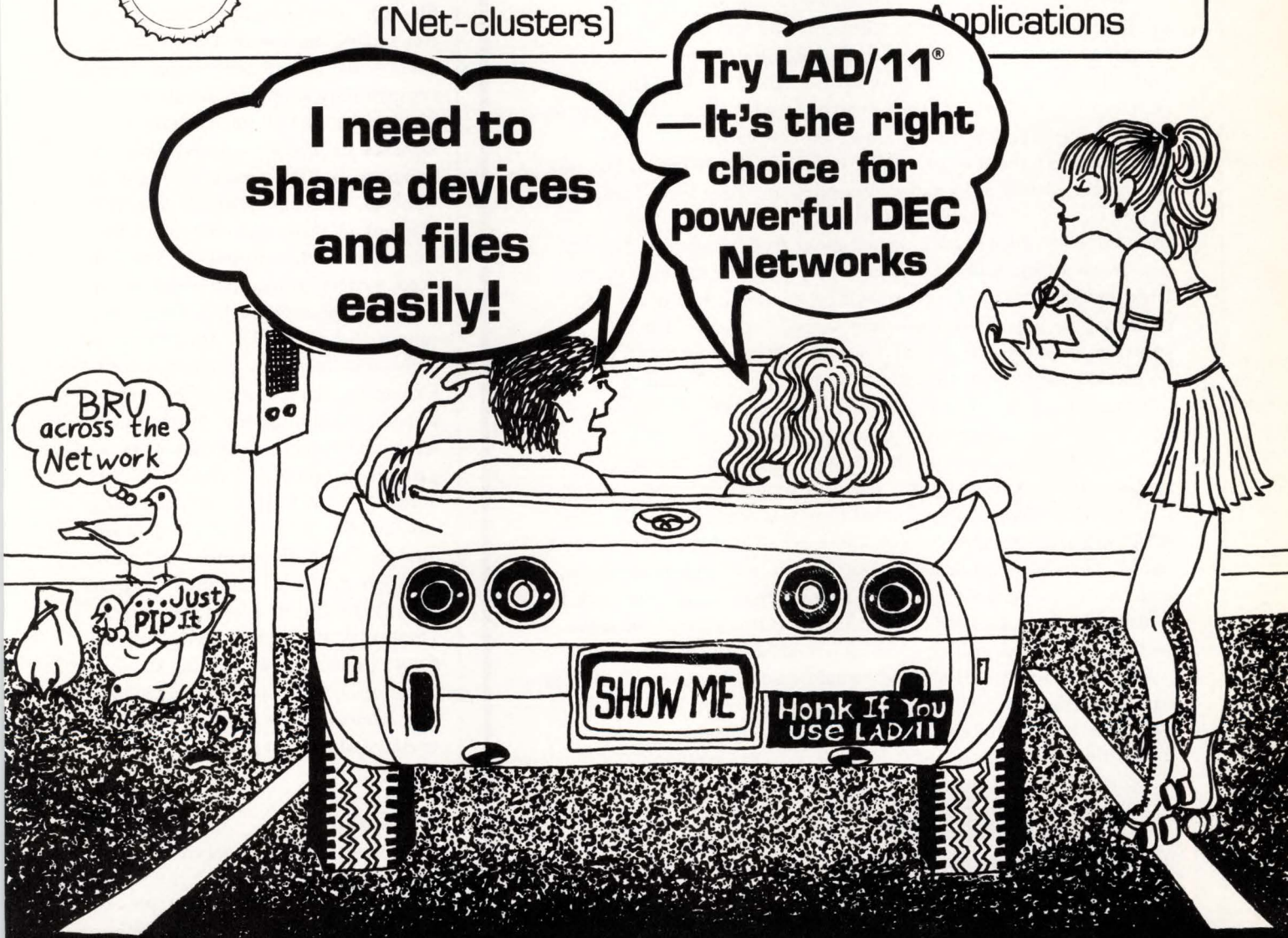

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Why Are The RX-50 (Rainbow) And IBM-PC Disk Different?

While the Rainbow and the IBM-PC can use the same blank diskettes, they are not compatible after they have been formatted. The Rainbow can read (but not write to) a single-sided-format IBM-PC disk, but putting a Rainbow diskette into an IBM-PC only will cause a read/write error. Why?

There are two separate, but related reasons for this. One is hardware related, the other is software. The Rainbow RX-50 drives cram 400 kilobytes of data onto one side of a floppy, while the PC puts 180 kilobytes on each side, for a total of 360 KB. The Rainbow can do this because it uses narrow read/write heads (96 tracks per inch, or TPI), and can lay down 80 concentric data tracks in the same space the IBM uses for 40 with its 48 TPI heads. For this reason, the RX-50 disks and drives often are (incorrectly) referred to as "quad density" while the PC's are called "double density." The software part of the puzzle comes about from the formatting process when a disk is first initialized. Formatting does three things: It defines the data tracks on an otherwise homogeneous area; it divides them into a number of pie-shaped "sectors" that help organize the data; and it creates a mini database called a "File Allocation Table" (FAT) on the outermost track containing information on the directory, format, and location of files. The IBM-PC commonly uses nine sectors (older ones used eight sectors); the Rainbow uses 10 sectors, but its operating system enables it to recognize and read single-sided IBM formats.

When an IBM-PC single-sided floppy is read on the Rainbow, MS-DOS recognizes from the data in the FAT that there are only 40 tracks. The read/write head is positioned to the appropriate track and sector, and actually has quite a bit of "play" since the track is twice as wide as the head. No problems. (Of course, if the disk were double-sided, half the sectors would be inaccessible to the Rainbow, and a "READ ERROR" would result.) If an RX-50 diskette from a Rainbow were put into a PC, the read/write head would pass over two separate tracks simultaneously, producing intense indigestion. As if that weren't enough, PC-DOS wouldn't recognize the 10-sector format used by the Rainbow.

Disk-conversion programs for the Rainbow use CP/M software to direct the RX-50 drive heads in a "foreign" pattern, and bypass the floppy-disk controller in the Rainbow to create the correct number of sectors. Since they are limited by the fact that the RX-50s are only one-sided, they cannot offer true interchange. This will be a real problem only if you have some very large files (over 180 KB).

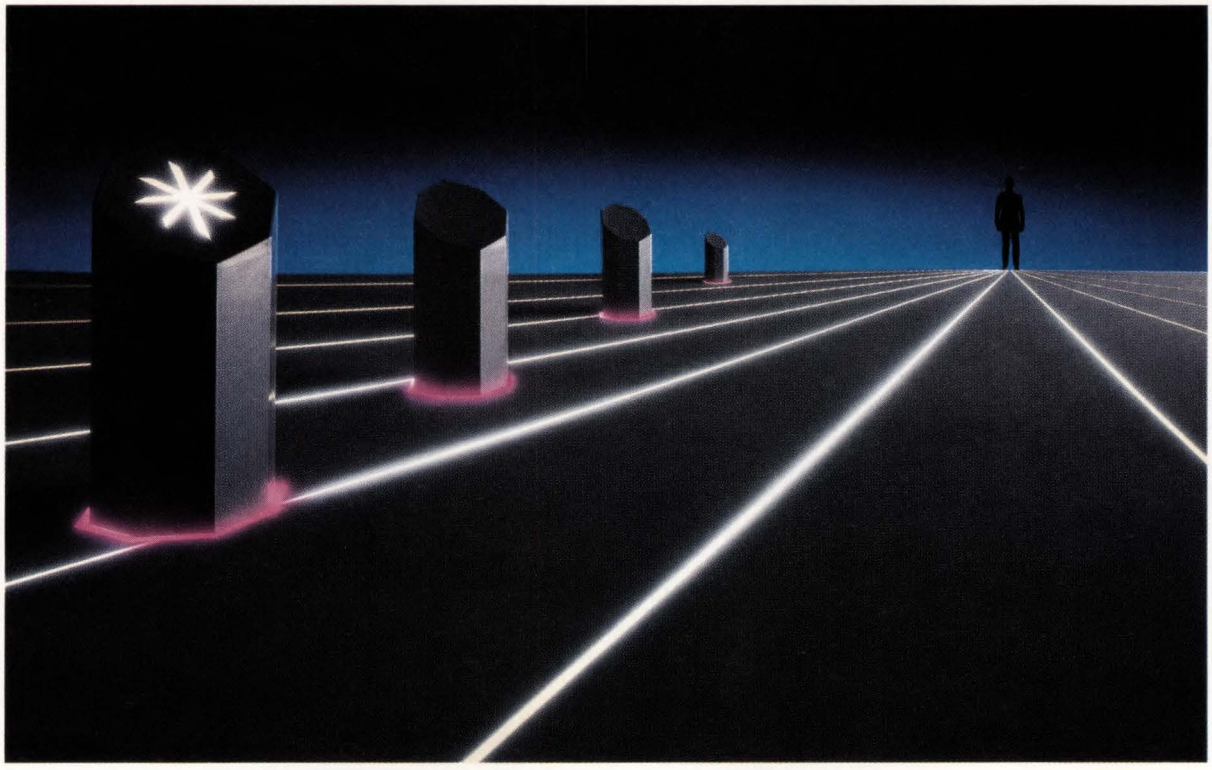
Even if you never need PC data compatibility, it gives you a third floppy (albeit a "foreign" one) for your Rainbow for only $400, compared to the $995 DEC wants for a pair of RX-50s.

While *IDRIVE* permits total floppy disk interchange—generally referred to as data compatibility—it neither offers nor claims true IBM program compatibility. That is, if you put an IBM version of *Lotus 1-2-3* in *IDRIVE*, you could get a directory and even "type" ASCII files (like .BAT files); but if you tried to run an IBM version of *1-2-3* from the *IDRIVE*, the system will "hang." Data compatibility simply means that a data file—say a *dBASE III* database or a *WordStar* document—created with the Rainbow or IBM version of *dBASE* or *WordStar* can be interchanged with a PC or Rainbow using that computer's version of the same programs. You still need system-compatible software to generate or access these files. Only some simple "plain-vanilla" MS-DOS programs that do not use graphics, screen-formatting, escape sequences, or the serial communications ports might work. However, enough do work — particularly public domain MS-DOS utilities — to make experimenting worthwhile. One note of caution, though: Some disk utilities and most copy-protection schemes bypass MS-DOS to directly access disk sectors. These may do strange things on the *IDRIVE*, including scrambling the disk directory. If in doubt, try it on a copy first. Remember, the *IDRIVE* is not really intended to run programs, only to read data.

Installation

The *IDRIVE* is hooked into the Rainbow's motherboard at the socket intended for a second set of RX-50s (drives "C:" and "D:"), and a ribbon cable comes out of the back of the sys-

Communication is a journey, not a destination.



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tem box at the port intended for the extended communications option. If you already have two pairs of RX-50 floppies on your Rainbow, forget *IDRIVE*; there is no conflict with a hard disk, though. Thanks to the clear step-by-step instructions, it took me under 20 minutes to attach two cables, open the access port on the cover, put it all back together and power up. A generous amount of cable allows you to place the *IDRIVE* in a convenient location. Because it contains a separate power supply (and requires its own electric outlet), it places no drain on the Rainbow's own power supply.

To use *IDRIVE*'s formatting or CP/M capabilities, you first must install it under MS-DOS. In order to make the MS-DOS operating system recognize the "I:" drive, you must add "DEVICE = IDRIVE.SYS/N" to MS-DOS's CONFIG.SYS file, and copy the IDRIVE.SYS file (included on the distribution disk with *IDRIVE*) to the root directory of your start-up disk. After rebooting, you will see the "IDRIVE installed as device I:" caption, and you can access the drive with any of the standard operating system commands.

Operation

IDRIVE is amazingly quiet. In fact, if it weren't for the little red light on the unit that comes on when the drive is running, you wouldn't know it's working. Compared to the coffee-grinder decibel level of the RX-50 drives, it's astonishing. Routine operation is user-transparent. If you know how to use the floppy drives on the Rainbow (or any other microcomputer, for that matter), you know everything there is to know about *IDRIVE*. There is only one rule, but it is VERY IMPORTANT: Keep your *IDRIVE* floppies separate and marked differently from your RX-50 diskettes.

If you accidentally put the wrong formatted floppy into the wrong drive and write to it, you may have trouble recovering the rest of the data on it. This especially is true if you write on an RX-50 diskette with the *IDRIVE*.

Under CP/M version 2.0 or higher, the *IDRIVE* behaves as if it were two single-sided drives, "C:" and "D:" This means that anything written on the "D:" side of a diskette can be accessed only through the *IDRIVE*, and will not be readable even on a PC running CP/M-86. CP/M version 1.xx will not recognize the "D:" drive/side.

Software that usually uses one drive for program files and another for data files will have no problem with *IDRIVE* as a target (data) drive. For example, I now use *IDRIVE* as the data drive for *dBASE III*, *WordPerfect*, and *Lotus 1-2-3*. In *WordPerfect*, I now can keep my system files on A:, the spelling checker files on B: and my document files on I:, thereby eliminating a considerable amount of disk swapping.

I had a feeling that the disk access time on the *IDRIVE* might have been slower than with the RX-50s, but a little checking revealed that the slightly slower initial access time (for example, reading a new directory) is more than made up for in a longer file by its faster overall transfer rate.

Formatting

The latest release of *IDRIVE* (version 1.05) includes a program to allow formatting IBM diskettes directly, using the IFORMAT utility supplied on disk. You may choose single- or double-sided, eight- or nine-sector IBM-style formats. The CP/M and MS-DOS FORMAT commands on the Rainbow operating systems will not work on *IDRIVE*. IFORMAT runs under CP/M 2.xx, but of course will generate a PC-DOS format on the target (I:) drive. Once formatted, the PC-DOS disk may be used for CP/M-86 on an IBM.

After installing *IDRIVE* under MS-DOS, reboot with CP/M-86/80 version 2.xx (in CP/M, you will not get the "IDRIVE installed as device I:" notice), put the *IDRIVE* distribution diskette in "I:", your CP/M working diskette in "A:", and copy the formatter in the familiar CP/M fashion:

```
PIP A:=D:IFORMAT.COM[ROV]
```

Note that the IFORMAT utility is supplied on the D: side of the distribution disk. Once you have IFORMAT.COM on your working CP/M disk, simply put any 48-TPI double-sided/double-density blank diskette in I: and type "IFORMAT" at the CP/M system prompt. You may append "/1" and "/8" switches to format single-sided (readable by the RX-50 drives) and eight-sector instead of nine.

All in all, *IDRIVE* offers an affordable, well-designed external disk drive that goes a long way to bridge the gulf that DEC created with its well-intentioned, but incompatible, drives. *IDRIVE* is a good product at a good price that fits a real need. Now, if they only would market a hard disk controller and formatter for the Rainbow . . .

IDRIVE
Suitable Solutions, Inc.
467 Saratoga Avenue, Suite 319
San Jose, CA 95129
(408) 725-8944
List price: $395; includes hardware, cables, external power supply, software and format utility
Requirements: MS-DOS 2.xx, CP/M-86/80 2.xx for formatting

N. Jay Bassin is senior principal of an environmental science-policy consulting firm in Silver Spring, Maryland. He is an active member of the Washington Area Rainbow Users Group.

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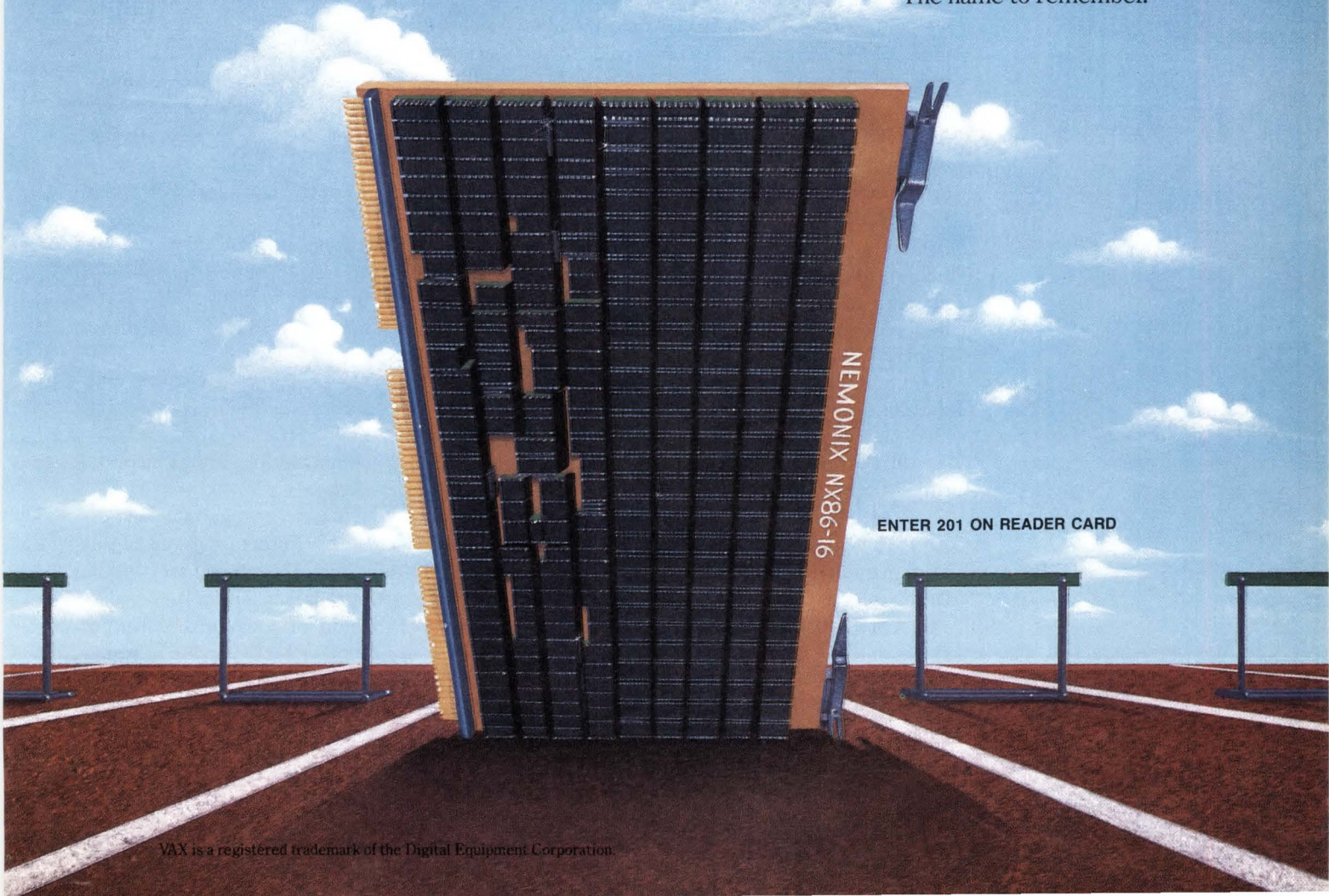

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4GLs

DATATRIEVE

By Robin C. Johnson

DEC's easy-to-learn Fourth Generation Language for the VAX.

Often it's the software that determines a company's choice of a computer system. A large organization looking toward automating its operation on a database couldn't eliminate Digital's VAX from the list of possibilities, because it runs one of the most powerful, comprehensive, and useable of the database programs available — VAX *Datatrieve*. Many companies have chosen VAX for just this reason, but if you already have a VAX, the addition of *Datatrieve* to your system could renovate completely the way you do business. Although it is extremely powerful and complex, *Datatrieve* also is surprisingly easy to learn and use. It is a program designed for both the programmer and the end user.

Datatrieve is a fourth-generation query language similar to COBOL, but more English-like, and easy enough for the nonprogrammer to learn and use with dexterity. With it, you can define, store, modify, format, and display information interactively. *Datatrieve* has a report writer, graphics capability, and the ability to call programs written in high-level languages supported by DEC.

In *Datatrieve*, files called "domains" are coded through "record definitions" and access RMS data files where the actual data is stored. Datatrieve requires the Common Data Dictionary to run, and is fully compatible with DECgraph, DECnet, FMS, and TDMS.

A typical *Datatrieve* query might be something like this: In a domain called CARS, find all the cars manufactured by Volvo. The command to do this is: FIND ALL CARS WITH MAKE EQUAL "VOLVO". As you can see, the format for the command is very similar to the English request, where CARS is the domain name and MAKE is the field name which contains car manufacturers.

With *Datatrieve*, you can merge two or more domains, define subsets of domains (called view domains), or access translation tables for codes contained in domains. Domains, view domains, procedures, record definitions, and tables all can have access control lists defined for them, allowing each dictionary object to have its own protection scheme.

Some of the notable features of *Datatrieve* are:

1. Validation checks at input
2. The ability to search or sort by any field in the database
3. The capability to restructure data into a new format
4. Immediate conversion of data types with edit strings for versatile displays
5. Dynamic modifications
6. The PLOT command for graphic displays.

THE MOST IMMEDIATELY recognizable advantage of *Datatrieve* over other programs of this type is learning ease. First-time users will be able to input, manipulate, and print out data within a half hour of program installation. *Datatrieve*, like other DEC products, comes with bountiful instructional material. Besides the printed material, there is a standard help library, structured like the VMS help library,

FIGURE 1.

```
ADT  ? - Help  ! - Fields  < - Back up <PF2> - Screen Help
-------------------------------------------------------------
CARS
      MAKE 20 characters
      MODEL
-------------------------------------------------------------

What's in MODEL — DATE
                  PERCENT
                  MONEY
                  NUMBERS used in arithmetic
                  CHARCTERS
                  GROUP?
Enter one of these words or its first letter : C
```

Application Design Tool (ADT).

FIGURE 2.

```
^ enter command, type ? for Help
Possible responses are:

  FIND      Retrieve a collection of records
  LEAVE     Return to normal Datatrieve
  PRINT     Print a record or records
  READY     Make a domain available
  REPORT    Create a formatted report
  SELECT    Pick out a particular record
  SET       Set default dictionary or plot dictionary
  SHOW      Display status information
  SORT      Re-arrange the current collection
  :         Invoke a Datatrieve procedure
```

Guide Mode.

which can be customized to your site with the Librarian Utility.

Also included is ADT (Application Design Tool), which allows nonprogrammers to create simple record definitions. This tool writes the coding for you, as it guides you through the process of creating a domain with explicit prompts. ADT creates either an indexed or sequential file which is ready to receive data as soon as you exit back to *Datatrieve* (See Figure 1).

Guide Mode guides the user through a command line; this is a useful self-teaching tool and can be modified somewhat to suit individual needs (See Figure 2).

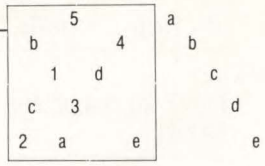
The Newuser program and files provide a sample database for practice purposes. Before their own database has been created, users can input records, make modifications, and write reports on these sample domains. They also can be used as a guide in creating your own database.

The error messages generated by *Datatrieve* are clear and direct, and there is even a command, HELP ERROR, which will give a further description of the error message you have just received, along with possible corrective measures.

FIGURE 3.

1.1 Beginning and Ending a Session
datatrieve functions

With DATATRIEVE you can:
- choose specific data
- sort your data
- and create reports.



REPORT

manager	expense
a	2.15
b	4.90
c	1.85
d	7.02
e	3.47

Press RETURN to continue. # 17 of 29

Introduction to Datatrieve.

FIGURE 4.

```
PROCEDURE NEW__CARS
DECLARE BONUS PIC 9(4).
BONUS = *.'your ID number'
IF BONUS NOT IN ID__TABLE THEN
  ABORT ''Invalid ID number''
READY CARS SHARED READ
FIND CARS WITH YEAR = ''85'' AND PREV__OWNER MISSING
SORT BY PRICE
REPORT
SET REPORT__NAME = ''NEW CAR COMMISSIONS''
PRINT MODEL, PRICE, PRICE * .05(''COMMISSION'') USING $$,$$9V99,
  (BONUS VIA ID__TABLE + PRICE * .05) (''TOTAL'') USING $$,$$9V99
END__REPORT
RELEASE
END__PROCEDURE
```

```
DTR> :NEW__CARS
Enter your ID number: 500
```

NEW CAR COMMISSIONS 27-Dec-1984
Page 1

MODEL	PRICE	COMMISSION	TOTAL
ESCORT	$ 4,999.00	$249.95	$1,249.95
EXP	$ 7,550.00	$377.50	$1,377.50
TEMPO	$ 8,200.00	$410.00	$1,410.00
MUSTANG	$ 9,500.00	$475.00	$1,475.00
LTD	$12,000.00	$600.00	$1,600.00

Datatrieve *procedure and sample run.*

An option available with the package is the computer-based instruction course, *Introduction to Datatrieve.* It is a shareable image that can be reviewed at the student's convenience. The course covers the very basic concepts and commands needed to use *Datatrieve* domains and produce reports (See Figure 3).

Like other DEC software products, *Datatrieve* updates come with easy-to-follow instructions for installation and lists of changes written to a read file or printer. For any problems you may have with the program, there is a responsive team of software services people available at the Digital Telephone Support Center.

Another desirable feature of *Datatrieve* is its file security schemata, wherein each object in the dictionary has an access control list assigning or denying up to 13 privileges to a specified user, UIC, terminal, etc.

On terminals with graphics support, VT125, VT240, or DEC personals — PRO 325, PRO 350, or Rainbow 100 — the PLOT command is available to produce pie, bar, line, and scatter graphs. It is possible to produce color displays with supporting equipment.

The *Datatrieve* Report Writer offers many options for output of data, from simple columnar reports to reports containing control groups and calculations that may be displayed in multiline headers and footers. Data types can be converted to forms other than the default in procedures and reports, and reports can be included in procedures which can contain the usual programming structures, such as IF-THEN-ELSE, WHILE loops, and CHOICE (case structure). These reports are permanently stored in procedures for continued use (See Figure 4).

One of the most useful features of *Datatrieve* is the editor, which is very similar to EDT and can be used to edit or create any of the procedures or record definitions. It is a full-feature editor that can be used in either line or screen mode. Many people find it easier to write procedures and reports in the screen mode of the editor than at

Datatrieve command level because of the full-screen editing capabilities, such as Cut and Paste, cursor movement, and the Search and Replace commands.

As with any complex program, *Datatrieve* has it faults. However, the program is in a constant state of revision by DEC, so we can look forward to more improvements in the future.

Anyone currently using a VAX 11/730 with one megabyte of main memory will not be able to ignore the fact that *Datatrieve* is slow. This is the minimum configuration required to run *Datatrieve*. Depending on the size of the database and the number of users, this normally would be sufficient. But, if speed is very important, a larger system is required. Depending on what other applications are running, a 200-record sort on a file of 2000-byte records, for instance, typically can take over one minute. Increase the collection size to 500 records and add another minute to the sort time.

The training tools also present some problems. Though the Guide Mode is useful, it also is limited and often confusing. In fact, it is sometimes inconsistent with *Datatrieve* itself. It will not allow users to issue ordinary *Datatrieve* commands with all the allowed qualifiers. For instance, on a system where more than one person accesses the same domain, you must ready the domain with shared access. The command to do this is READY [domain] SHARED READ. If you do not include the SHARED qualifier and someone else is using the file, you will get an error message. Guide Mode doesn't allow the qualifier, so if you attempt to ready a domain in Guide Mode, you will be unsuccessful if anyone else is using the domain. Also, if you are successful, anyone trying to read the domain after you will be locked out. This is just one of many limitations of Guide Mode.

Similar problems apply to ADT. Complex definitions of data are not possible using this tool. It does not include any validation strings, default, or

FIGURE 5.

MAKE	MODEL	YEAR	COLOR
Cheverolet	Camaro	74	Red
Ford	LTD	75	Green
Ford	Mustang	65	Black
Buick	Regal	83	Blue
Mercury	LN7	82	Gray

The default format produces columns . . .

FIGURE 6.

MAKE	MODEL	YEAR	COLOR	ENGINE
Cheverolet	Camaro	74	Red	V8
Cassette, AC, Vinyl top				
1000				
Ford	LTD	75	Green	V8
Cassette, AM/FM radio, power windows				
1500				
Ford	Mustang	65	Black	V6
AM/FM radio, bucket seats, new eng.				
2500				
Buick	Regal	83	Blue	V6
Cruise, AC, sun roof, power windows, power seats				
7500				
Mercury	LN7	82	Gray	4-cyl
AM/FM radio, AC, leather int.				
5000				

. . . but exceeding fields creates problems.

FIGURE 7.

```
READY CARS SHARED READ
FIND ALL CARS WITH YEAR GREATER-THAN "70"
SORT BY YEAR
PRINT MODEL, MAKE, COLOR, YEAR, PRICE USING $$,$$9V99 OF
CURRENT
```

Users must learn the language's commands.

special edit-string types, and does not allow hierarchical domains. An average user may not be able to write record definitions without ADT, but with it he is limited to the most common data types and foregoes many useful options.

Though *Datatrieve* is ideal for a company with very little programming support, overcoming some of these limitations may require a programmer. If you use *Datatrieve* as it is shipped, you will be able to do most of what it's capable of doing, but you will live with the limitations.

Sometimes the most frustrating characteristic of *Datatrieve* is the way it formats output. After defining a domain and storing records in it, you will want to print the information to your terminal screen or a printer. This can be very simple if you have set up the domain to include very few fields, fields with sizes not exceeding 80 characters (default screen width). All you do in this case is find the records you want to display using a FIND statement, then type PRINT [RETURN]. The default formatting in Datatrieve will produce a screen image that resembles Figure 5.

This printout is clear and readable. The problem begins when the fields you are printing exceed one line in length. In that case, your display would be formatted like Figure 6.

Notice that headings are printed for the first line only and that the other fields wrap to the second and third lines indiscriminately. The more fields you print, the more confusing the printout becomes. You can print fields selectively, of course, and can use numerous formatting options to display the data the way you want it to appear, but formatting can be very tedious and complicated. In fact, it can come very close to programming in its complexities.

For this reason, you may want to consider buying FMS (Forms Management System) to define forms for your domains. The limitation here is that only one form per domain is possible, but each domain can be reduced to

multiple "view" domains, and each of these can have one form. With FMS, when you type PRINT, you will be able to have headings and pieces of data wherever you want them on the screen without writing code to format the information each time you want a printout.

Since *Datatrieve* is a versatile query language, the user has many options and is not presented with a menu offering limited choices. Users have to learn the language and use it, which means a substantial amount of typing. To produce a simple printout (on the CARS domain), for instance, you would have to type the commands shown in Figure 7.

A similar procedure is required for each different display. Such groups of commands can be put into a procedure and called up simply by typing the name of the procedure, but the number of preformatted reports must be limited, and the ordinary user normally will be expected to perform this type of query on his own.

There are some shortcuts: command words such as READY, SORT, FIND, and PRINT can be abbreviated by declaring synonyms for them such as R, ST, F, and P. Also, GREATER-THAN can be abbreviated to GT, and ALL is optional. This reduces the typing somewhat.

Undoubtedly, many people would say no to *Datatrieve* because it isn't a truly relational database; that is, domains exist independently and have no effect upon one another. If you have two domains, for instance, one containing used cars and one containing new cars, you cannot write a report that will display data on all cars and give a total. Essentially, you have to write two reports and add the individual totals together in an elaborate procedure which is, for all intents, programming.

Also, a domain cannot be defined so that it will be updated automatically by updating a field in another domain. Any computed fields must be computed from fields within the same domain or can be done in input procedures. This is a serious limitation for anyone buying *Datatrieve* because of its ease of use. If a truly relational database is required, *Datatrieve* may be a wrong choice. It depends on how much programming will be required to make it work the way you want it to.

For the programmer, there are other difficulties. *Datatrieve* does not allow more than one level of hierarchy in a domain. For example, you cannot define a domain FAMILIES, which has a list of children within each family, and then another list of pets for each child. You must stop with the child list and put the pets in a separate domain.

Also, common commands such as READY and FIND cannot be used in a REPEAT loop. This could force users into some difficult maneuvers to produce the desired result. This means that in any *Datatrieve* procedure containing these commands (they almost all do), you cannot invoke the procedure using the REPEAT option. The procedure must be invoked by typing its name for each execution desired.

Datatrieve does not allow individual field protection. This problem can be overcome, however, by defining view domains with different protection schemes from the parent domain.

Most of these disadvantages are not serious enough to impair most applications, and usually there is a way around them. Any database program, especially one as easy to use as this, must have some limitations; in this case, there are fewer than might be expected, and the ease of use does not significantly diminish the versatility and power of the program.

DATATRIEVE DOCUMENTATION includes the following:

Installation Guide
Summary Description
Introduction to Datatrieve
User's Guide
Handbook
Reference Manual
Guide to Writing Reports
Guide to Using Graphics
Guide to Programming and Customizing
Pocket Guide

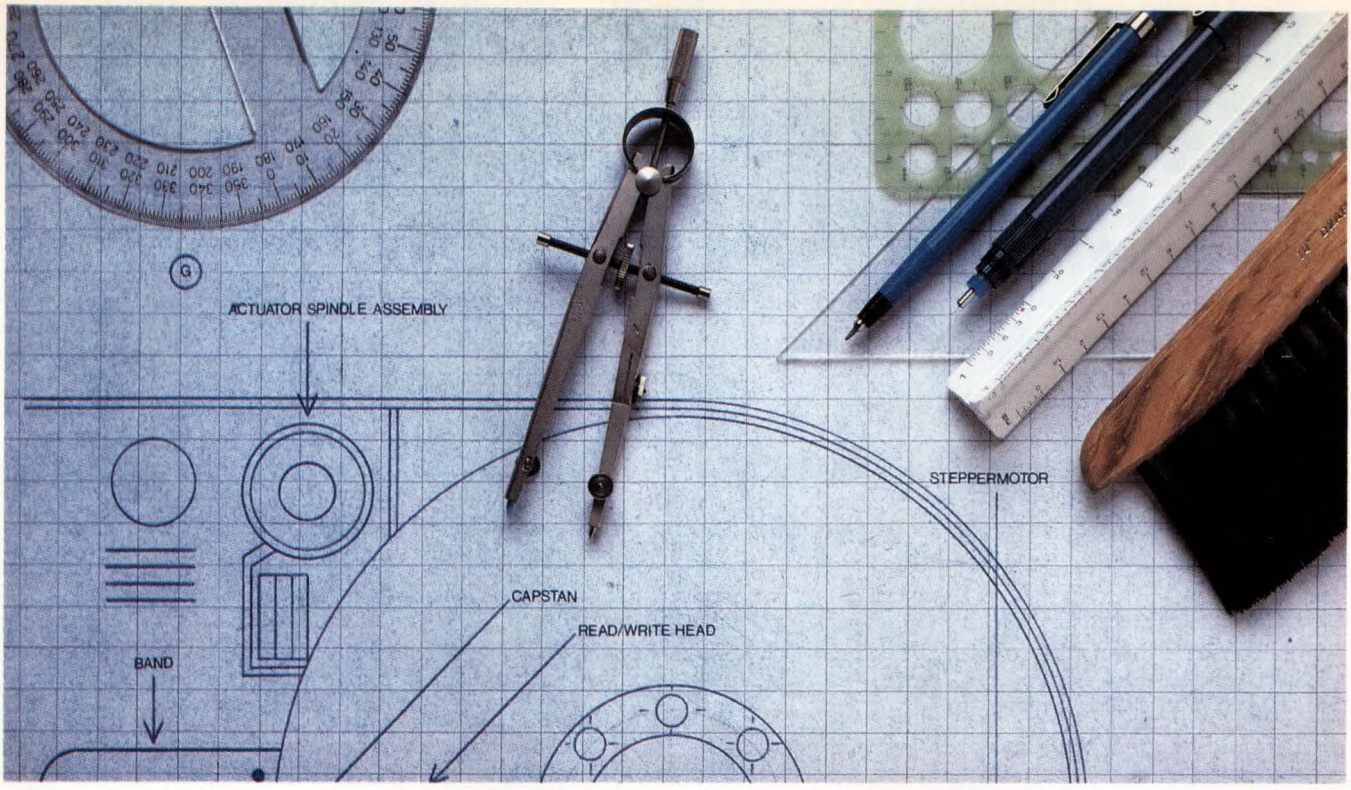
The manuals are comprehensive and well-indexed. They are separated logically into levels of expertise and by subject. A beginning user can spend a few minutes with the *Introduction*, which describes only the basic commands needed to get started, and soon can be using *Datatrieve* effectively without having to wade through technical information that only would confuse him. Likewise, the advanced user or programmer can refer to the appropriate volume for technical guidance.

The *Installation Guide* is easy to follow with clear instructions in step-by-step format. All manuals have many examples directly applicable to the Newuser domains.

Datatrieve is versatile. You can locate, sort, and output data based on any field or group of fields in your database. The way you display the data is not limited to any predefined format. It can change from moment to moment and user to user, locking no one into an undesirable or incomplete display. The learning ease of *Datatrieve* is a definite fact in its favor. DEC has gone to great lengths to make *Datatrieve* self-teaching. Of course, it is fully compatible with your VMS system and the other DEC applications you are running.

Datatrieve is currently available from DEC for the VAX/VMS system for $6,600. *Datatrieve* is also available for PDP-11 and TOPS-20 systems. To facilitate input and output, you may want to purchase FMS as well for $2,625. For companies with no accessible programmers, the addition of FMS may be worth the money. System requirements include a minimum of one megabyte of main memory and 10,000 disk blocks of mass storage.

Robin Johnson is a computer programmer for the Department of Defense in Stockton, California. She also has written fiction and nonfiction in various fields.



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one section to another you're doing just what the computer does when it moves the head across a fragmented disk; wasting time.
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3

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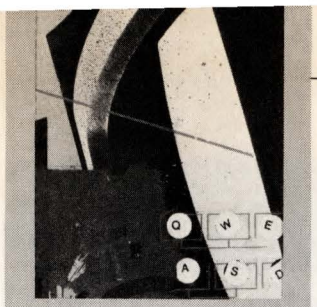

RSTS

USING MAPs

By Michael D. Stemle

Map statements add speed and increased performance.

A MAP statement allows file buffers or sections of memory to be defined and redefined as many times as needed. Since the compiler predefines the fields specified in a MAP, slow programs can speed up with a few simple tricks.

String variables, defined in a MAP, have a constant length that cannot be altered during the run of a program. This constant length may appear to be a waste of space, but it can be used to your advantage. For example, to produce a report that has many columns, you need to make sure that every person's name on the report is the same length. The first response may be to use a line like:

```
Report.Name$ = Left(Persons.Name$ + Space$
  (30%),30%)
```

However, a MAP and a statement like the following could be used to achieve the same results:

```
Map (Outrec) Report.Name$ = 30%
      :
      :
Report.Name$ = Persons.Name$
```

A reduction in execution time could be as much as 66 percent and 74 percent in CPU time (See Benchmark A).

PADDING A NUMBER with leading zeroes is another way to exploit the constant string length of MAPped strings. For example, the key to a file is a customer ID number expressed as a six-digit number padded with leading zeroes.

The first method that comes to mind is something like this:

```
Key$ = Num1$(Account.No)
Key$ = String$(6%-Len(Key$),48%) + Key$
       ! 48% is the CHR$() of '0'
```

Using a MAP as follows could cut as much as 37 percent elapsed time and 10 percent CPU time:

```
Map (Keymap) Key$ = 6%
             :
             :
Rset Key$ = "000000" + Num1$(Account.No)
```

It is interesting to note how much time is used by the NUM1$( ) function (See Benchmark B). I advise you not to use this function inside a loop to compare numbers.

One of the most common uses of a MAP statement is to divide a record into various fields of data. For example, there exists a file of names and addresses that must be printed in a report. This would be the standard MID approach:

```
Rpt.Name$ = Mid(Record$, 1%,30%)
Rpt.Addr$ = Mid(Record$,31%,30%)
Rpt.City$ = Mid(Record$,61%,20%)
Rpt.St$   = Mid(Record$,81%,2%)
Rpt.Zip$  = Mid(Record$,83%,5%)
```

A savings of 50 percent elapsed time and 11 percent CPU time may be obtained by using the following technique:

```
Map (Recmap) Record$ = 100%
Map (Recmap) Rec.Name$ =  30%
           ,     Rec.Addr$ =  30%
           ,     Rec.City$ =  20%
           ,     Rec.St$   =   2%
           ,     Rec.Zip$  =   5%
             :
             :
Rpt.Name$ = Rec.Name$
Rpt.Addr$ = Rec.Addr$
Rpt.City$ = Rec.City$
Rpt.St$   = Rec.St$
Rpt.Zip$  = Rec.Zip$
```

BENCHMARKS A-F.

Method	Elapsed Time	CPU Time
Non-Mapped	9 secs	7.5 secs
Mapped	3 secs	1.9 secs

BENCHMARK A shows the differences between using a MAP to guarantee a fixed-length string and using BASIC functions.

Method	Elapsed Time	CPU Time
Non-Mapped	113 secs	64.3 secs
Mapped	82 secs	57.9 secs

BENCHMARK B shows the differences when using a MAP to pad leading zeroes.

Method	Elapsed Time	CPU Time
Non-Mapped	34 secs	14.1 secs
Mapped	17 secs	12.6 secs
Both Mapped	12 secs	7.3 secs

BENCHMARK C shows the differences between using a MAP to extract portions of records versus using MID function.

Method	Elapsed Time	CPU Time
Non-Mapped	87 secs	54.5 secs
Mapped	54 secs	34.3 secs

BENCHMARK D shows the differences between printing directly from MAPs and using MIDs to extract the data and then printing it. The NL: buffer was used as the output device to help eliminate elapsed time problems encountered if a "real" device were used.

Method	Elapsed Time	CPU Time
Non-Mapped	7 secs	6.9 secs
Mapped	<1 sec	.6 secs

BENCHMARK E shows how dramatically a MAP can save time when using integers and floating point numbers.

Method	Elapsed Time	CPU Time
Non-Mapped	17 secs	13.9 secs
Mapped	2 secs	1.2 secs

ADDITIONAL RUNS of BENCHMARK E were made at 20,000 iterations to get the elapsed time of the MAPed example to at least one second.

Method	Elapsed Time	CPU Time
Non-Mapped	2737 secs	130.5 secs
Mapped	999 secs	84.9 secs

BENCHMARK F compares using MAPs to access a database quickly.

Additionally, a savings of 65 percent elapsed time and a 48 percent CPU time (See Benchmark C) may be obtained by MAPping the report as well as the input record:

```
Map (Recmap) Record$ = 100%
Map (Recmap) Rec.Name$ =  30%
        ,    Rec.Addr$ =  30%
        ,    Rec.City$ =  20%
        ,    Rec.St$   =   2%
        ,    Rec.Zip$  =   5%
Map (Rptmap) Rp.Name$  =  30%
        ,    Fill$     =   1%
        ,    Rp.Addr$  =  30%
        ,    Fill$     =   1%
        ,    Rp.City$  =  20%
        ,    Fill$     =   1%
        ,    Rp.St$    =   2%
        ,    Fill$     =   1%
        ,    Rp.Zip$   =   5%
             :
             :
Rp.Name$ = Rec.Name$
Rp.Addr$ = Rec.Addr$
Rp.City$ = Rec.City$
Rp.St$   = Rec.St$
Rp.Zip$  = Rec.Zip$
```

ANOTHER INTERESTING FACT about MAPs is that they allow printing of fields of data directly from the file buffer that was used when a record was read without moving the data around. To show how to do this, we'll use the previous example but include the PRINT statement in the calculations. The first method would look like this:

```
Rpt.Name$ = Mid(Record$, 1%,30%)
Rpt.Addr$ = Mid(Record$,31%,30%)
Rpt.City$ = Mid(Record$,61%,20%)
Rpt.St$   = Mid(Record$,81%,2%)
Rpt.Zip$  = Mid(Record$,83%,5%)
Print  1%, Rpt.Addr$;" ";Rpt.Addr$;" ";
           Rpt.City$;" ";Rpt.St$;" ";Rpt.Zip$
```

You can save 38 percent elapsed time and 37 percent CPU time (See Benchmark D) by printing directly from the MAPs as follows:

```
Map (Recmap) Record$ = 100%
Map (Recmap) Rec.Name$ =  30%
        ,    Rec.Addr$ =  30%
        ,    Rec.City$ =  20%
        ,    Rec.St$   =   2%
        ,    Rec.Zip$  =   5%
             :
             :
Print  1%, Rec.Addr$;" ";Rec.Addr$;" ";
           Rec.City$;" ";Rec.St$;" ";Rec.Zip$
```

One of the largest savings of a MAP statement is the ability to define and use integer and floating point numbers directly. For example, we need to tally up the count and amount that was paid for several items. The non-MAP method might be:

```
Total.Cnt% = Total.Cnt% + Swap%(Cvt$%(Mid(Rc$,1%,2%)))
Total.Amt  = Total.Amt  +       Cvt$F(Mid(Rc$,3%,8%))
```

Using a MAP could result in an 88 percent elapsed time and 91 percent CPU time savings (See Benchmark E). This is the code that was used:

```
Map (Recmap) Record$ = 100%
Map (Recmap) Rec.Cnt%
           ,  Rec.Amt
             :
             :
Total.Cnt% = Total.Cnt% + Rec.Cnt%
Total.Amt  = Total.Amt  + Rec.Amt
```

However, to use MAPs like this, you must insure that integers and floating point variables are aligned on word boundaries (even number bytes preceding the definition). This is such a small inconvenience for such a large savings!

TO SUMMARIZE, if code like the following:

```
Call Nextrc(Status$,Data$)
If Status$ <> Ok$ then
   Print "%Error ... ";Status$
else
   Kode = Val(Mid(Data$,27%,5%))
   If (Kode => Lo) and (Kode <= Hi) then
      Total.Red   = Total.Red
                  + Swap%(Cvt$%(Mid(Data$, 7%,2%)))
      Total.Blue  = Total.Blue
                  +       Cvt$F(Mid(Data$, 9%,8%))
      Total.Long  = Total.Long
                  + Swap%(Cvt$%(Mid(Data$,17%,2%)))
      Total.Short = Total.Short
                  +       Cvt$F(Mid(Data$,19%,8%))
      Kount       = Kount + 1.0
```

is modified to something like the following, then as much as 33 hours could be trimmed off of jobs that pass the debtor file (See Benchmark F):

```
Map (Recmap) Rec.Data$ = 40% ! Whole record
Map (Recmap) Rec.Key$  =  6% ! Record key
           ,     Rec.Red%        ! Number red widgets
           ,     Rec.Blue        ! Number blue widgets
           ,     Rec.Long%       ! Number long widgets
           ,     Rec.Short       ! Number short widgets
           ,     Rec.Kode$ =  5% ! Widget class code
Call Nextrc(Status$,Data$)
If Status$ <> Ok$ then
   Print "%Error ... ";Status$
else
   Kode = Val(Rec.Kode$)
   If (Kode => Lo) and (Kode <= Hi) then
      Total.Red   = Total.Red   + Rec.Red%
      Total.Blue  = Total.Blue  + Rec.Blue
      Total.Long  = Total.Long  + Rec.Long%
      Total.Short = Total.Short + Rec.Short
      Kount       = Kount       + 1.0
```

BENCHMARKS A-F contain the tables of times for each of the preceding examples to run 10,000 iterations during a normal load. The code, shown earlier, is the interesting part of each test program. None of the support code; i.e., files opens/closes, time calculations, miscellaneous inputting, etc., was included. All of the support code is outside the loops used to calculate the benchmarks and should not effect the times. The times are averages of several different runs.

Michael D. Stemle is senior systems programmer at National Revenue Corporation, Columbus, Ohio.

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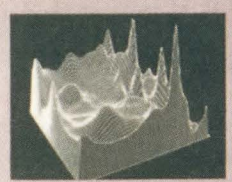

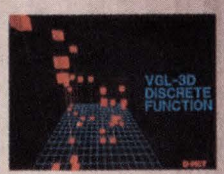

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RESOURCE EXECUTIVE

PLAS

Ralph Stamerjohn

The Program Logical Address Space, or PLAS directives allow RSX programmers access to the memory management hardware discussed in last month's column. PLAS directives are the main tool programmers may use to manage large sets of data and overcome the 16-bit address limit of a PDP-11. Using PLAS, RSX tasks easily can use a 32-KW virtual address space to reach up to two million words of physical memory.

Memory management and the PLAS directives are not easy concepts to understand. Two fundamental definitions that must be mastered are those of regions and windows. A region is any contiguous portion of physical memory. A window is a view into a region — a mapping between a set of virtual addresses and physical memory. In terms of hardware, a window simply is one or more memory management registers.

One way of looking at memory management, regions, windows, and the different PLAS directives is to imagine a fancy slide show with multiple projectors and slide trays. Each projector is a window and the trays of slides represent different regions.

If the entire slide show is equivalent to an RSX task, we learned last month that we can have a maximum of eight projectors because the screen can show only eight 35mm slides at once (16 if we are using the fancy new I/D space screen that projects on both sides at once). However, typical shows will use one large main projector and only one or two small 35mm projectors. An absolute rule is that the main slide projector can look at one and only one slide. No matter what combination, projectors always show multiples of 35mm slides and the sum of the size of all projectors cannot exceed 8*35mm (or 16*35mm).

In RSX terms, a task may have a maximum of eight windows (16 if I/D space is used). Each window covers a multiple of 8 KBs in virtual address space. The first window always is used for the task root region and can never be remapped because the window maps the task stack and other essential context.

> ***"Using PLAS, RSX tasks easily can use a 32-KW virtual address space to reach up to two million words of physical memory."***

Some of the PLAS directives are concerned with regions. There are directives to attach, detach and create regions. You also can get status about a region and send region context to another task.

IT IS EASY TO SEE the purpose of the region directives by looking at the slide show example. There is always more then one slide show going on at once. Total confusion results if all slide projectors can use all slide trays. There are also security risks. You would not want a slide show on employee morale suddenly to access a detailed presentation of salaries. So, before a slide tray can be used by a specific presentation, it must be authorized for use by the slide show. An attach request is made to a central authority that either grants the request or returns a security error notice. A tray's association with a slide show is dissolved either by explicitly issuing a detach request or when the entire slide presentation is finished.

The attach mechanism involves no physical operations. It allows a slide tray to be attached by any number of slide presentations. Also, a slide tray is not attached to any specific slide projector, but to the entire slide presentation. Any projector in the slide show (except the main projector) may use the attached slide tray.

Finally, a special command allows a slide presentation to create a new slide tray filled with blank slides. The projectors in our example are special units that can both show (read) and photograph (write) slides. So, a slide presentation can create trays to hold new information. Furthermore, another command allows one presentation to pass trays to another presentation.

RSX defines three types of regions: task, global commons, and dynamic regions. RSX-11M-Plus tasks consider the read-only portion of a multiuser task as a fourth type of region. As stated above, regions must be attached by a task before use. You always are attached to your task region. Global areas linked with a task by the LIBR, COMMON,

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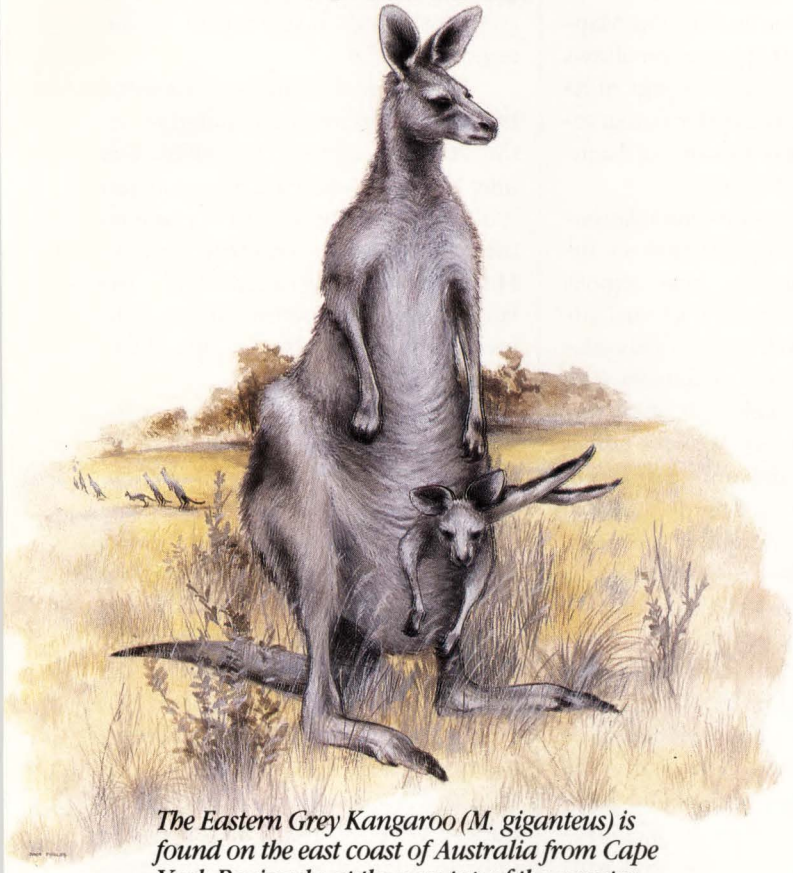

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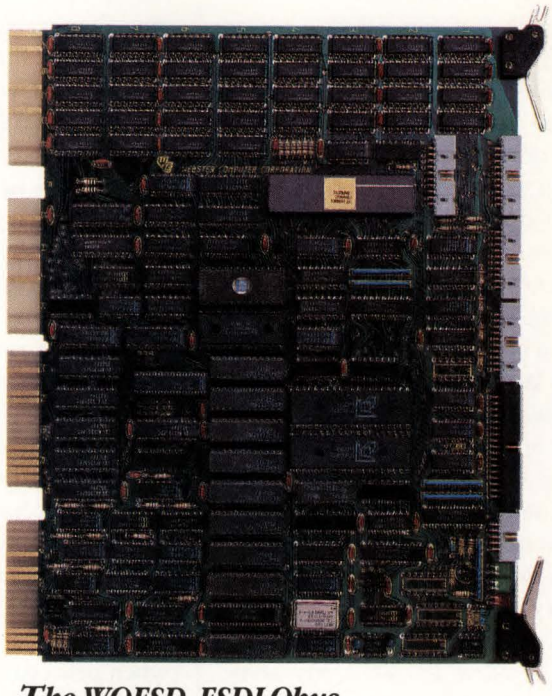

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RESLIB, RESCOM, or RESSUP task builder options automatically are attached when the task is loaded. The attach region (ATRG$) directive is used to associate a task with dynamic regions. A task's association with a region is removed by the detach region (DTRG$) directive or when the task exits. Normally, a task does not detach a region unless it is using the send-by-reference (SREF$) directive to send a descriptor of a region to another task for further processing (RREF$, RRST$). The create region (CRRG$) creates a dynamic region. Regions can be initialized to delete automatically when the last task attachment is removed. Otherwise, a special flag in the DTRG$ directive must be used to mark the region for deletion.

The last PLAS element to consider is windows. In our example, regions of memory are our slide trays, and windows are slide projectors. So, in the same manner a slide projector lets you show some slide in a tray, an RSX window lets you look at some portion of a memory region.

THE SLIDE SHOW EXAMPLE has some fairly unusual characteristics if it is to be equivalent to the RSX PLAS mechanism. As stated before, a slide tray is attached to the slide show and not to any specific window. Futhermore, the tray may be attached simultaneously to different slide shows. So, the same slide may be shown at the same time by different projectors, even by projectors in the same slide show! When a projector changes slides, it not only can pick any slide from the current tray, it can switch to a different tray!

To use PLAS windows, you must first declare how many windows a task will need. T KB automatically reserves windows needed for the task root, I/D space, memory-resident overlays, and static areas. The T KB WNDWS options specifies any extra windows needed for dynamic regions.

The create address window (CRAW$) initializes a window for use and optionally maps the window to a specified region. The MAP$ directive then can be used to change mapping with a current region or switch to a different region. It is even possible to use windows allocated by the task builder for static regions; e.g., a resident library to map dynamic regions. The Get Mapping Context (GCMX$) directive allows a task to get the current settings of its address windows. The buffer format returned for GCMX$ is the same as the input to the MAP$ directive.

There is no one-for-one relationship between regions and windows. Indeed, a task may attach to many regions and use the same window (virtual address) to access each region. This property can be used very effectively with resident libraries, such as FCSRES, that are only used for I/O. When a task is compute bound and only processing data, the window used for FCSRES can be used to access dynamic data regions. The GCMX$ directive is used to save the FCSRES mapping before the compute bound processing starts. The MAP$ directive restores the normal context when processing finishes.

The reverse relationship also is possible. Multiple windows may be mapped into a single region. One common example of this is memory-resident overlayed tasks. Several windows are needed to map the overlay segments in the task region. Some applications also will benefit from using two or more windows to access a single region. If the front of a region contained frequently accessed data, one window can map this area while a second window is used to access other parts of the region.

TO SUMMARIZE THE PLAS directives, they are split into two groups: one for associating tasks with memory regions and another for managing virtual address windows. A task may create a new region (CRRG$), attach to an existing region (ATRG$), or detach from a region (DTRG$). Once a region is attached to a task, the region can be mapped using an address window (MAP$). Address windows are created (CRAW$) and eliminated (ELAW$) by the task as needed. Region context can be passed between tasks using the send and receive, by reference (SREF$, RREF$, RRST$) directives. Finally, a task may get its current mapping context (GMCX$) and information about regions (GREG$).

Some people think pure assembly language programs are required to use the PLAS directives. They think that only MACRO-11 provides programmers with the necessary control to map virtual addresses to different regions. However, some special task builder and language-specific features allow high-level languages also to use PLAS features.

FORTRAN programs may use the VIRTUAL statement to declare arrays that will be referenced using a window managed by the FORTRAN run-time system. The VIRTUAL statement allows the use of very large arrays with no special programming and only a few restrictions. VIRTUAL arrays may have a maximum of 32,767 elements and cannot be used in a COMMON, EQUIVALENCE, or DATA statement. VIRTUAL arrays cannot be used as CHARACTER data types or used as text buffers. VIRTUAL arrays may be passed only to subroutines as an undimensioned array.

Using FORTRAN VIRTUAL arrays is the easiest method for a FORTRAN program to handle large amounts of data. The main disadvantage of VIRTUAL arrays is the increased CPU overhead. Every reference to a virtual array element generates a run-time system call that checks to see if the element currently is mapped by the window, issues a MAP$ directive if necessary, and returns the virtual address of the array element. Even if no MAP$ directive is issued, 28 extra instructions are executed converting the virtual array

reference to a virtual address. On my PDP-11/24, a FORTRAN loop to zero a 10,000 element integer array took four times longer if the array was declared VIRTUAL, as opposed to a normal declaration.

Direct control of task windows would allow a programmer to eliminate the run-time overhead of VIRTUAL arrays. The problem with high-level languages like FORTRAN-77 is that there is no control over where variables are placed in virtual address space. The languages also lack operators that deal with memory addresses. You have to be able to partition virtual address space into multiples of 8-KB segments to use the PLAS directives. A 4096 element integer array named FACTOR cannot be used as an address window to a region because it could be at any virtual address. The problem is solved by using the task builder's VSECT option. This lets you position any program section to any virtual address. The VSECT option directs T KB to position the named program section to the specified base address and length. Thus the statement:

```
VSECT = TEST:140000:20000
```

places the 8-KB program section named TEST at virtual address 140000. Any variables placed in the program section TEST will map to virtual addresses 140000 to 160000. Any high-level language uses of program section TEST now are resolved to a specific set of virtual addresses.

High-level languages use different means to declare program sections. FORTRAN uses the name of a common as the program section name. The FACTOR array now can be used as an address window by placing the array in a common area named TEST as follows:

```
INTEGER FACTOR(4096)
COMMON TEST/FACTOR/
```

FACTOR can now be used as an 8-KB window into one or more regions.

To summarize, the PLAS directives allow RSX programs to address large sets of data by managing which regions of memory may be addressed and moving windows within attached regions.

Next month's article will show some examples of how the PLAS directives were used to solve real problems. A set of subroutines that manage a dynamic pool using 32-bit addresses will be used in the examples.

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

THE NETWORKING EDITOR

Distributed Databases

By Bill Hancock

One of the problems of distributed processing is that the processors are all distributed. It would be nice if they were all in the same place so that when things broke or went nuts, all you'd have to do is walk down the hall and reboot the system. Users usually don't mind too much, especially after they recover from the initial shock (strokes have a way of taking the pep out of you). Unfortunately, distributed means just that. It also means that networked systems probably will be scattered all over the western hemisphere — or across the globe.

For those who are snickering over the fact that all you have is a two-node network, keep it up while you can. Management has a funny habit of changing everything when you least expect it, and it usually means more nodes, more work, same budget, less time . . . Sound familiar?

Along with the problem of managing remote systems is the problem of remote user support. Frequently, on larger networks, there are no trained personnel to handle the remote system management needs and user assistance needs. Users usually have to fend for themselves and, as a rule, have a great deal of difficulty doing it. Ever try to explain to a user how to reboot a system? Try to explain how to switch the modem on the leased line into remote digital loopback. Now you're getting the picture.

To add insult to injury, with the increasing use of relational databases on corporate systems, the network manager is faced with the unpleasant task of supplying virtual terminal support to remote systems so that users may access the database; he has to figure out a way to allow access, remotely, to the database from any machine in the network. This is a difficult problem to solve; most vendors do not set up their database products to allow remote access, and many networking products do not provide virtual terminal access capabilities. Of course, they'll tell you anything, but delivery is a completely different matter.

> ***"Different networks have different ways to communicate task-to-task, and different databases have different ways of parsing queries from users . . ."***

By the way, if I sound a bit cynical when it comes to vendor claims concerning networks, I am. I've been burned so many times by vendor claims, I've taken out fire insurance on myself.

Now, as if you didn't have enough problems, management has deemed it necessary to put in an SNA network next to your bright, shiny DECnet network. How wonderful. And, since you've done so well with management of the DECnet network and, by implication, must be a wonderfully talented person (you probably are if you can get the silly thing to work right day after day), you get the honor of running the SNA network. Of course they trust you. Of course it has to talk to the DECnet network. Well, obviously, the ORACLE database on your VAX system has to talk to DB2 on the IBM. Isn't that what networks are for? By the way, you should be warned that the new VP of finance will be installing a Prime 750 and also will need access to the current databases. Your job, whether you decide to accept it or not, Mr. Phelps, is to "git them networks talking to each other!"

THE FINAL PROBLEM has to do with management of tasks. Everyone has his own way of doing things and, in companies without centralized systems management, it is not uncommon to see three or more different relational database products on the systems basically fulfilling the same functions. This usually happens over a period of time and, by the time a company is ready to "standardize" on a given database product or vendor, the users have written a great deal of applications that are database-specific and would require a great deal of time to change over. You know users — those people who justify your existence. The same ones you keep the .357 in the upper left-hand drawer for (just in case one comes in with Hollerith cards). Those nice folks who caused the creation of the term "mental breakdown." The same ones who will refuse to learn the new database, don't want to change anything, and will fight you to the death over their right to use any software product they deem

necessary to do their job, whatever it may be.

Management, God love 'em, has the perfect solution: "You can do it, Mark! We have confidence in you! Just don't spend any money, hire any people, or cause any disruption in the way we do business. Other than that, do anything you need to get the job done. Also, we know that it will be difficult, but we will remember you generously at raise time next year if we get the contract we've been working on and our profit margin is better than it is now."

What a spirit-lifter! You, and you alone, have been selected to pull off the miracle of the century. Carefully, you pull out your coax and BNC connector rosary and proceed to pray to the great God of Networks for strength, knowledge, sanity, and error-free communications.

I know, I'm exaggerating a little — not much, but a little. About the rosary, that is. The rest is very real and I have a lot of friends who can attest to the truth you have just read. I've been known to work a little magic from time to time, but alchemy is a little out of my league. Waving the rubber chicken at the network will not necessarily work either.

Therefore, how do you solve the problem of communication between systems attempting to access distributed databases on the various systems in the network?

THE MOST LOGICAL SOLUTION is to use a "front-end" of sorts to "talk" to the databases and to communicate across the network. This sounds pretty simple, but it's not that easy to do. Different networks have different ways to communicate task-to-task, and different databases have different ways of parsing queries from users, as well as different "languages" for querying the databases.

Within the structure of DECnet, there is the capability to allow task-to-task (program-to-program) communication between systems participating on the DECnet network. Basically, programs are written for each node (system) on the network and set up as a network task. After this is done, the program on the remote node is "connected to" and communications happen via network service routines, similar to file reads and writes. Once the work is complete, the user terminates the program on the host node and the link is destroyed.

While this technique allows you

to access a type of network, it does not solve the problems of dissimilar networks and of query translation from database to database. So, for starters, let's look at the relational database problem.

Some relational databases, such as *ORACLE* (and, lately, *INGRES*), use a query language called SQL to access the database and use SQL statements from programs to talk to the database kernel. As a result, programs passing SQL statements in the proper manner to routines from the database-callable library can access the database in a reasonable manner. Other databases, however, use different techniques to access the database. A Britton-Lee database machine expects the host to parse the query and pass database primitive information to it, not parse the query after it is received and pass the information back to the host. Other databases use variations such as QUEL, TEQUEL, and other home-grown methods (such as the Datatrieve-like interface to Rdb/VMS) to communicate to the database kernel. The points being that a) every database has its own routines to talk to the database kernel, and b) some databases parse the query in the subroutine and others parse the query in the database kernel.

The next — and more severe — problem is that of communicating to dissimilar networks. We all have heard of gateways ("portals" into different networks); various vendors offer them as methods to communicate with dissimilar machines on other networking protocols. This is all well and good, but there are some significant drawbacks to this type of thinking. For one thing, it is not only necessary to have networking expertise for one kind of network, now it is necessary to have expertise for all types of networking protocols available for access. This gets very expensive and can be very scary. What happens when the network guru you hired leaves the firm? Now the fireworks really start. Sure, you will survive, but it will be quite painful for quite a while. Also, finding good people with multi-network expertise is very difficult. Compound these problems with the hassle of differing hardware, differing software, and the general hassles of support and maintenance and the problem becomes increasingly clear: Multivendor networks get very expensive very quickly.

> ***". . . it is not only necessary to have networking expertise for one kind of network, now it is necessary to have expertise for all types of networking protocols available for access."***

As with all problems, there is a solution. The basic problem that needs to be solved is the communication between dissimilar systems on a reasonable basis. The wrench in the solution is that there is no cohesive, standardized architecture that allows this to happen.

Contrary to anything that you may have heard, networking is still in its infancy. Most companies take an idea that one person or firm has developed and copy it with their own implementation scheme. Hah, you say! Yes, they do. The final products may not look much like each other, but the basic rudiments do. For example, many networks use what is called the "circuit" concept of networking. This means that a remote system sets up a physical routing and virtual connection to a host

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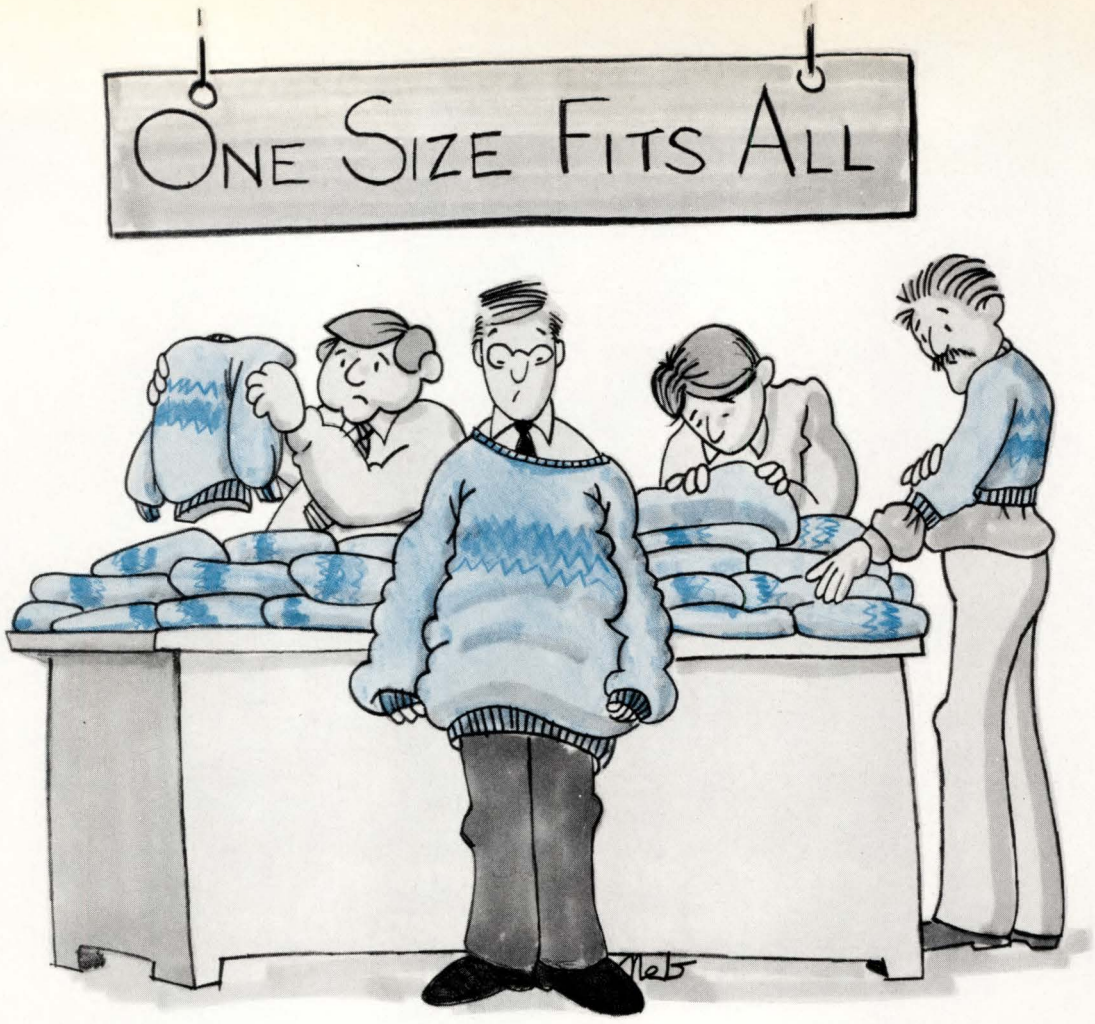

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on a network. This virtual connection exists until the remote or the host discontinues the session. During that time, both the host and the remote have to manage the link from both ends and continually monitor the status of transmissions and link activity. This happens for every connection to/from the nodes and can be a real pain to manage as well as debug and support. Another example is the token ring. Someone came up with the idea and, next thing you know, there are slotted rings, bidirectional rings, etc. But, the basic element is the token and a ring; everyone else has its implementation of the basic idea.

Another situation is the use of "standardized" protocols. Sure, there is X.25, IEEE 802.3, RS232-C and many others, but consider this: 90 percent of the "standardized" protocol architectures only specify layers 1 and 2 of the seven-layer Open Systems Interconnect (OSI) architecture. The other 10 percent attempt to specify level 3, but not with much success. In any case, there is no standardized seven-layer network architecture available for use because no standardizing organization ever has gotten around to completing standardization procedures for the upper layers. The International Standards Organization (ISO) is starting to get into the act, but ANSI and CCITT are taking their own sweet time. What this means is that most network users have to rely upon vendor expertise in the implementation of networks and hope that they know what they are doing. But it also means that the vendor most likely will NOT provide his seven-layer architecture on other vendors' systems and will settle for providing rudimentary gateway access to dissimilar networks.

So, for example, if you buy DECnet for your VAX system (most of this applies to all DEC systems, by the way) you can choose to use standardized protocols (such as X.25) for levels 1 and 2, or you can use DEC's protocols (such as DDCMP, CTERM, or others). From level 3 and up, however, you use DECnet, which, of course, only runs on DEC operating systems on DEC machines (according to DEC). You could implement DECnet on an IBM mainframe, but if IBM changed the operating system or if DEC announced Phase V tomorrow, you could be dead in the water until you provided an upgrade to the software or hardware. To compound the problem, even if you did implement DECnet on another system, there are copyright questions to be answered, as well as the problems of implementation. While DECnet provides general adherence to the map of the OSI model, the actual implementation is somewhat cryptic and is frought with neat things like Ancilliary Control Processes (ACPs) and other nifties that make implementation of DECnet on anything other than DEC operating systems very difficult (and somewhat difficult on some DEC operating systems).

I also should mention that if you are industrious, it can be done. I got a version of DECnet up and running on my Macintosh a while back, and I've seen such feats done on other operating systems as well. Therefore, implementation of a selected vendor's architecture on all machines on a network is worthwhile, provided you have the ability to support it and the architecture provides the necessary functionality.

ONE OF THE MAIN PROBLEMS in the distributed database environment is the issue of database transparency. Database transparency refers to the issue of a user accessing a relation in a given database on any node without having to specify the node. The net effect is that access to the database and the included relation is transparent to the user, and he does not know that there is a network involved in getting to the database. Some vendors, such as DEC, already have implemented this capability to an extent. For instance, in Rdb/VMS, it is possible to INVOKE (open) a database on a remote node (provided DECnet is available between the systems) and access the relations in the database as if they were local. The problem of data transparency becomes worse because multiple nodes may have multiple databases that contain multiple relations. How do you keep track of all this information so that everyone knows where everything is and not kill the systems and network in the process? Also, what about the problem of accessing multiple relations in dissimilar databases on various nodes simultaneously, such as a multirelation, multinode CROSS (JOIN) operation? This is a highly desirable feature that no vendor has implemented to date because it is a very difficult software engineering problem to solve.

Another issue with distributed databases comes with the problem of

. . . there is no standardization seven-layer network architecture available for use because no standardizing organization ever has gotten around to completing standardization procedures for the upper layers.

knowing when the data has been "committed" or properly stored in the database. In the distributed environment, it is necessary for the sending node to tell the user or the program that the data was sent and then receive not only an acknowledgement from the remote node's networking software that the packet was received, but also from the remote database that the data correctly and safely was stored in the remote node's database or relation. The technique that is used to provide this function is called a two-stage commit (stage one is on the host and stage two on the remote node), one that is implemented in very few so-called "distributed" databases. A two-stage commit is essential if multiple databases being accessed across a network are to be entrusted with any type of data that requires reliability.

As with any network application, the problem of data transfer speed and access time is always an issue. In the distributed database environment, transfer speed can be a real issue. Suppose a user on a MICROVAX II decides to copy a 200-MB relation over to his node from the clustered 8600? All things being optimal, there could be a great deal of traffic involved, not to mention the problem of how to keep users from killing the network with unnecessary data transfers. Consider, also, the up and coming problem of CD-ROMs on PCs. What if the CD-ROM contained, say, a 300-MB database and a user decided to copy sections of it into the VAXcluster database? What if there were more than one user doing it at a time? You begin to see the problem.

THE BENEFITS of distributed databases far outweigh the costs because applications dollars are saved, vendor independence is possible (utilizing front-end technologies), network gateways are reduced or eliminated, and distributed systems are easier to implement. Most important, manpower is reduced from a network support point of view (if all systems are running the same networking software, there is not a cross-network experience factor necessity) and the use of advanced application building tools allows the user, not a programmer, to develop his own applications. Remember, the most expensive component in any system or network is not the hardware — it's the brainware

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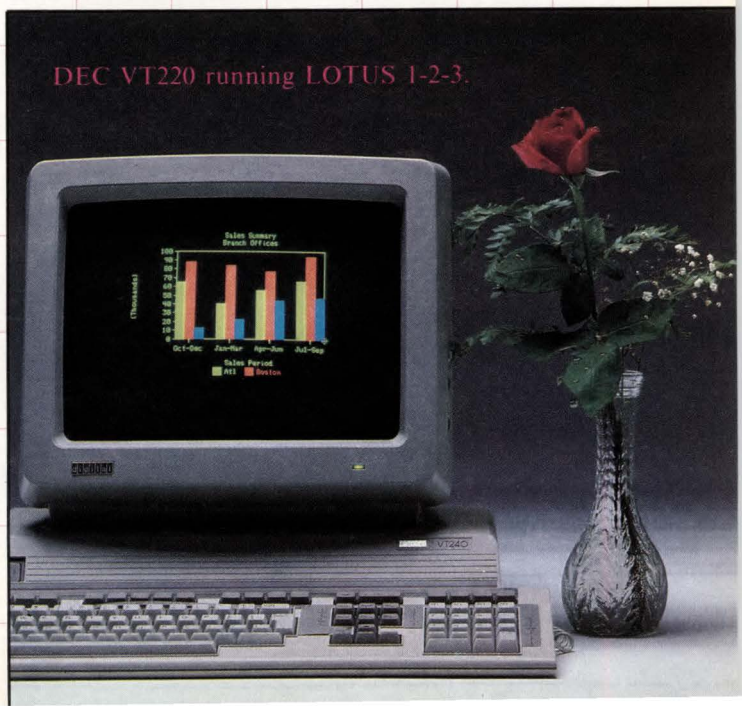

of the people who have to program and support the applications, systems and network.

Obviously, there is nothing on the market yet to do such a feat. Some companies have taken it upon themselves to use a vendor-supplied networking architecture and try to provide some capabilities themselves, but this is a limited effort and does not really solve the problem. I know of a company that is working on such an interface, but as with all good things, it takes time. What is important is to differentiate a REAL distributed database from the fakes. Truly distributed databases should provide the following basic capabilities:

1. Two-stage commit.
2. Node transparency (the user should not have to know what node the information resides within).
3. Network product transparency (it should not matter if the network used is Ethernet, token ring, DECnet, or SNA).
4. Multinode simultaneous access (users should be able to have multiple databases open on multiple nodes simultaneously).
5. Ability to use relational operators on multiple OPEN databases and multiple relations simultaneously; i.e., a JOIN operation from multiple relations in multiple databases in multiple nodes.
6. Multinode journaling, rollback, and recovery.
7. Application transparency (an application should not have to be modified or recoded to take advantage of the distributed database capability).
8. Multinetwork architecture capability (most companies do not support only DECnet or only SNA; there is usually a mixture of multiple networking technologies).
9. Identification of query requests that will require a large amount of data transfer over the network and allow the user to confirm or deny the request before the network gets buried.
10. Access path "memory" (queries that are sent off to remote nodes that are similar to previous query paths should not have to thrash around in an indexing scheme more than necessary).
11. Network access statistics and network use statistics should be integral to the distributed access capability to help in monitoring actual network use by the database, perform timing tests, monitor system and network performance, and to provide heuristic, historical information to management when more powerful machines or networking capabilities are required.
12. Integrated set of database and network monitoring and management tools.

Something that I don't necessarily view as required, but is highly desirable, is the ability to access dissimilar databases (such as Rdb/VMS, ORACLE, or INGRES) with a single query.

Something that I don't necessarily view as required, but is highly desirable, is the ability to access dissimilar databases (such as Rdb/VMS, *ORACLE*, or *INGRES*) with a single query. Obviously, this would require a type of "query translator," but it would be very useful to companies with dissimilar database technologies on dissimilar machines.

The point that I'd like to make clear is that distributed relational databases are the trend of most companies in the future and will be necessary to provide management with timely information while not centralizing all the database horsepower in one location. Those of you who are giggling again better look out. That user down the hall with dBASE III may be your boss someday and require that all databases on PCs be connected to the mainframe. Why? Because marketing information for 10 different regions are on those PCs, and the corporate twinkies want an update of what is going on, but they don't want to dictate to the regions how to do their work. Still giggling? I've already gotten requests for such nonsense, so if you don't hear anything yet, just wait a while — it's coming.

Getting a distributed database up and running is not easy and is heavily dependent upon the network(s) and relational databases that you will be using. For those with networks and relational databases, the day is coming. For those with no network, but relational databases, your time is coming as well. And for the rest of y'all out there, beware: Vendors are getting their relational databases up and running on PCs, so the herd of relational databases in a company is a very real possibility. So, the time that your manager comes in with the idea that he would like you to connect all the relational databases in the company together, remember the .357 is in the upper left-hand drawer of your desk.

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

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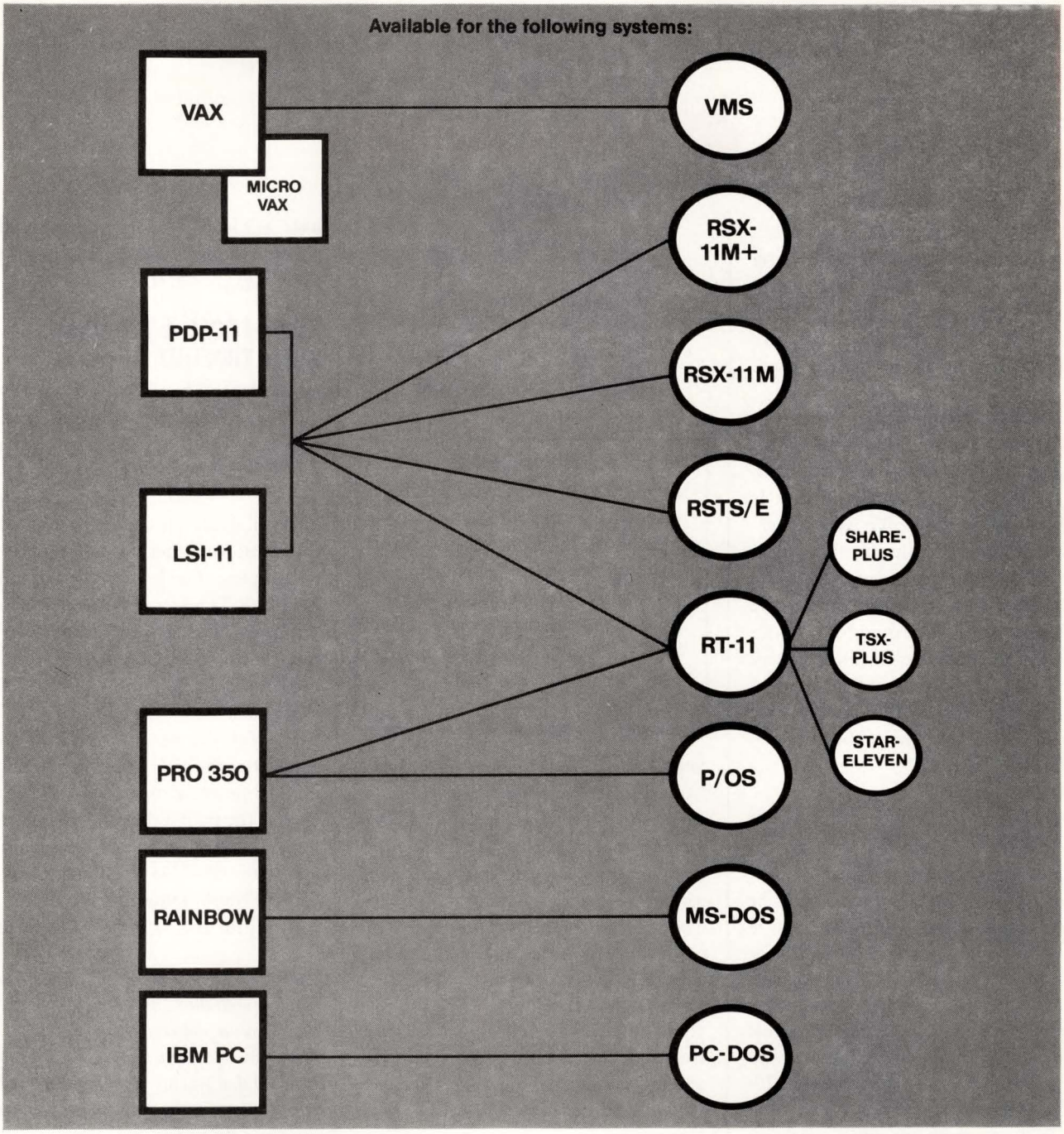

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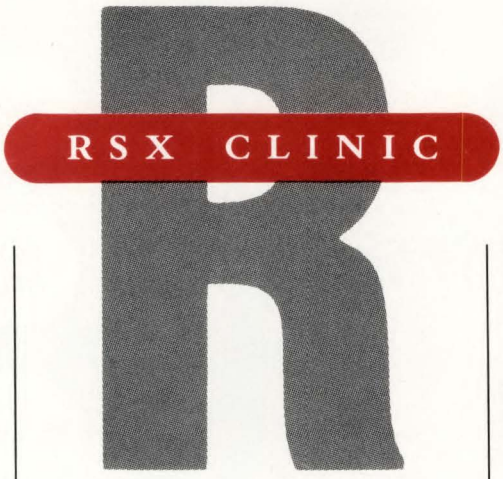

Our first two questions this month come from people who are still using older versions of RSX, particularly RSX-11M versions 3.1 and 3.2. These were solid, stable releases, relatively small and fast, and were heavily used.

MIDNIGHT BACKUPS

QUESTION: We are running RSX-11M Version 3.1 on a PDP-11/34 with two RL01 disk drives. The second disk is used only for backups. We want to perform automatic backups from the main disk drive to the secondary disk drive using the BRU utility, doing the backups at 3 a.m. each morning without operator intervention. Is there a way under RSX-11M Version 3.1 for us to start BRU at a preset time and be able to pass a command line to the utility to perform the backup?

REPLY: *A physicist I once worked for reminded me of the things I could do to a mosquito, given enough time and patience. There is always a way. The technique in the current release of RSX, M or M-PLUS, is to write a task that uses the SPWN$ directive to spawn MCR, passing to MCR the command line or the name of an indirect command file containing whatever commands you would like to have executed. In this case you would pass a BRU command line sequence. It's nicely worked out, and even gives you the ability to check the BRU completion status. The task is then scheduled to run at 03:00 with the command "DCL RUN/SCHEDULE:3:00:00 taskname".*

Version 3.1 of RSX-11M did not have the ability to spawn tasks, so this technique has to be modified. Instead of using the SPWN$ directive, you must call the executive routine $QMCRL from a privileged task which already has issued a SWSTK$ directive. As its name implies, $QMCRL queues a command line to MCR, the minimum operation necessary to invoke another task. The $QMCRL routine is documented in the executive listings which are created as part of the 3.1 SYSGEN, in module QUEUE.LST. Write a task that issues SWSTK$, calls $QMCRL with the right arguments, and then returns. As 3.1 tasks didn't exit with status, you can not directly check the completion status of tasks invoked in this fashion; you'll have to improvise your own status notification mechanism.

Something bothers me about your question. I assume you have retrofitted a BRU from a later release and are using it under 3.1, as 3.1 did not contain BRU. Please be very careful doing this sort of thing. Even though it may work correctly on your RL01s, you may just have lucked out. Do not assume that BRU will work with any other disk under 3.1, or even that another release of BRU will work with your RL01s under 3.1.

By Jim McGlinchey

I will try to respond to interesting questions that are applicable to the general RSX user. Please mail your questions to: RSX Clinic, DEC PROFESSIONAL, P.O. Box 503, Spring House, PA 19477-0503, or leave them in the suggestion box on ARIS. Dial (215) 542-9458.

READ FROM A TERMINAL, WITH TIMEOUT

QUESTION: I have been trying to implement a "read with timeout" routine on a PDP-11/70 with RSX-11M Version 3.2. The planned process was first to set an AST to execute after the timeout interval, issue an asynchronous read, then wait for either the AST or the read to complete. The last step was to cancel the Mark Time request in case the read was successful. My problem arose in the last step. To the best of my knowledge, the Cancel Mark Time (CMKT$) didn't cancel, and, even though the read was successful, the AST routine would execute after the specified time or enough mark time requests would build up to deplete the pool if the time, period were long enough. Was there a known problem with RSX-11M Version 3.2 and the Cancel Mark Time Directive? We are waiting for the M-PLUS 3.0 release.

REPLY: *Yes, Version 3.2 of M did have a problem with the Cancel Mark Time Directive. It never did work correctly. The technique you describe is the correct one to use. It's good that you are planning to upgrade to a new release, as this problem has been solved directly in the current RSX Terminal Driver. All Read QIOs issued to a terminal now have a timeout parameter, and timed-out reads simply return the error code IS.TMO to the issuer.*

BOOTING FORTH SYSTEM FROM RSX

QUESTION: We operate a PDP-11/34 in an environment where it is necessary to shift between an RL02-based RSX-11M system and a stand-alone FORTH system, booted from mag tape. Our problem is that we would like to be able to switch between these two systems by means of remotely issued software commands. Going from FORTH to RSX is easy—a FORTH word just loads the RL02 boot address into the program counter. The problem is how to define an RSX command file that enters a "forbidden address," namely that of the MT boot (773404) into the program counter without being defeated by all the RSX features designed to preserve the system integrity. Can RSX be made to defeat itself under these conditions?

REPLY: *To get direct access to the I/O Page registers for something like this, use the SWSTK$ command from a privileged program. The code you want to use is listed below. The program's APR 7 will be mapped to the I/O Page, and, therefore, can access the Mag Tape Boot location. You must be a privileged user to run this program.*

```
; FLOAD.MAC
;
        .MCALL SWSTK$
START:: SWSTK$ 10$          ; Destroy System Integrity
        JMP    @#173404     ; by issuing MT boot
10$:    HALT                ; never (HA!!) gets here.
        .END   START
```

The commands for assembly, task building and execution are:

```
MAC FLOAD,FLOAD/-SP=LB:
 [11,10]RSXMC,SY:
 <UIC>FLOAD
TKB FLOAD/-CP/PR:
 5,FLOAD=FLOAD
RUN FLOAD
```

Now for the caveats. "Execution" takes on an entirely new meaning here, as this code stops RSX dead in its tracks. Before you run this program, make sure that all tasks have exited, all files have been closed, and all users have logged off.

LET'S C NOW

The Run-Time Library — Part II

By Rex Jaeschke

Occasionally, it is necessary or desirable to manage storage dynamically, at run-time. This capability is provided by the library functions **calloc**, **malloc**, **realloc**, and **free**. This dynamically managed space is often referred to as the heap, and its size may vary from zero bytes up to some implementation-defined limit. On some implementations, the maximum size of the heap is inversely proportional to that of the stack because both must share the same fixed-size memory segment. On other systems, the heap, the stack and the user program must share the same total space.

On a PDP-11, a task's address space is 64K bytes and the larger the task size, the smaller the amount of heap available. On RSX, the allocation of heap might be implemented using the Extend Task Directive which (typically) causes the size of the task to grow. If the task cannot be extended in place in memory, it will have to be checkpointed to disk and reloaded into a new memory location that has room for its expanded size. Other operating systems may have techniques to shuffle in-memory. The mechanism also may vary from single- to multiuser systems.

Regardless of the heap location and management method, it is possible that heap space is not always available, particularly if it shares space with the stack. As we have seen, the size of the stack in use depends quite a lot on the flow path of the current invocation of the program. Therefore, it is wise to detect the heap full condition and to deal with it in an appropriate manner.

The calloc Function

The following example demonstrates the use of **calloc** in allocating space for 10 characters. When the program no longer needs this space, it releases it via the **free** function.

Editor's note: This month Mr. Jaeschke continues with his series on the C Run-Time Library and, in particular, he sheds some light on the memory allocation functions. Where existing practice is varied or unclear, he uses the proposed ANSI function definitions. The exit function is also discussed.

```
/* heap1.c - allocate and free storage */

#include <stdio.h>

main()
{
    char *calloc();
    char *pc, *pc1;

/* get storage for an array of 10 chars */

    pc = calloc(10,1);

    if (pc == NULL) {
        fprintf(stderr,"heap full\n");
        exit(1);
    }

/* display initial contents of area */

    printf("value is %d %d %d\n",
        *pc, *(pc+5), *(pc+9));

    pc1 = pc; /* save start address */

/* initialize area with a string */

    *pc++ = 'A';
    *pc++ = 'B';
    *pc++ = 'C';
    *pc++ = 'D';
    *pc   = '.';

    printf("string stored at pc1 = >%s<\n",pc1);

/* initialize area with another string */

    pc1[0] = 'H';
    pc1[1] = 'e';
    pc1[2] = 'l';
    pc1[3] = 'l';
    pc1[4] = 'o';
    pc1[5] = '.';

    printf("string stored at pc1 = >%s<\n",pc1);

/* release allocated space */

    free(pc1);
    exit(0);
}

value is 0 0 0
string stored at pc1 = >ABCD<
string stored at pc1 = >Hello<
```

Note that **calloc** is declared to return a **char** pointer. This declaration is often included in the header file **stdio.h**. The ANSI Standard has it in the header **stdlib.h**, which will require many existing programs to be changed.

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In this example, the data to be stored in the allocated space happens to be type **char**. However, any type could be stored there, provided sufficient space were available. In any case, **calloc** still returns a **char** pointer and that must be cast to the appropriate pointer type before use. The ANSI Standard defines the memory allocation functions as returning the type pointer to **void**, which is written as **void ***.

The first argument to **calloc** is the number of elements to be allocated, and the second argument is the size of each element in bytes. In the above example, space for 10 one-byte elements is requested. If the requested space can be allocated as a contiguous chunk of memory, it is, and the address of the start of the allocated area is returned. If insufficient room is available, or if the number of elements or their size is zero, a **NULL** pointer is returned.

In the example, both arguments have type **int**, which on many implementations is a signed quantity, which could lead to problems if either or both arguments have a negative value. The ANSI Standard has introduced a pseudo-type called **size_t** which is the type returned by the compile-time operator **sizeof**. Both arguments to **calloc** have this type. Hence, the ANSI function prototype for calloc is:

```
void *calloc(size_t nelem, size_t size);
```

In its simplest form, **size_t** could be defined using:

```
    typedef unsigned int size_t;
or  typedef unsigned long int size_t;
```

If **calloc** expects unsigned integer values and constants such as 10 and 1 are passed, this will work on DEC machines because their sign bit will be zero. However, if the arguments are negative, they will be interpreted as large positive values, so care should be taken when porting this kind of code.

Instead of using a size of 1, a better, more obvious method is to use:

```
pc = calloc(10,sizeof(char));
```

therefore, making the code more portable. It also requires no knowledge of the compiler's specific storage requirements. While the latter reason may seem trivial with type **char**, it is most important for structures and unions, where alignment and holes may be involved. For example:

```
struct s {
     int i;
     double d;
     char ca[10];
};

f()
{
     struct s *ps;

     ps = calloc((size_t) 5,sizeof(struct s));
}
```

allocates space for an array of five structures of type **s**. By casting the number of elements to type **size_t**, we can guarantee that the argument will be interpreted correctly, provided **calloc** expects such an argument (as it does in ANSI-conforming environments).

The space allocated by **calloc** is initialized to all-bits-zero. This is demonstrated by displaying elements 0, 5 and 9 of the **char** array **pc**. Note that on the PDP, VAX and Intel 8088 machines, integral and floating point representations (as used in C) of zero just happen to be all-bits-zero, in which case, **calloc** initializes all elements to zero. This is also true for pointers, so they are set initially to the NULL pointer.

Note that this is not guaranteed by C; **calloc** sets all bits to zero and says nothing about any type's representation. For example, on some machines, a floating-point zero is not all-bits-zero, in which case, any **double** allocated by **calloc** will not be set to floating-point zero; Likewise for pointers. An implementation may not use an all-bits-zero value for the **NULL** pointer. Beware when porting such code.

External and static variables have a default initial value of zero cast to their type and, as just stated, this may be quite different from the all-bits-zero set by **calloc**.

```
f()
{
     static double sd;
     double *pd;

     pd = calloc(1,sizeof(double));
}
```

In short, the value of **sd** may not be the same as ***pd**.

Since **pc** points to the first character of the allocated space in **heap1.c** above, we can use the statement ***pc++ = 'A';** to initialize it. In fact, pc is just a char pointer and can be used as such, even though it points to an area on the heap rather than to a local or global variable. As the **++** operator is used, the address pointed to by **pc** changes with each assignment. For this reason, we copy the starting address into **pc1** before changing **pc**. As we shall see later, we need to remember that starting location.

In previous installments, we have seen that a pointer

can be subscripted so it behaves like an array. Therefore, **pc1** can be so subscripted without changing the actual address pointed to by **pc1** (which remains as **&pc1[0]**).

The free Function

This function can be used to release space allocated by the **calloc**, **malloc**, and **realloc** functions. The **free** function has only one argument, a pointer to the start of the allocated space, and has no return value. This is why we needed to preserve the value returned by **calloc**, and we did so by copying it to **cp1**.

If the pointer given to free is **NULL**, no action occurs. However, if the pointer was not one previously returned by an allocation function, or if the space pointed to already has been released, the behavior is undefined. Similarly, if you access an area after the pointer to it has been released, the results are unpredictable.

If space were allocated by a program and not released by free, it will be released automatically by the termination code of the startup module linked in with the user's program. However, it is a good idea to release such space explicitly. Of course, any released space immediately can be allocated again for other purposes.

Note that the heap may become fragmented. Consider the case where five areas each of 100 bytes are allocated such that only 50 bytes remain available at the end of the heap. If areas 2 and 4 are released by **free**, that makes 250 bytes available for allocation, but as 2 x 100 bytes and 1 x 50 bytes. An attempt to allocate a 250-byte area will fail. Heap space can not be shuffled to make free areas contiguous because this would cause all currently active base pointers returned from **calloc** to point to the wrong place. So, if you plan on allocating and releasing heap space regularly, or in big lots, you should design your program accordingly. You may even find it better or necessary to allocate one large area and to manage it yourself so you can do garbage collection.

The ANSI function prototype for **free** is:

```
void free(void *ptr);
```

The malloc Function

This function is very similar to **calloc** except it allocates a given number of bytes and does not initialize them. For example:

```
/* heap2.c - allocate with malloc */

#include <stdio.h>

main()
{
     char *malloc();
     double *pd;

/* get storage for an array of 10 doubles */

     pd = malloc(10 * sizeof(double));

     if (pd == NULL) {
          fprintf(stderr,"heap full\n");
          exit(1);
     }

/* initialize area with a string */

     pd[0] = 1.234;
     pd[1] = 2.345;
     pd[2] = 3.456;

/* release allocated space */

     free(pd);
     exit(0);
}
```

The ANSI function prototype for **malloc** is:

```
void *malloc(size_t size);
```

The realloc Function

This function can be used to increase or decrease the current space allocated as follows:

```
/* heap3.c - allocate and reallocate */

#include <stdio.h>

main()
{
     char *calloc(), *realloc();
     char *pl;

/* get storage for an array of 10 longs */

     pl = calloc(10,sizeof(long));

     if (pl == NULL) {
          fprintf(stderr,"heap full\n");
          exit(1);
     }

/* decrease the allocated space */

     pl = realloc(pl,5 * sizeof(long));

     if (pl == NULL) {
          fprintf(stderr,"heap full\n");
          exit(1);
     }

/* increase the allocated space */

     pl = realloc(pl,25 * sizeof(long));

     if (pl == NULL) {
          fprintf(stderr,"heap full\n");
          exit(1);
     }

/* release allocated space */

     free(pl);
     exit(0);
}
```

First, space for 10 **long** values is allocated. Then that area is decreased to five **longs** (that is, space for the last five values is released). Finally, the area is increased to accommodate 25 values.

If the first argument to **realloc** is **NULL**, **realloc** behaves like **malloc**. If the area being allocated is decreased, it is truncated with all remaining values being preserved. If the space is increased, the initial value of new space is undefined (just as for **malloc**). The second argument specifies the new allocation size in bytes. This is an absolute value: It is NOT relative to the current size.

If the first argument points to an area not currently allocated or to some value other than that returned by a previous **calloc**, **malloc** or **realloc**, the result is undefined.

The return value points to the start of the new allocated area, or **NULL** if the area cannot be allocated. In the latter case, the object stored at the old pointer remains unchanged. It is possible to release an area by reallocating with a new size of zero. In this case, **realloc** behaves like **free**.

Note that when the area is increased from five to 25 objects in the example above, the value of **pl** may change. If the space for the extra 20 objects cannot be added contiguously to the existing space, a new area is allocated, the existing data copied there, and the old space released. This activity is all transparent to the user. Therefore, don't assume **realloc** will return the same value on multiple calls, even if you "know" there is contiguous space available.

The ANSI function prototype for **realloc** is:

```
void *realloc(void *ptr, size_t size);
```

The void Pointer

This concept has been introduced by the ANSI Standard to give a specific type to a generic pointer such as that returned by the allocation functions. These functions must allocate space such that the pointer returned can be cast meaningfully to any data pointer type. If this were not the case, then alignment problems would result on machines such as the PDP-11, which requires all word operations to be performed on even addresses.

```
f()
{
        int *pi,i;
        double *pd,d;
        char *calloc();

        pi = *calloc(sizeof(int));
        pd = *calloc(sizeof(double));

        i = *pi;
        d = *pd;
}
```

If **pi** and **pd** don't point to even addresses, the two latter assignments would produce Odd Address Traps, which are usually fatal unless trapped by the user. Therefore, the allocation functions must return a pointer that satisfies all alignment requirements. This includes structures and unions, and arrays thereof, as well as scalar variables. Note that in the above example, an Odd Address Trap can never be produced by the assigning of **pi** and **pd** because these pointers can hold any address value. It is only when these points are dereferenced that the error conceivably could occur if **calloc** were ignorant of alignment requirements.

The **void** pointer is being implemented with newer compilers. It behaves much like a pointer to **char** and on many systems the two will be identical. However, a **void** pointer is a different type than a **char** pointer, even if it has similar characteristics. A **void** pointer can be used as an argument to a function, as a return value, and to hold a data pointer of any other type. However, a **void** pointer can never be dereferenced because an object stored at a **void** pointer location has no size and type attributes. Therefore, a void pointer first must be cast to some other pointer type before being dereferenced.

Data pointers freely can be cast to and from a **void** pointer without loss of information. On many existing machines, all data pointers have the same size. However, on newer machines and existing word-addressed machines, pointers to different object types may have different sizes and casting one pointer type to another may not be so straightforward.

The exit Function

Throughout this series of articles, the **exit** function has been used to terminate a program prematurely, but in a controlled fashion. In the heap examples above, **exit** has been called with an argument of 1 whenever the required allocation fails for any reason. It is called with an argument of 0 if the program completes successfully. The value and meaning of exit codes are mostly implementation-defined, except that a value of zero typically means Success. (Exit codes under VAX/VMS are treated somewhat differently because zero implies an error. Therefore, the VAX-11 C compiler uses different values and you should read the compiler manuals for details.)

Why have an exit value? Well, on systems like UNIX

and MS/PC-DOS, this value can be tested from the command-language interface and appropriate action can be taken. For example, if a compiler returns a nonzero exit code when at least one fatal compilation error is detected, any subsequent link command in the command stream can be skipped. There is no point linking if there were compilation errors. The same thing can be achieved with application programs, however, not all systems provide a mechanism to get at a program's exit code.

On a hosted system, C programs are linked typically with a vendor-supplied startup module which initialized file tables, hardware registers, etc. Then it transfers control to the **main** function in the user's program using something like:

```
#define MAXARGS 32

_main(cmdline)
char *cmdline;
{
     int argc;
     char argv[MAXARGS];

     /* setup cmd-line args */

     /* ... */

     /* xfer control to user */

     exit(main(argc,argv));
}
```

Using this approach, the value returned from **main** becomes the **exit** value unless the user program explicitly terminates with a call to **exit** itself. Therefore, a call to **exit** at the end of **main** is the same as using the same exit value as the operand to a **return** statement.

Note that in the above heap examples, the programs always exit with a predictable value. If the **exit(0)** statements were removed, the **main** functions would behave as if a **return;** statement were executed, in which case, some undefined value (possibly 1) would be returned to the startup code. The rule, then, is if you terminate a program in one place via a call to **exit**, you should do so in all possible exit places, otherwise, you run the risk of generating a bogus exit code.

A popular belief is that, by falling through the final closing brace of **main**, a call to **exit** with value zero is implied. This is not guaranteed, although it is certainly the case with a number of popular compilers. They achieve this by using something like:

```
_main(cmdline)
char *cmdline;
{
     /* ... */

     /* xfer control to user */

     main(argc,argv);
     exit(0);
}
```

Here, any value returned from **main** is ignored and the program exits with a value of zero. You can check your compiler for this by writing the following program:

```
main()
{
     return (12345);
}
```

If the exit code tests zero, the returned value is being ignored and this is a bug, because a **return** with value from **main** is quite legitimate. After all, function **main** has a return type of **int**, not **void**, so any legitimate **int** value can be returned. Since this bug is common, you should use **exit(expr)** instead of **return(expr)**.

Next issue we'll continue with the run-time library by removing some of the mysteries from **stdio.h** and **FILE** pointers in particular. Readers are encouraged to submit any C-related comments and suggestions to Rex Jaeschke, 2051 Swans Neck Way, Reston, VA, 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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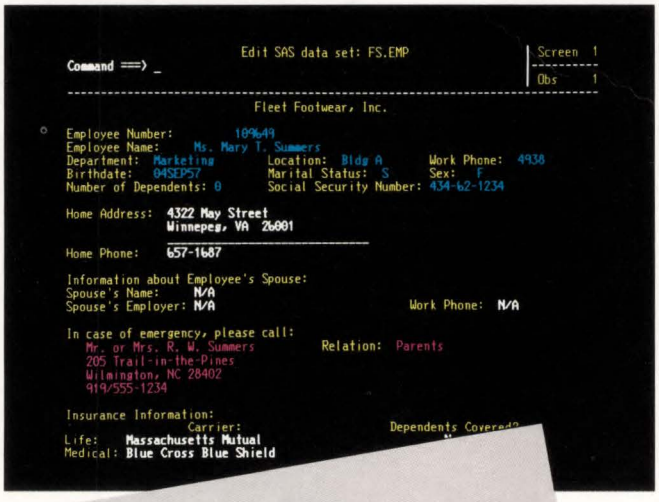

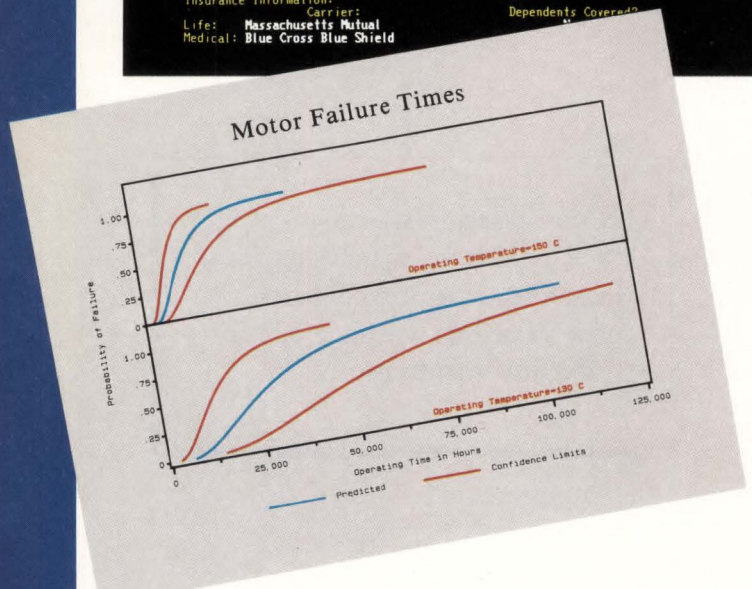

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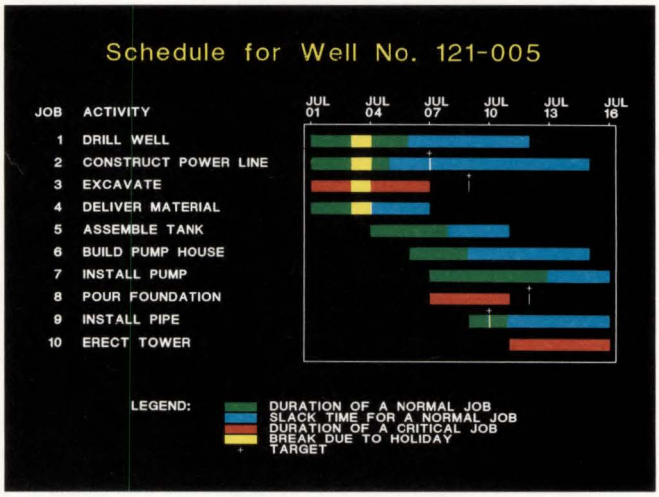

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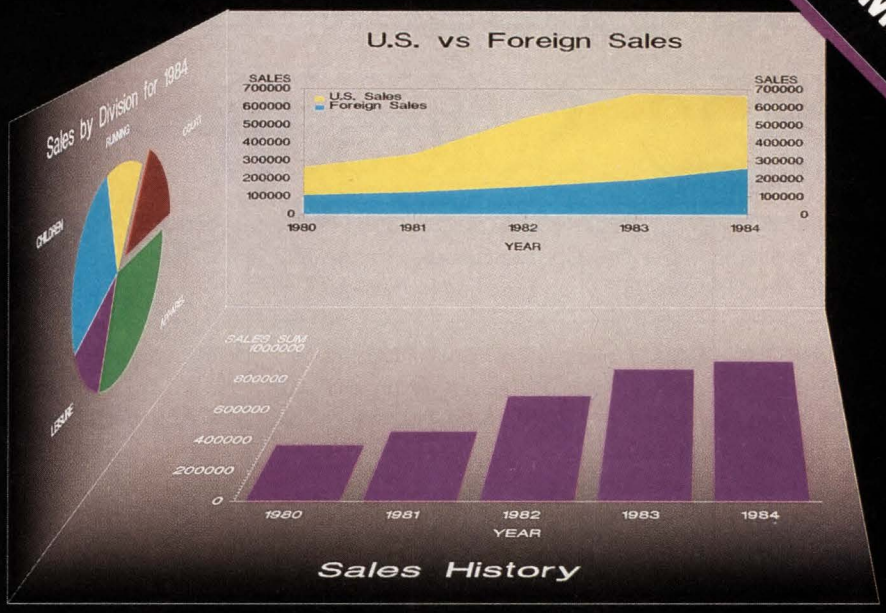

Cost Estimation Performance Report

		Category						Total	
		Labor		Material		Overhead			
		Estimate	Cost	Estimate	Cost	Estimate	Cost	Estimate	Cost
		in $1,000s	in $1,000s	in $1,000s	in $1,000s	in $1,000s	in $1,000s	in $1,000s	in $1,000s
Estimator	Job								
Barbour	2618	549	538	715	763	101	103	1,365	1,404
	2635	619	624	312	298	82	81	1,013	1,003
	2645	589	581	425	423	86	85	1,100	1,089
	2695	119	124	98	103	18	19	235	246
	All Jobs	1,876	1,867	1,550	1,587	287	288	3,713	3,742
Murphy	Job								
	2647	149	144	267	254	32	30	448	428
	2651	748	727	538	523	109	106	1,395	1,356
	2665	836	794	345	353	106	102	1,287	1,249
	All Jobs	1,733	1,665	1,150	1,130	247	238	3,130	3,033
Richards	Job								
	2620	459	483	635	663	87	91	1,181	1,237
	2630	272	246	547	536	62	59	881	841
	2640	632	601	741	698	111	105	1,484	1,404
	2670	239	227	394	347	49	45	682	619
	2680	317	322	296	201	50	45	663	568
	All Jobs	1,919	1,879	2,613	2,445	359	345	4,891	4,669
All Estimators		5,528	5,411	5,313	5,162	893	871	11,734	11,444

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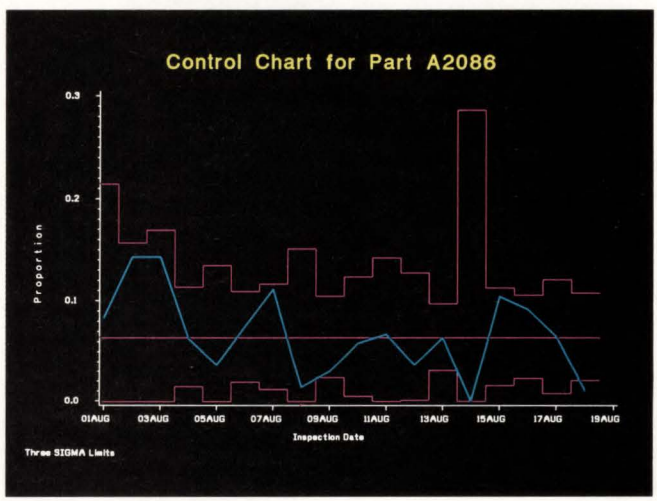

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FROM THE LAB

The Emulex CS23 Solution

By Dave Mallery

The *CS23*, from Emulex Corporation, Costa Mesa, California, is a hex-high UNIBUS-resident communications controller that is DHU compatible. In fact, in its simplest configuration, it emulates *two* of them for a total of 32 ports with simple, full-duplex (212-type) modem control. It is equally happy on the UNIBUS of a VAX or a PDP running RSX or RSTS.

The unit is capable of reconfiguring itself, with different distribution panels, into supporting smaller numbers of more complicated protocols, such as RS-423 and half-duplex modem control, that require more control lines (e.g., CTS/RTS).

In addition, for devices that don't support the DEC standard XON XOFF protocol for flow control, the first distribution panel (first DHU emulation) can be configured on a port-by-port basis to support three levels of hardware flow control (DTR).

Most of the above are rare birds and not part of the normal continental U.S. VAX/PDP installation. If you need them, you know you need them. My *CS23* came with a pair of 16-port CP22 panels.

The board has several other interesting features. The newer high-speed technologies used in its construction allow much greater (50,000 char/sec) aggregate baud rates during operation, bringing at least a few really high-speed lines into the realm of possibility. (Didn't you always want to see 19.2 and 38.4 KB?) Also, better UNIBUS bandwidth utilization is possible with the multiword DMA transfer option and the controller's ability to gracefully relinquish bus ownership to a higher priority grant request.

I had received the board the Friday after DEXPO. On Sunday, I went into the 750 to add the last two megabytes of memory that also had arrived (#7 and #8). I could hear Murf laughing as I powered the CPU back up and the console informed me that TXC0-7 and TXD0-7 no longer were there. (They were there, but the board had lit up its failure light and left town . . .) Well, no time like the present for the new Emulex! I should note that the previous configuration consisted of a Dilog and an Able VMZ-type board (16 channels each of DMF emulation).

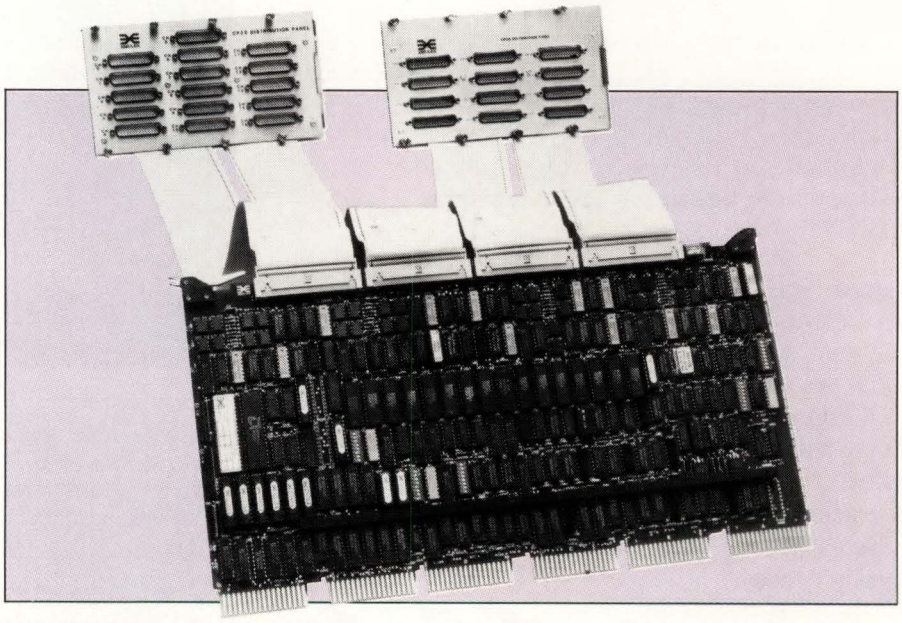
Normally, I like to do hardware installations slowly and spend a long time digesting the manual (because I'm going to both write about it and live with it). Not so today. The 750 is our main machine for editorial production and for our **A**utomated **R**eader **I**nformation **S**ervice (ARIS). It can't be down if there is any reasonable way to keep it up.

Out with the two VMZ-type boards. I checked SYSGEN for the proper configuration:

```
$ run sysgen
sysgen>config
device>dhv11
device>
```

Device: DHV11 Name: TXA CSR:760440* Vector: 300* support:yes

The switches were set just so from the factory. First, a dual bus grant card into one of the empty slots, and then the *CS23* into the other. (I had the bus grant wires pulled from both before for the prior inhabitant.) Deep breath, and up she came. When I ran SYSGEN again, I got the only surprise of the day. DHUs are 16-line devices; I had TXA0-15



This CS23 has a CP26 panel installed on the first emulation. This yields only 12 ports (vs. 16 on adjacent CP22), but these 12 have extended *modem control at the price of 4 fewer ports. The re-configuration is transparent and is done by the cabling.*

and TXB0-15 instead of the previous TXA0-7, TXB0-7, TXC0-7 and TXD0-7. I only had to edit the terminal characteristics part of SYSTARTUP.COM. Fortunately, the existing cables and distribution panels worked fine, so there was no need to pull the lot and recable! I must have done good deeds at DEXPO!

I wrote this article Sunday evening on the new board. My first attempts to try 19.2 KB failed. First, the 19.2 wouldn't go through my Equinox data PBX. At least not on the rev level boards I had in there at the time . . .

I tried to connect to one of the ports that was not going through the Equinox (we use them for modems and fixed printers). No cigar. Then I went back to see if that port worked at all.

These investigations yielded the fact that the port I had been trying to use for my 19.2 experiment didn't seem to work. In addition, the dial-in modems were connected to adjacent ports and I noticed that they didn't have DTR lit; therefore, they didn't answer the phone.

Now it was time to read the manual!

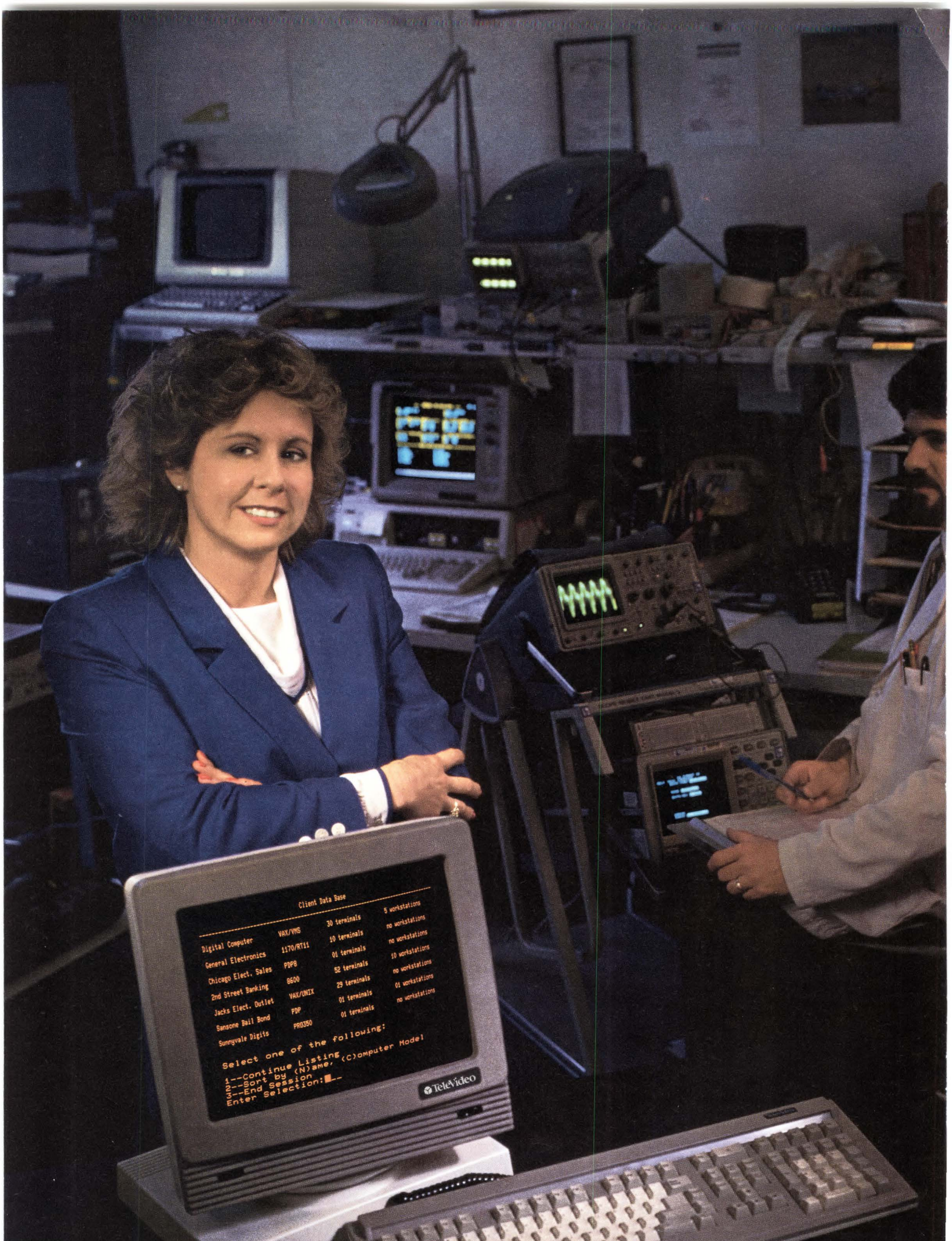
The next morning, all was solved. First, the manual shows that the signals that control the modem (DCD and RI) were not activated; in fact, they were deactivated by factory jumpers. You can select whether modem control will work on a panel-by-panel basis. The manual does not make this entirely clear and presumes you know what DCD and RI actually do! In addition, I discovered a few cable problems. Describing cabling is probably the most difficult job facing a hardware documentor. You have to take the illustration *literally*, even if it means standing on your head to get the right orientation. After 10 years of hardware, I still have the axiom that if it doesn't work the first time, you got the cables wrong again, dummy!

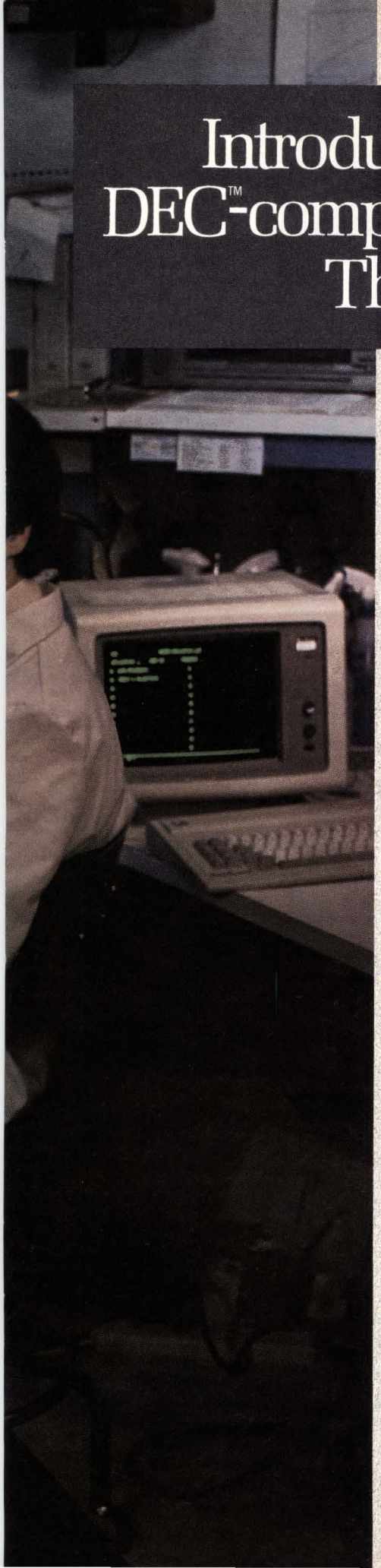
The other change I made (after *really* reading the manual) was to allow multiword DMA transfers. This is done via SW2-4 and is a nice performance enhancement for those full-screen paints.

Then I was ready for another try at 19.2.

I wrote this paragraph at 19.2 KB. I must say that the slow scroll feature of the terminal takes all the fun out of it! Now, I could reconfigure my Talaris laser printers' QMS boxes to run at 19.2, greatly increasing the speed of the font-loading process, as well as the general throughput.

The *CS23* has been yet another fine Emulex offering, continuing the tradition of spoiling the user.


Client Data Base
Digital Computer VAX/VMS 30 terminals 5 workstations
General Electronics 1170/RT11 10 terminals no workstations
Chicago Elect. Sales PDP8 01 terminals no workstations
2nd Street Banking 8600 52 terminals 10 workstations
Jacks Elect. Outlet VAX/UNIX 29 terminals no workstations
Sansone Bail Bond PDP 01 terminals 01 workstations
Sunnyvale Digits PRO350 01 terminals no workstations
Select one of the following:
1--Continue Listing
2--Sort by (N)ame, (C)omputer Model
3--End Session
Enter Selection:
TeleVideo



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Susan Kennedy is a product analyst at Leasametric, a company that rents, sells, and services DP equipment all over the country. Including thousands of terminals. And if reliability is important to the average user, it's critical to Leasametric. Because everything they offer not only has to stand up to the rigors of shipping, but the extra wear and tear that rental equipment always takes. And if a Leasametric machine breaks down, so does the cash flow it generates.

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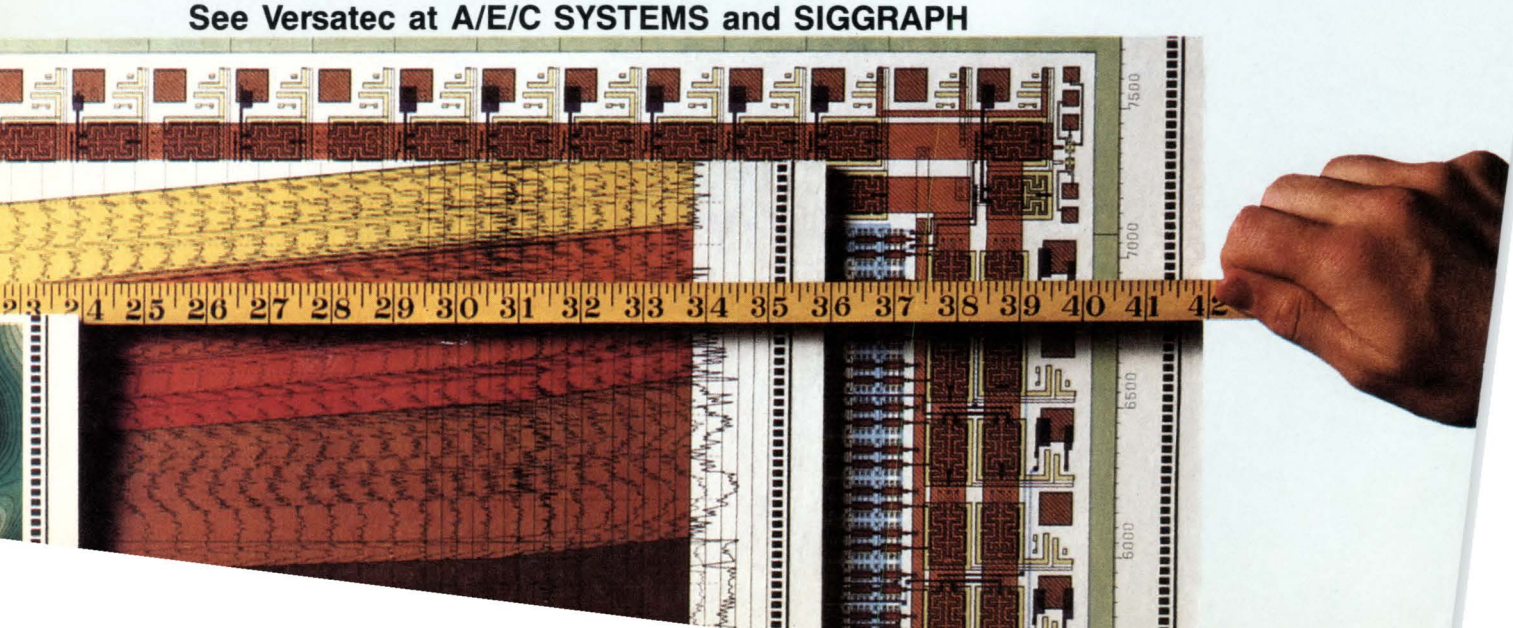

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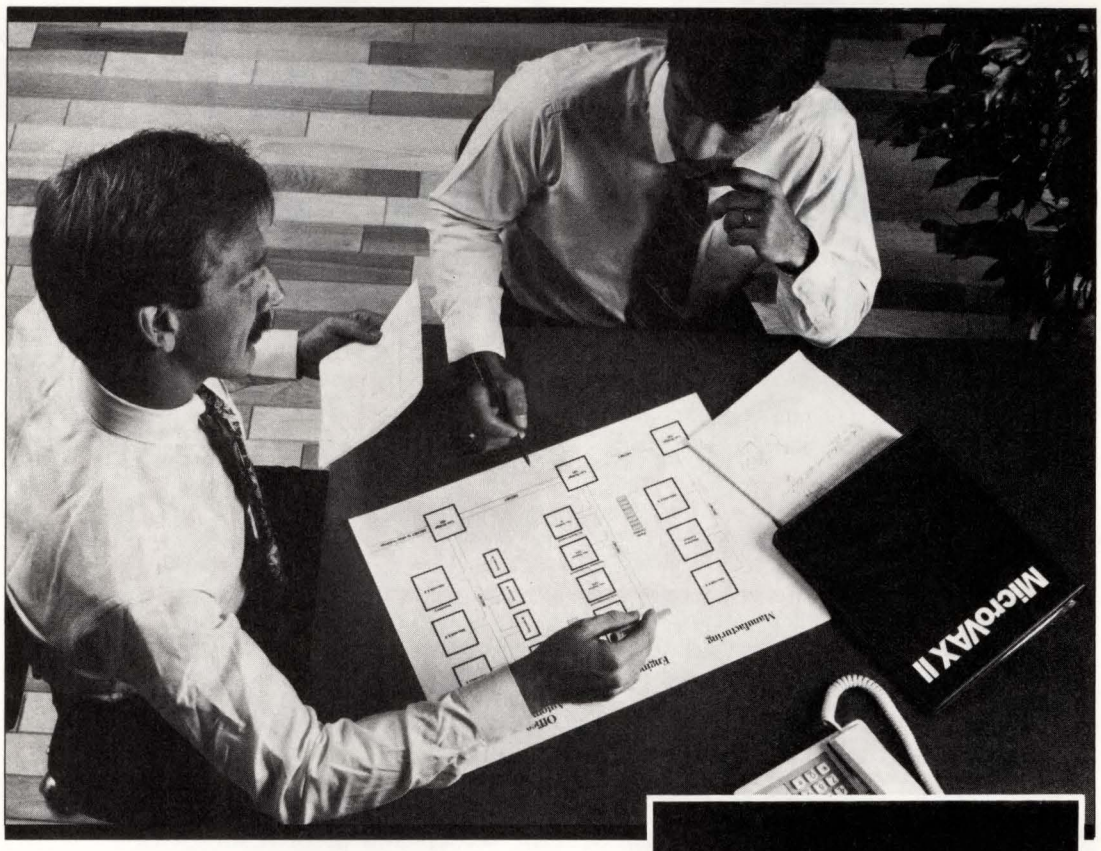

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IT'S 2:28 AM

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.

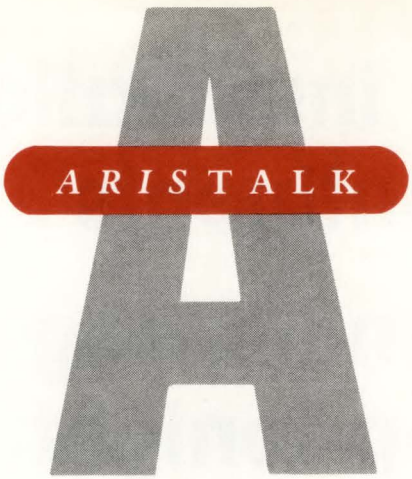
He dialed into a non-priv account,let himself in through a back door ([1,82]xTSK(232)].

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



PDP TO VAX

QUERY:

Steven Fisher: I frequently transfer data between our PDP 11/73 and a VAXcluster over telephone lines. Our PDP is running TSX+ 5.1C, and I use VTCOM to transfer the files. If a file that I am transmitting is large, after a while the VAX receiving the file thinks that I am finished, and that the remaining data are VMS commands (I have used both EDT and "Create" to get the VAX to store the data). DEC has TRANSF to talk between PDPs—why nothing for transferring from a PDP to a VAX?

REPLIES:

Ruth A. Lorenzen: RT-11 version 5.03 has a TRANSF for VAX/VMS.

Doug Schneyman: I use a product called: *CALOUT+* from Clyde Digital Systems, (801) 224-5306, to communicate between PDP 11/73 RSX and VAX/VMS. Try it!

David Beorn: Have you tried using EDT in Insert mode?

Augie Freda: We had a similar problem with transfer between a PRO and the VAX, as well as between a DEC Rainbow and the VAX. Your transfer software may be working fine, and you just may be seeing a buffer overflow going one way or the other. On the VAX end, be sure that the terminal port you're hooked into is set for HOSTSYNCH (SET TERM/HOSTSYNCH) which will allow for complete communication of the XON/XOFF signals. You also may want to look into *POLYxfr* from POLYGON Associates. Hope this helps!

How To Use ARIS

If you are a subscriber to the *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, 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 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.

Chris Ruhnke: You are probably encountering an input buffer overflow on the VAX end. If setting the VAX terminal for HOSTSYNCH doesn't clear the problem, also try setting the terminal for the ALTYPEAHD alternate type-ahead buffer. The default settings are usually 72-character buffers for type-ahead buffering and 200 characters for alternate type-ahead buffering. The terminal driver will send an XOFF at about 60 percent buffer load (if HOSTSYNC is enabled).

Bonnie Auclair (SYSOP): We had a similar problem transferring DECmate documents to the VAX. HOSTSYNC wasn't enough. We needed ALTYPEAHD.

Layton Galbraith: Use the public domain program Kermit for transferring your files. There are versions for the VAX and PDP and everything else in the world.

Ted Bardusch: I suggest that you use Kermit, the FREE file transfer protocol, to move your data around. It is much preferable to the alternatives available these days, since it's free and runs on darn near any computer. You can get the VMS version from the DECUS symposium tapes, and the rest from Columbia University if you need the full distribution.

Phil Anthony: Would love to get hold of a copy of Kermit in some standard DEC language (like MACRO-11 or BP2/CSPCOM) to run under RSTS/E. If you can help, it'd be greatly appreciated.

By the way, how the !$@*?!? does EDT work? I'm an old TECO buff myself, and the Sperry PC/IT I'm work-

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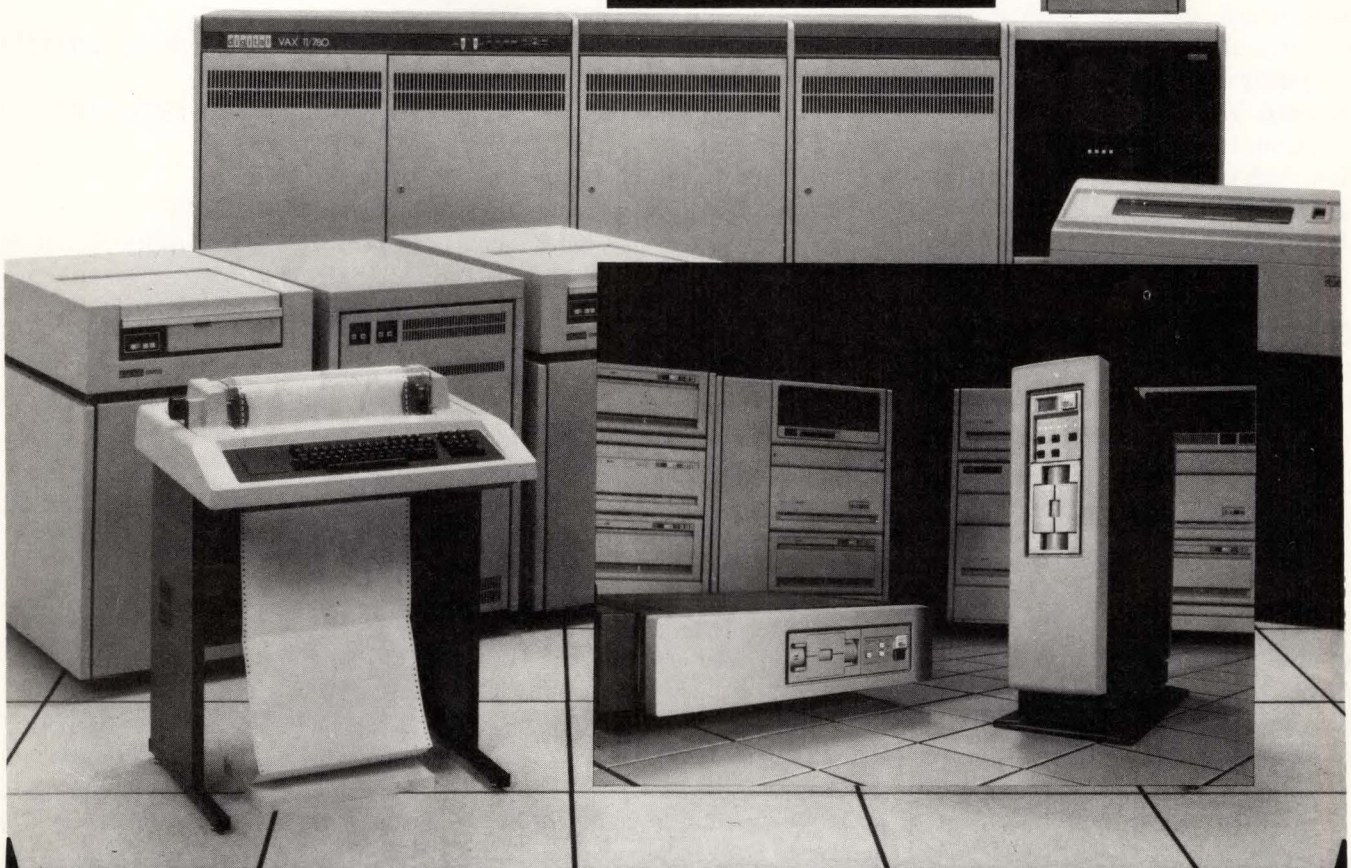

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ing from doesn't have any keys labelled PF3 or whatever this silly editor wants.

Kenneth Kemp: We have a similar situation at my office. We wanted to transfer daily accounting information from Micro-11s and Micro-73s in the field to our 750 at the central office. We use TSX+ and VMS and all programs are written in DIBOL, but this should work for other languages as well. The PDP has a program that autodials and logs into the VAX by WRITES statements for transmitting and READS statements for receiving. Upon receiving the DCL prompt, it WRITES "R programname" to execute a program on the VAX. The program on the VAX and the program on the PDP then transfer the data by using more WRITES and READS statements. To ensure that the data is not corrupted by the long distance lines, each transmitted record contains a hash total which the VAX verifies, and responds OK or NOK to the PDP. This is certainly nothing fancy, but it is very effective. We have been transmitting data from 10 sites for a year and a half now, with extremely impressive results. Bidirectional communication is now in the works.

ERRATIC RING-DETECT

QUERY:

Ron Parker: We bought DF224 modems when they first came out . . . but they seem to be a bit erratic at ring-detect: They sometimes decide not to answer. Have checked the obvious, like TR and the DIP switch settings. Any other occurrence of this problem?

REPLY:

Bill Mayhew: We had problems with early DF224s too, particularly failure to recognize a carrier after autodialing a number. There is an ECO/FCO that fixes "several problems." Yours may well be one too. Assuming you are under warranty, contact Field Services.

PACKED DECIMAL NUMBERS

QUERY:

Bill Gutschow: Is there anyone out there who has bumped into a simple way to convert packed decimal numbers from an IBM EBCDIC tape? We tried a DEC 2780/3780 Emulator, and also a simple read of the tape, and then convert using System Library Routines. Both work great until a packed field is encountered, then all bets are off!

REPLY:

Brian Hulse: I believe that the 2780/3780 package should work. I work for Software Results which makes the COMBOARD (front-end that emulates 3780 or HASP or SNA workstations on DEC). Several of our customers successfully use it for the packed decimal field format.

We need a reliable source for 9-track tape to TK-50 duplication. Any references will be appreciated. I'm frustrated!

CAPTURED CURSOR

QUERY:

Dr. Scott E. Siddall: We have had inordinate difficulty installing dBASE-II on a PRO 380 with the CP/M card. Can't seem to get the direct cursor escape sequences through the card to P/OS, then to the screen for full screen editing. Rainbow sequences don't work. Suggestions are very welcome.

GRADING UPGRADES

QUERY:

Jedoss: We currently are considering upgrading an 11/24 and/or saving an 11/34 from certain death by upgrading processing and memory capabilities via third-party products (in particular, Nissho.) These products have been given fairly favorable reviews by those in various quarters, but how about the users? Can anyone offer any information, pro or con, about these products? Many thanks!

INTERRUPTED RDB ON PASCAL

QUERY:

Curtis Snyder: I am running RDB under VAX/PASCAL using RDB$ INTERPRET. I am avoiding the precompiler in this instance, due to the complexity of the search involved. I am able to send values to RDB with the %DESCR passing mode; however, when I try to recover an array of character (varying, packed or unpacked), I get a fatal RDO error indicating an unsupported descriptor class. The DEC help line was temporarily stumped, and has not been able to get an answer for me. Sample code is as follows:

```
PROGRAM TEST (INPUT,OUTPUT);
TYPE
CHARRAY = PACKED ARRAY
 [1..12] OF CHAR;
VAR
CHRAY : CHARRAY;
[ASYNCH,EXTERNAL]FUNCTION
 RDB$INTERPRET(COMMAND :
 VARYING[D] OF CHAR):
 INTEGER;
EXTERNAL;
begin
{init database etc}
rdb$interpret ('GET !VAL =
 USERNAME END_GET',%DESCR
 CHRAY);
...{FINISH THE PROGRAM}
```

VAX to HP

QUERY:

Don Boelling: I would like to know if anyone has a software utility that will allow file transfer and remote log-in from VAX to HP3000 (68 series). We have tried several schemes. HASP+ and

MRJE (2780/3780) work, but are not as foolproof as we would like. If you know of anyone, please let me know.

REPLIES:

Jaime Garmendia: Maybe you can use VMS Kermit. It does have dial-out capabilities. The only thing you need is a Kermit for the HP.

You can obtain information on Kermit for almost any computer out there from:

Kermit Distribution
Columbia University
Center for Computing Activities
612 West 115th street
New York, NY 10025

They will provide you with copies in any media, for the cost of the media only.

Another source is:

DEC-Market BBS
(617) 467-7437

To log-in type:
@log lcg.kermit KERMIT

The string in capitals is the password and will not echo. Good luck!

Jim Hobbs: If version 4.n of VMS is installed, you can use the SET HOST/DTE command to dial a modem and connect to the HP as if you had a terminal directly connected. With the advent of 2400-bps modems, dial-ups are not too slow anymore. Likewise, using the same type of connection, an FCOPY from a file to the terminal on the HP and a COPY from the terminal to a file may work. The catches are that the HP file must be 100 percent ASCII characters (no binary, no packed numbers). There is no protection from corrupted files. Kermit is available for both machines, and would ensure data validity.

SEMIANNUAL CUMULATIVE INDEX

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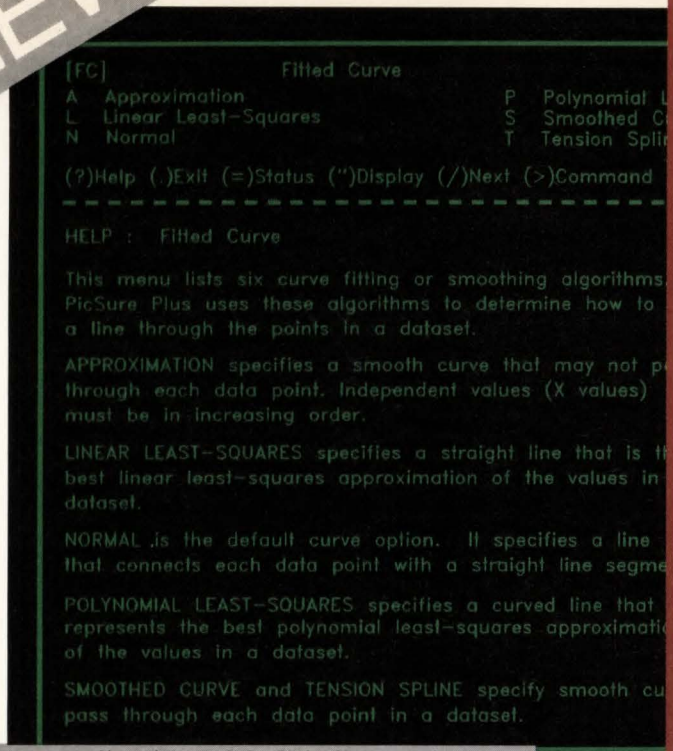
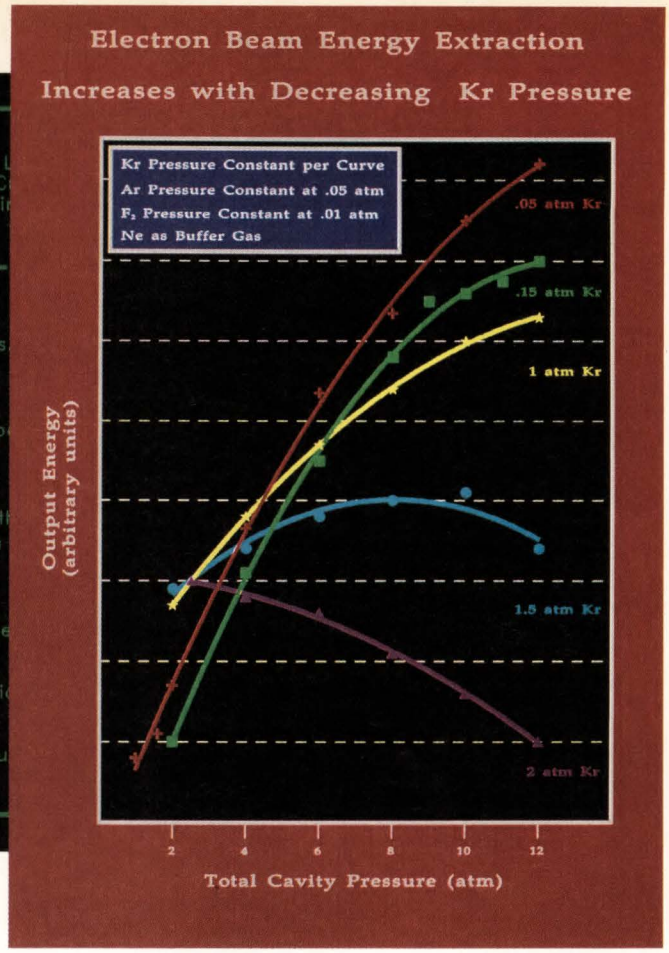


This image was created interactively using PicSure Plus' pushbutton prompting menu system. Features shown include data read from test instruments, color palette selection, LOCATOR positioning for text, and curve fitting. Menus can be tailored for specific applications. PicSure Plus is device independent. The image was previewed on a Tektronix 4105 connected to a VAX 11/785, with final output to a film recorder.



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PicSure Plus is an interactive graphics system for producing charts and graphs. Prompting menus guide novice or occasional users in creating line, bar, scatter, pie, text, and table charts. Experienced users can access PicSure Plus features by entering commands, or building tailored menus for specific applications and environments. These user-interface options offer a flexible gateway to the most powerful set of charting functions available today.

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☐ Powerful prompting menu interface speeds chart building for novice and occasional users ☐ Integrated command interface available for more advanced users ☐ Interactive positioning of all chart elements ☐ Directory keeps track of saved charts, datasets, command files, and metafiles—so users don't have to understand the computer's file system ☐ On-line tutorials and instant HELP facility for new users ☐ Easily combine multiple charts into a single image ☐ Draw charts simultaneously on multiple graphics devices for high production chart building ☐ Symbol creation for building flowcharts or illustrations ☐ Merge and annotate images created with other Precision Visuals products ☐ Read up to 10,000 datapoints from system files, or from other software packages ☐ Powerful numeric functions to perform arithmetic and statistical operations on your data ☐ Programmer's interface for accessing custom subroutines, databases, and the operating system ☐ Automatic layout and text sizing for word charts.

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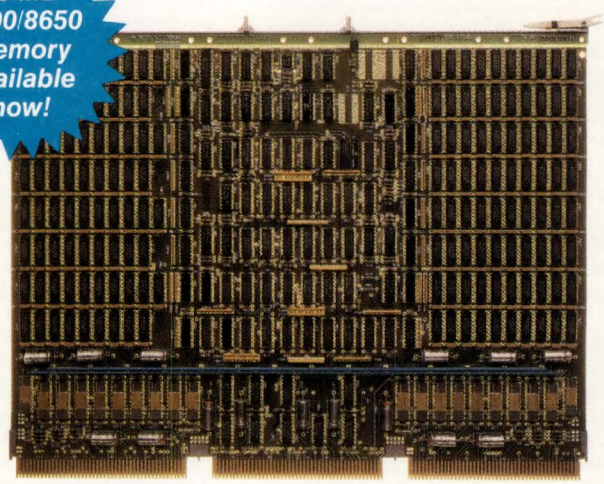

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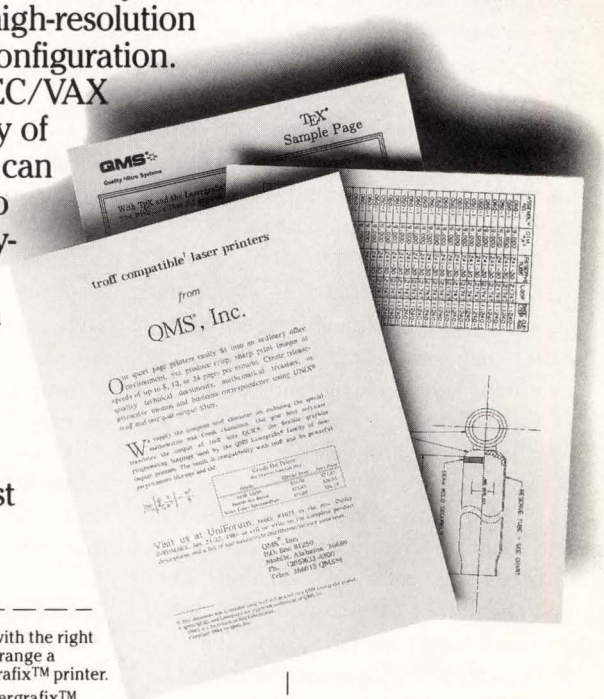

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'INSIDE *AutoCAD*'

Bruce Feldman

INSIDE AutoCAD is a guide for the use of this popular microcomputer software from Autodesk, Inc. The manual is intelligently designed and written by two expert users: One is the president of a computer graphics and market research consulting firm, the other, the publisher of the guide, is a biochemist and expert user and developer of pattern recognition software.

The volume is profusely illustrated with over 300 drawings of symbols, menus, visual ideas and finished *AutoCAD* designs from a variety of graphics-intensive fields. An important aspect of the manual is the useful quick help reference passages, including summaries and tips at the end of each chapter, and a glossary that contains microcomputer terminology as well as specialized CAD vocabulary.

INSIDE AutoCAD is a tutorial first, and manual second; i.e., topics are organized in graduated complexity rather than encyclopedically. Still, the volume is fully indexed and the Table of Contents is annotated extensively with subheads for ease in locating desired topics.

The manual's 12 chapters each have one or more accompanying hands-on tutorials that reinforce learning. The first chapters cover setting up and navigating through the program. The authors correctly view ease of editing (as opposed to creating) drawings as the prime virtue of any CAD system worth its salt and spend a chapter discussing the most efficient diagrammatic editing methods. Revisions simply are a way of life in the design world and there is no doubt that the ease of revising with CAD justifies the time it takes to create designs, and the time required in learning how to manipulate the program. It certainly beats the straight edge and compass routine for designing anything more complex than a hat box.

> ***. . . INSIDE AutoCAD is worth a read, and not just for the entertainment value, but for the extent to which the authors build upon the basics into the truly elegant uses of the package.***

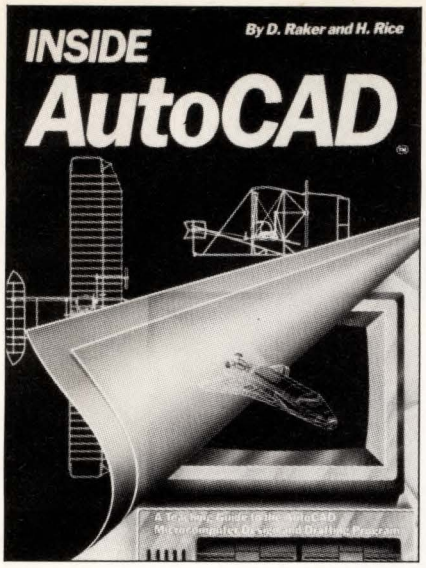
The middle chapters take you on a extensive tour of the *AutoCAD* landscape in depth, with discussions of time-saving features, like how to reuse work already completed, for future sessions, accomplished by the creation of groups of graphic objects called "symbols." Also discussed are methods for embellishing bare bones drawings to simulate their real-life referents. How to get the most out of your plotter is also covered.

TECHNIQUES FOR CUSTOMIZING *AutoCAD* is the focus of the latter chapters, including the defining of unique symbol libraries and templates, or what the authors call, "Player Piano CAD-SCRIPTS" (SCRIPTS being an *AutoCAD* utility that stores a listing of commands) that later can be "played back" as needed in future drawings, thus, sparing the creation of the same objects twice (or more). These customization chapters are worth the price of admission alone, both in terms of the potential for saving time and in the conservation of cranial cartilage.

The Appendices are reserved for hardware installation instructions for MS-DOS systems, along with a rundown of the *AutoCAD* menu system. Charts of menu displays abound for the customization of menus to suit the user. Finally, included are checklists for the installation of a pen plotter; i.e., the Houston Instruments (HI) Model DMP 52.

INSIDE AutoCAD is a complete companion to the software, hence, there are bound to be areas of overlap with the documentation accompanying the program. Before substituting, it would be advisable to delve fully into the "free" *AutoCAD Drafting Package User Guide*. The value of a manual like *INSIDE AutoCAD* often is inversely proportional to that of the packaged documentation itself. And in this case, the documentation may be sufficient for the casual user; the key difference, perhaps, being in *INSIDE AutoCAD*'s focus on how to get the *most* from the program, as opposed to just getting it to work.

The value of a painstakingly complete guide such as *INSIDE AutoCAD* can be at the expense of overdrawing the obvious for the more experienced applications software fiddlers. But to



the authors' credit, the text is casual without being unctuous, and to the publisher's credit, the book's appealingly diverse textual and graphic layout, breaking up passages with anecdotes, tips and eyecatchers, defuses the danger to a great extent. For someone who wants "just the facts, Ma'm," the user guide might be the shortest distance between two points. Still, even for the journeyman *AutoCAD* user, *INSIDE AutoCAD* is worth a read, and not just for the entertainment value, but for the extent to which the authors build upon the basics into the truly elegant uses of the package.

INSIDE AutoCAD
A Teaching Guide to the *AutoCAD* Microcomputer Design and Drafting Program
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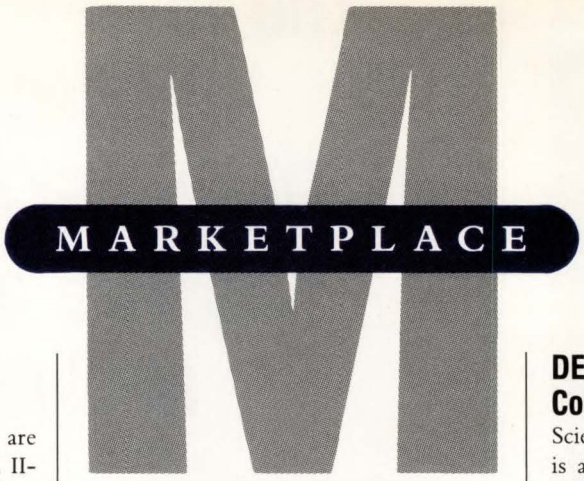
Reviewed by Bruce Feldman



Agreement Signed For Publishing System

DEC and CADDEX Corporation are cooperatively marketing a MicroVAX II-based computer-aided publishing system for engineering documentation and technical publishing applications. CADDEX is the first technical publishing concern to participate in DEC's Cooperative Marketing Program.

Under the program, which includes cooperative sales calls, trade shows, technical demonstrations and support, DEC and CADDEX are working together to bring their integrated system to companies in aerospace, defense and commercial electronics industries.

The CADDEX system integrates the technical documentation/technical publishing process by providing you with complete control over the creation, composition, and production of technical documentation. The system includes a dedicated and integrated system, a single, unified database that provides management with control over the technical publishing process, a powerful word processor, and a versatile two- and three-dimensional, CAD/CAM-oriented graphics system.

The system has the ability to import and edit data created on a number of third-party word processing and CAD systems and a pagination system that composes and paginates documents according to preselected style guidelines. It includes output drivers for laser printers and typesetters.

For more information contact Digital Equipment Corporation, Maynard, Massachusetts 01754-2571.

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VAXELN Driver Debuts For GPIB11-V2 Card

National Instruments' new driver controls the GPIB11-V2 interface card in MicroVAX II applications running under the VAXELN operating system.

VAXELN features a small, fast kernel that supports both multitasking and multiprogramming. It provides a real-time environment often necessary for test and measurement applications.

In addition to the GPIB device handler, the software consists of a PASCAL language interface that links the application program to the handler. An interactive control program is included that enables the user to experiment with commands and troubleshoot bus problems from a terminal. All of the software is distributed as source code and is written in VAXELN PASCAL.

The software offers two levels of control. The higher level subroutines simplify interfacing to GPIB instruments and provide the shortest development time. The lower level gives users greater flexibility for optimizing system performance and for interfacing to special instruments on the GPIB.

The new software product is available now and is priced at $500. The GPIB11-V2 is $1495. Prices are for quantity-one, U.S. domestic. OEM and quantity discounts are available.

For more information, contact National Instruments at 12109 Technology Boulevard, Austin, Texas 78727-6204; (800) 531-4742; from Texas call (800) IEEE-488. Telex: 756 737 NAT INST AUS.

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DEC-Compatible Controller Released

Scientific Micro Systems, Inc.'s SMS 0107 is a new DEC-compatible controller that utilizes MSCP to interface a variety of Winchester and floppy disk drives to MicroVAX II or LSI-11 computers.

Because the SMS 0107 is completely compatible with the MSCP/DU device handler, the controller provides access to all formats of 5¼″ and 8″ floppy drives. It supports the MicroVMS, RSX-11M-PLUS, RSX-11M, RSTS/ E and RT-11 operating systems without modification.

The SMS 0107 performs control functions required for high speed data transfer between the disk and host Q-bus system. To maximize disk data throughput, it uses a non-interleaved disk format that allows access to data at the full disk data rate. Multisector transfers occur without latency or rotational delay. The controller implements Block Mode DMA for high speed transfers of up to 3M per second (burst rate).

The SMS 0107 is priced at $950 in OEM quantities. The product is available now.

For more information, contact SMS at 339 N. Bernardo Avenue, Mountain View, CA 94043; (415) 964-5700.

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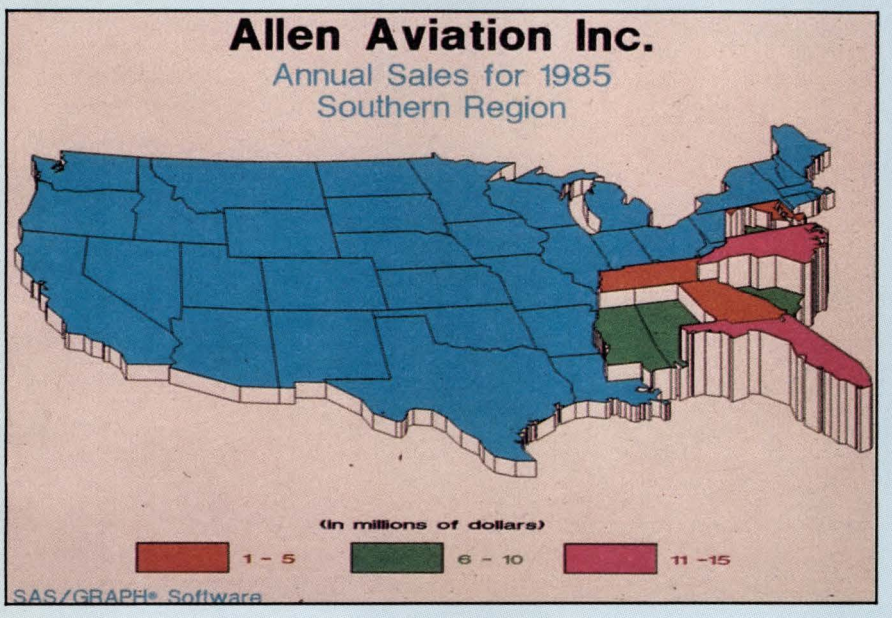
Qualogy Announces ESDI Storage Systems

A new family of high-performance Enhanced Small Device Interface (ESDI) storage systems, from Qualogy, Inc., gives MicroVAX and MicroPDP-11 computers the highest levels of performance and flexibility now available.

Qualogy's new QE-2000 family includes a quad-height controller, the QE2,



SAS Institute Inc.'s SAS/GRAPH software runs on the MicroVAX II and produces charts, plots, and maps in a variety of patterns and in up to 256 colors. This photo shows a map of the United States created with SAS/GRAPH.

with a 1-MB cache memory that supports up to four ESDI drives. Qualogy is configuring the QE2 with high-performance, 5¼" Winchester drives that have storage capacities of 140 and 330 MB and offer fast access times. Maximum capacity of one QE-2000 system is 1,320 MB.

The QE2 has a 1-MB cache memory. Using an efficient proprietary adaptive caching algorithm, frequently accessed data is held in random access memory, ready for use. Data transfers from the cache are four milliseconds; the usual drive access times of other systems are 20-30 milliseconds. This gives the QE-2000 family up to an 80 percent reduction in access time.

QE-2000 series products optimize seeks by queueing up to 32 commands and computing the best order of execution in order to minimize head movement and enhance throughput in heavily loaded systems. With multiple disk drives, seeks are initiated in parallel to further improve performance.

Prices for the QE-2000 family range from $1,770 for the QE2 controller board to $36,000 for a rackmount storage system that includes four drives with a total capacity of 1,320 MB. Qualogy's ESDI subsystems are supported by its service network.
For more information, contact Qualogy, Inc. at 2241 Lundy Avenue, San Jose, CA 95131; (408) 946-5800. Telex 4993489.

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SAS/GRAPH Runs On MicroVAX II

SAS Institute's SAS/GRAPH software now is available for the MicroVAX II computer running MicroVMS. SAS/GRAPH software provides tools for device-intelligent information and presentation color graphics.

The software produces charts, plots, and maps in a variety of patterns and in up to 256 colors. Displays can be created, stored in a catalog, retrieved as needed, and combined with other graphics. Facilities are provided for customizing graphics output and displaying several different graphs on a single page.

SAS/GRAPH software is integrated with all the data-handling capabilities of the SAS System. The foundation of the system is base SAS software for data management, statistical analysis, and report writing. Additional products include SAS/AF software for developing menu-driven applications; SAS/FSP software for full-screen editing, query, letter writing, and spreadsheets; SAS/ETS software for planning, forecasting, financial modeling, and row-and-column reporting; SAS/OR software for

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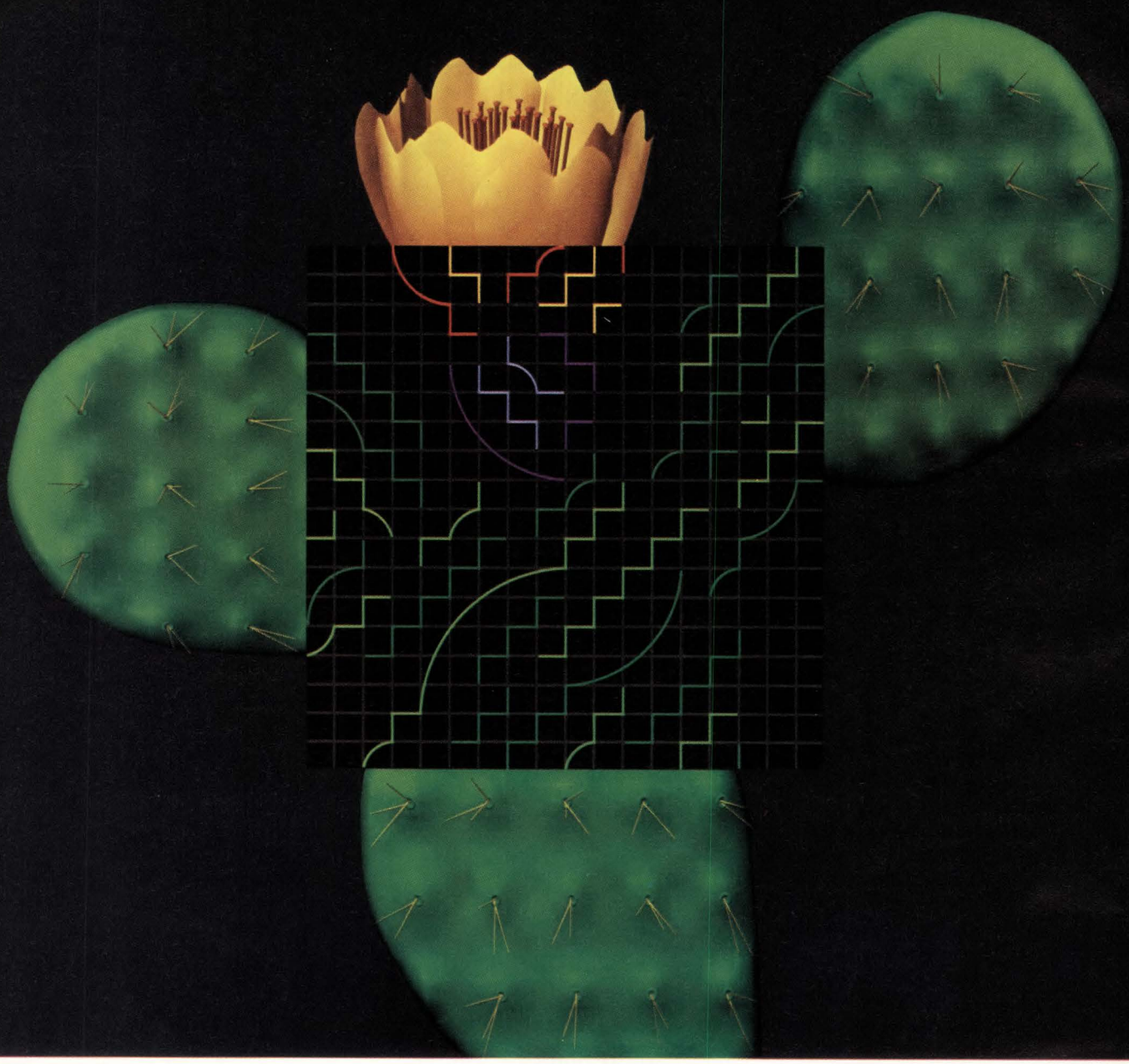

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project management; and SAS/IML software for interactive matrix programming.

The Institute licenses all software on an annual basis. The first-year license fee for SAS/GRAPH software under MicroVMS is $2500 for corporate customers. Renewals are available at lower rates. To use SAS/GRAPH software, sites need base SAS software.
Find out more by contacting the Software Sales Department at SAS Institute Inc., Box 8000, SAS Circle, Cary, NC 27511-8000; (919) 467-8000.

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PC To VAX Package Updated With Kermit

Coefficient Systems Corporation's new VTERM III is an enhanced version of the VTERM II integrated software package for communications between IBM PCs or PC-compatibles and VAX and PDP-11 computers. VTERM III combines VT100 terminal emulation, Kermit and multiprotocol file transfer, and asynchronous communications capability up to 19,200 baud into one software package.

VTERM III provides extensive capabilities for the transfer of text and binary files with or without error-correction, and under local or host control. VTERM supports ASCII text file transfer and the error-correction protocol, XMODEM, Coefficient Systems' VTRANS7 and VTRANS8 protocols, and Kermit, the micro-mainframe communications standard with wildcard file transfer and data compaction from Columbia University.

VTERM III's free VTRANS file transfer system, including source code for the host, provides fast, error-correcting exchanges of text and binary files with a host computer or with other personal computers equipped with VTERM III. The VTRANS file transfer system is compatible with a variety of host operating systems and languages, including RSTS BASIC, VAX/VMS BASIC, VAX/VMS FORTRAN, UNIX C and RSX-11 FORTRAN.

With VTERM III, all host software written for DEC terminals, including full-screen text editing packages like EDT, TECO, WORD-11 and EMACS, runs on the IBM PC, PC-XT and PC-AT, without modification.

VTERM III is available from Coefficient Systems or authorized dealers for $195. VTERM II users can upgrade to VTERM III for $70. VTERM III with VT100 and Tektronix 4010 terminal emulation is available for $249.
Find out more by contacting Coefficient Systems, 611 Broadway, New York, NY 10012; (212) 777-6707.

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PLOT 10 GKS Passes Certification Tests

In February 1986, the Tektronix PLOT 10 Graphical Kernal System (GKS) became the first commercially available GKS package to be tested and certified as a conforming implementation of the GKS International Standard for graphics software development systems.

GKS is the product of an international cooperative effort to provide standards for computers and data processing. Pioneered in West Germany as Deutsches Institut für Mormung (DIN) standard 66 252, it was adopted by the American National Standards Institute (ANSI) as X3.124-1985 in June 1985, and by the International Standards Organization (ISO) as International Standard 7942 on July 15, 1985.

Although the GMD certification directly applies only to the DIN standard, the functional equivalence of national and international standards based on GKS means that application software developers in the U.S., West Germany, the U.K., or any other nation that has adopted GKS, now can be certain PLOT 10 GKS is a conforming implementation of the standard.

Testing was performed by the Gesellschaft fur Mathematik und Datenverarbeitung (GMD) MBH BONN, a German research institution and testing laboratory.

Precompiled object library implementations are available for VAX/VMS and IBM MVS/TSO, and VM/CMS operating systems. The highly transportable FORTRAN 77 source code enables package installation on many other operating systems. The base $7,500 price of PLOT 10 GKS may vary depending on the host operating system, and includes source code and documentation. Customer training is available.

For more information contact Tektronix, Inc., P.O. Box 1700, Beaverton, OR 97075.

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Esprit Launches Buyer Protection Plan

A three-pronged buyer protection program aimed at distributors and end users has been launched by Esprit Systems, Inc. Under this program, Esprit is offering to replace, within 24 hours, its own or any competitor's failed terminals.

Esprit kicked off the following marketing offensives:

"Esprit to the Rescue" is aimed directly at Esprit's closest competitors. Through this direct mail and ad campaign, Esprit is offering to send a free replacement unit for any competitive terminal that fails — within 24 hours — for a 30-day evaluation at no cost or obligation.

"Esprit Express" is designed specifically for those customers who need responsive service and support. Esprit is offering a 24-hour replacement of its ESP 6515, a VT220 emulator, at an annual fee of $39 per unit. This express service plan includes all charges for parts, labor and shipping as well as a toll-free "Express Service" hotline (800) 645-5300.

The Esprit 30-month guarantee will be packaged with each ESP 6515 terminal. In addition to a 90-day warranty, Esprit guarantees that if the terminal fails more than once in 30 months, they will replace the unit free of charge.

The ESP 6515 emulates the VT220 while maintaining full compatibility with all VT100 application software. The ESP 6515 costs $629 for either amber or green displays. For further information contact Esprit Systems, Inc., 100 Marcus Dr., Melville, NY 11747; (516) 293-5600 or (800) 645-4508.

Enter 902 on reader card

Dataplotting Announces Color Mapping Software

The new release of DSI/CMap, from Dataplotting Services, Inc., is a software system for the creation of color map displays.

On a standard line contour map, the values of mapped quantities must be read from contour labels. Using DSI/CMap, color can be introduced to add an independent third dimension to maps, making it easier to interpret map features.

DSI/CMap supports two types of color presentations — standard color mapping and shaded relief mapping. Color mapping parameters can be specified using an interactive program, or they can be entered directly into a control file to produce the first display automatically. The parameters can be fine-tuned as required.

Color maps are generated from a regularly spaced grid of data values. If the original data set is not in this form, gridding programs are available for interpolating a regular grid.

DSI/CMap can be used for a simple quick look at color mapping on an interactive graphics terminal, or for the production of high quality output on a graphics plotter or printer. The system is designed for use by non-programmers and programmers.

Further details may be obtained by contacting Dataplotting Services, Inc., 225 Duncan Mill Rd., Don Mills, ON M3B 3K9; (416) 441-4163 or (800) 268-7878.

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RTE Deltec's upsized version of its 6000 Series.

RTE Deltec Announces Upsized 6000 Series

The upsized version of the 6000 Series Uninterruptible Power Systems (UPS), from RTE Deltec, now can support 25 percent larger inductive loads than previously possible with no increase in cabinet size or price.

For example, the 15-KW models can support an inductive load of 18.75 KVA (at 0.8 lagging power factor), the 30-KW models can support 37.5 KVA, and the 45-KW models can support 56.25 KVA.

The new units are available for delivery with prices starting at $27,900.

Additional information is available by writing to the Marketing Department, RTE Deltec, 2727 Kurtz St., San Diego, CA 92110; or call (800) 854-2658, or in California, (619) 291-4211.

Enter 905 on reader card

Sentinel Opens Refurbishment Facility

Sentinel Computer Services recently opened its second independent refurbishment facility in the U.S. The 30,000 square-foot center, located in Westmont, Illinois, provides complete refurbishment installation and discontinuance service of IBM, DEC and Wang CPUs and peripherals.

The new refurbishment facility handles storage and auditing, install, de-install, staging and feature sales and installation for the majority of DEC, Wang and IBM equipment. Sentinel's other facility is located in Phoenix, Arizona.

For more information contact Steve Kunkel at (312) 325-8120.

Enter 904 on reader card

FORTRIX-C Enhanced With Version 4.0

Rapitech Systems Inc. has released an enhanced version of FORTRIX-C Conversionware, which automatically translates FORTRAN programs and files to C language.

FORTRIX-C version 4.0 translates FORTRAN statements such as Assign, Pause, Inquire and Backspace. The program supports assumed-size, adjustable and three-dimensional arrays.

FORTRAN intrinsic functions are converted to their C counterparts. Data statements can be used to initialize multidimensional arrays, and character arrays can be used as format declarators.

FORTRIX-C Conversionware translates 50,000 lines of FORTRAN into C code in two weeks, while manual conversion would require at least one man-year of programming time. The program runs on VAX/VMS, UNIX, MS-DOS and others, and on DEC, IBM, AT&T, SUN computers, and others.

Additional information may be obtained by contacting Rapitech Systems, Inc., Montebello Corporate Park, Suffern, NY 10901; (800) FORTRIX, or (914) 368-3000 in New York, Telex: 509210.

Enter 914 on reader card

Ada-Based Designs Get Document Generator

Software Systems Design's new automatic documentation generator — Doc-Gen — reduces the cost of producing Mil-Standard documentation for Ada-based designs.

Doc-Gen is a document generator that automatically can produce documentation to satisfy the contractual format requirements such as DOD-STD-2167, Mil-Std-1679, or Mil-Std-490 formats. In addition to Mil-Std documentation, customized documentation formats can be produced directly from Ada

source code that has been annotated with the relevant design information.

Doc-Gen works in conjunction with the Ada-based Design And Documentation Language (ADADL) processor that assists designers in creating designs using an Ada-based PDL. ADADL extracts documentation information from an Ada/PDL design or from a program containing executable Ada code. ADADL and the Doc-Gen tool are designed to work at any stage of the development cycle: preliminary design, detailed design, or after executable code has been written.

The ADADL processor is 'priced at $8,500. The Doc-Gen tool is priced at $7,500.

Further information may be obtained from Software Systems Design, 3627 Padula Ave., Claremont, CA 91711; (714) 625-6147.

Enter 907 on reader card

PCI Offers EASI/Pace Solution

EASI/PACE 3.0 is a flexible solution from PCI that handles image analysis problems. This system combines a user interface package, which allows you to tailor the software to your needs, with a powerful image processing package that provides solutions for research and production problems. EASI/PACE may be used in a wide variety of disciplines including medicine, oceanography, resource management and geological exploration.

EASI/PACE is independent of operating systems and displays. Currently, VMS, RSX-11M, MS-DOS, UNIX and OS/32 operating systems and Adage, Aries, Comtal, Ebba, Genisco, Gould, Number 9 and Pictral displays are supported.

The EASI/PACE system offers complete raster display control, extensive database archival and inquiry capabilities, and a full range of correction, classification, filtering, transform and hardcopy plotting functions. An easy-to-use application development tool is available.

ESI/PACE is available in turnkey, programmable, and source forms, not only to end users, but also to OEMs and VARs. For more information contact PCI, 4800 Dufferin St., Suite 202, Downsview, ON, Canada M3H 5S8; (416) 736-0452, Telex: 06-217652.

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New Network Matches Businesses And Assets

Global Venture Network, a computerized network that matches the money to the minds, is available on Delphi, the international communications and information service.

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entrepreneurs, consultants, equipment vendors and employees.

Using a personal computer and a modem, users call Delphi and enter the Global Venture Network. GVN does its networking through listings within its Venture Economics Industry Code Matrix, which lists all high-technology market segments and most other standard market segments. They proceed to an industry's market-segment location, which is their gateway to the six-level GVN network.

An account with Global Venture Network costs $25, which provides unlimited access within the network and permits the user to post one listing on the network. Additional listings may be inserted for $5 each. An introduction to a listing ranges in price from $10 for a name and address to $25 for a complete documentation package. Major credit cards may be used for online transactions such as subscriptions, placing orders for listings and ordering introductions by electronic mail or U.S. Postal Service.

For more details contact General Videotex Corporation, 3 Blackstone St., Cambridge, MA 02139; (617) 491-3393.

Enter 908 on reader card

Two-View Developed For PDP-11 Systems

Lilly Consulting/System Services, Inc. (LCSS) has released version one of its RSTS windowing software. Two-View (LCC/2VU) turns any two-page mode or scrollable CRT into a multijob processing terminal. With 2VU, you may switch back and forth between any two jobs you established. 2VU maintains screen mode and cursor positioning of the jobs being processed.

2VU provides you with the ability to free your terminal from a single-use processing. It's useful to system managers and system support staff who must respond to user inquiries. Systems people may switch from their present screen task to a second screen and respond to the user inquiry. Once the user inquiry has been resolved, the systems persons can switch back to the task at hand. Non-systems personnel can use 2VU to switch back and forth between multiple entry or inquiry screens.

LCSS intends to release Four-View (4VU) in RSTS and VMS in August. LCSS/2VU is available for PDP-11 systems running RSTS/E V.8.0 and greater. The fee for a single-use license is $50. Discounts and multiuse licenses are available.

For more information and/or a demonstration package, contact Lilly Consulting/System Services, Inc., 7259 West Marine Dr., Milwaukee, WI 53223-9990; (414) 354-6731.

Enter 910 on reader card

Laser Printer Linked To The VAX

A new interface package from Scicon Limited offers plug-in compatibility between the VAX and high-speed Rank Xerox

8700/9700 laser printers.

Scicon's LPI/690 enables online access between the VAX and laser printer, therefore, eliminating the need to hand carry tapes between the two and allowing the VAX to act as a print server over DECnet, using distributed queuing software. The package offers savings in both computer time and staff time.

The LPI/690 is a microprocessor-based intelligent front-end processor, capable of transferring 6,000 print lines per minute. Scicon offers printer software containing a device driver and a printer symbiont for integration to the VAX.

The product can operate multiple Xerox printer stations attached to a single VAX and has printer serving applications where high and low speed devices can queue print jobs over DECnet for access to the printer.

The LPI/690 is available from Scicon throughout Europe and is fully supported. Quantity and OEM discounts are available. To obtain further information contact Scicon Limited, Wavendon Tower, Wavendon, Milton Keynes MK17 8LX, England; Tel. 0908-585858.

Enter 911 on reader card

AVIV Announces GCR Tape Controller

Model TFC 919, from AVIV, is a new full performance universal GCR magnetic tape controller for the MicroVAX, MicroPDP-11/73-83 and LSI-11/23+ on a dual height card. The new controller provides space and power savings over existing controllers.

It interfaces high speed 6250 bpi GCR tape transports operating up to 200 ips to the MicroVAX, MicroPDP-11/73-83 and LSI-11/23+ via the Q-bus. The tape controller emulates the DEC software driver TSV05 or TS-11. Therefore, it is compatible with the RSX-11, RSTS, TSX-11+, RT-11, ULTRIX, MUMPS and UNIX operating systems.

The high data throughput of 1.25 MBPS is achieved by incorporating a 4-KB fast buffer based on high speed static RAMs and distributed processing in high speed PALs. The high speed data buffer coupled with fast handling of the Q-bus via fast PALs and programmable DMA burst size or block mode transfer virtually eliminates data late conditions.

The TFC 919 is a universal tape controller, compatible with all ½-inch tape drives equipped with Pertec formatted interface. It's the first controller in the industry on a dual-height board to offer 200 ips GCR handling and block mode capabilities.
To learn more contact Aviv Corp., 26 Cummings Park, Woburn, MA 01801; (617) 933-1165.

Enter 913 on reader card

GE Plans Option For CALMA Systems

General Electric's Calma subsidiary plans to offer the first commercially available CAE/CAD/CAM system incorporating the new high-performance 3D graphics processor developed at GE's Silicon Systems Technology Department.

The Graphicon 700 will be a hardware option to GE Calma's computer-aided engineering and design system that allows engineers the rapid exploration of design alternatives of 3D mechanical parts and structures by using the pan, zoom and rotation capabilities of the new processor. The new unit will display complex, 3D images on the Calma workstation at rates up to five times faster than current Calma products for simple screen refresh commands, and up to 30 times faster for generation of shaded images.

The Graphicon 700 unit will be offered for VAX- and MicroVAX-based Calma systems operating DDM (Design, Drafting and Manufacturing), I-Deas and DIMENSION III software for 3D mechanical and architecture engineering/construction engineering and design applications.

The Graphicon 700 unit will be available worldwide as an option to Calma VAX- and MicroVAX II-based systems with shipment beginning in the fourth quarter of 1986.

For further information contact Calma Company, 501 Sycamore Dr., Milpitas, CA 95035-7489; (408) 434-4000, TWX: 37-20067F CALMA SNTC.

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EDITECH Uses VOX To Improve Efficiency

Editech brings together the best names in word processing, graphics, database management, and spreadsheets in a single integrated package using VOX office automation software on the VAX and MicroVAX.

Editech places all of your system's resources within reach of both technical and non-technical users; improving efficiency through the use of program links and a variety of productivity tools.

Program links allow you to exchange data between database and word processing, database and spreadsheets, spreadsheets and word processing, and database and business graphics. Productivity tools provide you with fast access to information and improved control over your projects. Standard items include a calendar, phone book, project manager, room scheduler and calculator. Optional electronic mail enhancements allow you to attach binary files to messages and receive delivery receipts on all electronic mail.

Find out more by contacting Editech, 310 Madison Ave., Suite 2008, New York, NY 10017; (800) 345-4016, or (212) 949-9143 in New York.

Enter 915 on reader card

Designing a highly complex piping configuration for an oil refinery is easier and faster using General Electric's Graphicon 700.

IBM Participates In DECnets

IBM PCs, XTs and ATs now can participate in DECnets using MICOM-Interlan NI5010 data link controllers and DECnet-DOS software. The NI5010 interfaces IBM PCs and compatibles to Ethernet local area networks, providing reliable 10-Mbps data communications. DECnet-DOS software provides protocol support allowing PCs to participate in DECnets.

MICOM-Interlan makes two versions of its NI5010 controller. One version ($650) includes an on-board transceiver for thin-cable Ethernet. The other NI5010 version ($550), for use with Ethernet/IEEE 802.3 cables, provides an IEEE 802.3 standard transceiver cable interface for connecting to an external transceiver.

Both versions install simply by plugging

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

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

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into the PC's internal bus, and both are supported by extensive diagnostics. Additionally, Digital offers service agreements covering IBM PCs with NI5010s operating on DECnet Ethernets.

Additional information is available from MICOM Systems, Inc., 4100 Los Angeles Ave., P.O. Box 8100; Simi Valley, CA 93062-8100; (800) MICOM-US.

Enter 916 on reader card

Parse Introduces VAX Diagnostics

POSSUM is the new line of diagnostic products designed for use on the VAX series from Parse, Inc.

POSSUM diagnostics are DEC compatible and operate with peripheral controllers and subsystems manufactured by other vendors. They run standalone, not requiring the intervention of either the operating system or the operator. POSSUM diagnostics report status and errors in plain English.

The POSSUM line is available for most VAX systems and includes diagnostics for CPU, memory, disk, tape, communications, Ethernet controllers, and subsystems. POSSUM diagnostics include extensive documentation and listings. They come with a 90-day warranty and free updates for a six-month period. Parse provides free user training at its offices. Training at the customer's site can be arranged for an additional fee.

POSSUM diagnostics are priced on an individual basis at $2500 per license, with a royalty of $150. A full diagnostic package is available.

To find out more contact Parse Incorporated, Coolidge Office Park, 131 Coolidge St., Suite K, Hudson, MA 01749; (617) 568-0669.

Enter 917 on reader card

DPD Enhances Crossword For RSTS/E

Data Processing Design, Inc. (DPD) has enhanced its file transfer and conversion software product, CrossWord, to include support for the RSTS/E operating system and WordPerfect word processing software.

CrossWord allows transfer of word processing files between an IBM PC and a DEC minicomputer running VAX/VMS or RSTS/E. CrossWord includes software for both the IBM PC or XT and the DEC minicomputer.

PC users can transfer and convert documents to WORD-11, DPD's word processing software system, or between other PC word processing software.

Prices for CrossWord are $1,300 for the minicomputer license and one PC diskette, with additional PC copies priced at $200 each. For sites that do not have a WORD-11 license, one license and one PC diskette are priced at $2,300. Complete documentation and customer support are included.

To obtain further information contact DPD, 1400 N. Brasher, Anaheim, CA 92807; (714) 970-1515.

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• NS630 (1-4 mb)	• NS638 (8 mb)
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UNIBUS PDP 11/24, 11/34, 11/44, 11/45	
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We started by building a bulletproof emulation of DEC VT 220 and 100 alphanumeric terminals, DEC ReGIS and Tektronix 4010 through 4015 graphics terminals. Then we added advanced features that help you work more productively than ever before.

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GraphOn terminals provide true zoom, not just pixel replication. You can zoom in on the finest details, enlarging any part of an image up to 16 times its original size. Unlike other graphics terminals with 10-bit (1024 x 1024) display resolution, GraphOn terminals store coordinates just as they come from the host in 12-bit (4096 x 4096) resolution. So you can be sure that every bit of data transmitted from the host is available for clear display in the enlarged image.

With GraphOn local pan and zoom ability, you can zoom in on an image, and then pan and zoom again until you see every detail. The zoomed image can be saved locally and called back to the screen quickly and easily.

With GraphOn 200 Series terminals, you can zoom in or out, edit an image while it's zoomed, add text, zoom and edit again, and print the image in its enlarged or reduced form.

LOCAL POWER FOR SPEED AND CONVENIENCE.

We've built powerful local capabilities into GraphOn 200 Series terminals, giving you maximum speed and flexibility without burdening the host. Panning and zooming are local functions, controlled locally through keyboard or mouse commands, or remotely from the host, if you choose.

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When you get down to details, the GraphOn difference is perfectly clear.

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Rainbow Gets Desktop Manager

VuSoft, Inc.'s Switch-It/Desk is a new desktop manager for the Rainbow 100 series. It belongs to a new class of memory resident software that provides instant access to desktop accessories typically found on an office desk — calculator, notepad, phone book, dialer, alarm clock, terminal, index card file, etc.

The program runs on a Rainbow with 256K memory and MS-DOS 2.05 or 2.11. Switch-It/Desk can be used either as a memory resident program or as a standalone second program with VuSoft's multitasking program Switch-It. Once installed in memory, any of the desktop tools can be accessed instantly, even in the middle of a program. Switch-It/Desk works with all popular packages, including Lotus 1-2-3, dBASE III, WordStar, etc. Switch-It/Desk is available for $125. To learn more contact VuSoft, Inc., 248 Tower Rd., Lincoln, MA 01773; (617) 259-0686.

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Unbound Supports Traveling Customer

QUBE, from Unbound, Inc., is a lightweight and modular DEC-compatible Q-bus system with a family of disk and tape peripherals to support any customer's need.

The QUBE family starts with the Q1 Master Module including four Q-bus quad slots, 22 or 44 MB of disk, and either a dual RX50 floppy or quarter-inch cartridge tape device. It weighs less than 25 pounds and is available with a carrying bag should the customer want to take his system traveling.

The basic QUBE Master Module can be extended with the expansion module to add four additional Q-bus slots, and with the peripheral module to provide peripheral mounting space for two additional full height 5¼-inch disk or cartridge tape devices.

There are 10 models of the QUBE, starting in price at $6,995 for the basic QUBE with an 11/23 processor, .25-MB memory, 25-MB disk, dual RX50 floppy and four-port DLV11-J. The top of the line is a full QUBE, with an 11/73 processor, 1-MB memory, 8-quad slot backplane, two Winchester disks (51 MB and 140 MB), cartridge tape unit, and 16 lines of DHV11 ASCII communications, and is priced at $19,195. Volume discounts are available. For additional information contact UNBOUND at 15239 Springdale St., Huntington Beach, CA 92649.

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GMS Launches Terminal Emulation

PC220 is the latest addition to a full line of terminal emulation packages from General Micro Systems (GMS). This new emulator provides full keyboard and screen emulation of DEC VT220, 200, 102, 101, 100, and VT52 terminals. PC220 provides all VT220 features including slow scroll at six lines per second, 132-column support, and status line.

Up to 30 softkeys can be defined by the PC user or host computer to perform repetitious tasks with a single keystroke. You may program complicated command scripts for auto-login and other functions. Scripts can be attached to keys or can be automatically executed when PC220 loads. An autodial directory is included.

A "shell" key is provided to let you temporarily suspend PC220 (still resident in memory), hop out to DOS to execute DOS commands or other programs, and hop back to PC220.

PC220 is priced at $169. Quantity prices, site licenses and multiple CPU licenses are available.

Contact GMS for more information at P.O. Box 5330, 9951 Valley View Rd., Eden Prairie, MN 55343-1533; (612) 944-0593.

Enter 930 on reader card

Terminal Family Gets Six New Members

Human Designed Systems, Inc.'s six new members of its HDS2000 Series of DEC and Tektronix compatible terminals offer higher resolution, faster drawing speeds and more graphics and alphanumeric features than the terminals they replace.

The new series provides a full range of compatible terminals, including ANSI standard, APL, and medium- and high-resolution graphics, to meet the application needs of engineering, scientific, and business organizations.

Each terminal features a combination of a high-resolution 15-inch monitor in a streamlined housing with a one-square foot footprint. The terminals are available with your choice of amber, green or page-white phosphor colors.

The HDS2000 Terminals range in price from $795 to $1,895, and delivery of the terminals is 45 days ARO.

For more information contact Human Designed Systems, Inc. at 3440 Market Street, Philadelphia, PA 19104; (215) 382-5000.

Enter 931 on reader card

MicroVAX II Receives Disk Storage Systems

Storage Concepts, Inc.'s parallel transfer disk storage systems are ready for use with the MicroVAX II. Based on the Concept series of Parallel Transfer Disk (PTD) processors,

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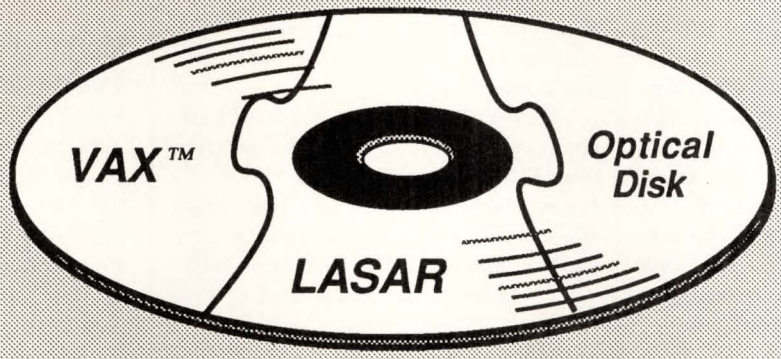
Software was the missing piece to the optical disk puzzle ...



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the MV21 offers a sustained transfer rate of over eight MB per second for ultra high speed data storage. The MV21 plugs directly to the MicroVAX II for commands and status, and provides a high speed port for up to 9.3 MB per second data transfers.

Typical applications for the MV21 include real-time imaging such as medical imagery, flight and vehicle training simulators, seismic imagery and animation. Specialized commercial and military applications include rapid data searches and high speed satellite communications storage.

The MV21 is a complete storage system comprised of a rack-mountable disk processor, a single quad-height board assembly, a parallel transfer disk and a device driver for the MicroVMS operating system.

A complete MV21 system with one M2350A PTD is priced at $42,200 fob Costa Mesa, California. OEM quantity discounts are available. The MicroVAX device driver is priced at $2,000.

For more information, contact Storage Concepts, Inc., 3198-G Airport Loop Drive, Costa Mesa, CA 92626; (714) 557-1862.

Enter 932 on reader card

IPT Announces Two Products

Augmenting its array of minicomputer-hosted software development tools, IPT Corporation has released its F68K and C68K products to facilitate multiprogrammer FORTRAN and "C" code development on DEC and Data General minis, targeting the Motorola 680X0 processor series.

F68K and C68K include IPT's source level debuggers, FORTRAN-lint and lint-PLUS (for "C") that greatly shorten the development cycle by providing significant debugging before traditional compile and execute testing. Both debuggers can analyze all the modules in a program simultaneously and output operator selectable levels of comment about the code, such as serious errors, minor errors, and FYI.

Both FORTRAN-lint and lint-PLUS are available as standalone tools, separate from F68K and C68K.

For more information, contact John Dee at IPT Corporation, 1096 East Meadow Circle, Palo Alto, CA 94303; (415) 494-7500.

Enter 933 on reader card

Personal Computers Get VAX-Based Librarian

Polygon's new poly-SHARE product lets personal computer and VAX/VMS users build an easily-accessed VAX-based library of personal computer applications.

poly-SHARE is designed for programmers, administrators, managers, salespeople, and others who use standard data files, spreadsheets, programming macros, and word processing documents. poly-SHARE users can check text or binary file entries into and out of the poly-SHARE library, reducing repetitive data entry, insuring access to the latest up-to-date information, and improving productivity.

The price of poly-SHARE begins at $995. Fully functional evaluation copies are available at no charge.

For more information, contact Polygon at 1024 Executive Parkway, St. Louis, MO 63141; (314) 576-7709.

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Meridian Announces Two Software Programs

MAXPLOT and MAXVUE are two new software programs, from Meridian Software, designed to enhance production capability and ease the programming burden for CalComp and HP plotter users under VAX/VMS.

The MAXPLOT program stores all plotting commands, along with any desired messages to the plotter operator, in an intermediate plot file. It is not necessary to access a plotter in order to test a program, and the plotter can be kept free for production work.

MAXPLOT has a facility for the creation of a formatted report of file contents, listing all calls to the plotter, so that debugging work is simplified. MAXPLOT allows

continuous plotting, spooling of plots, rotating and scaling of plots, starting and stopping of plots at selected points in the file, manipulation of aspect ratios, and the creation of a permanent file of user-defined special characters.

The MAXVUE program allows for the previewing and windowing of plots on VT125, VT240, and Tektronix 4010 graphics terminals.

Additional information may be obtained from Meridian Software, Inc., P.O. Box 651, New Town Branch, Boston, MA 02258; (617) 527-0050.

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Digi-TECH Provides Instant Information

A new full service computer software package designed to run on RSTS/E or VMS systems now is available from Sperry Tech, Inc.

The software package, Digi-TECH, provides instant information for all areas of television, audio, microwave oven and VCR repair service. Software includes warranty inquiry, work in progress, service history, diagnostic, service literature index, labor and parts pricing, automatic invoicing, financial and management reports.

Digi-TECH programs are fully integrated and built around a multiscreen, mass storage concept using bar code technology. The bar code technology makes it possible to keep massive amounts of information updated with maximum accuracy while reducing operator error.

The Digi-TECH package includes turnkey installation, training and user support. Digi-TECH has been under development during the past three years at Sperry Tech. Find out more by contacting Sperry Tech, Inc., P.O. Box 5234, Lincoln, NE 68505; (800) 228-4338.

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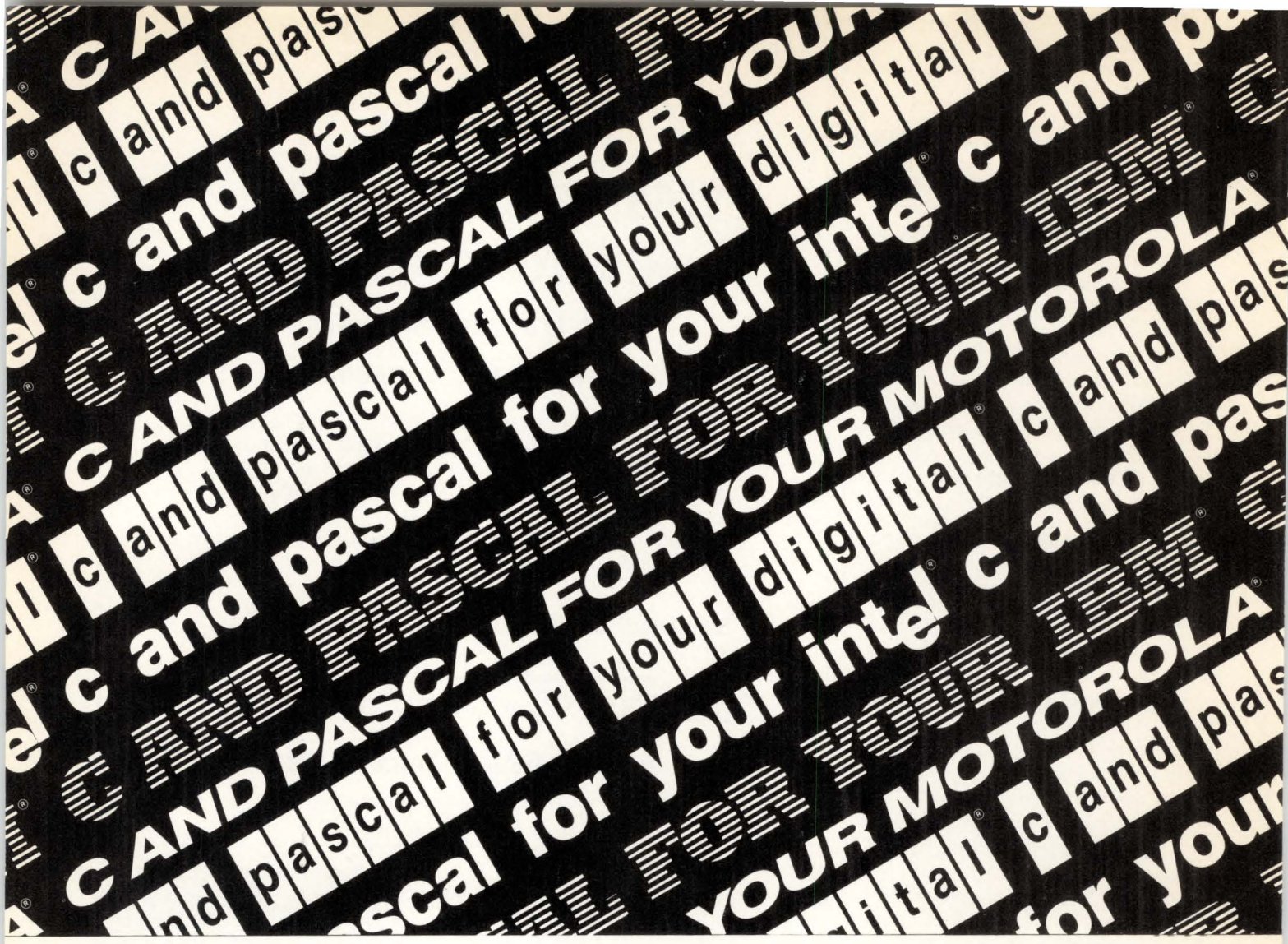

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ENTER 67 ON READER CARD

—Program continued from page 56—

```
                        ;The job is running at or less than MAXPRI,
                        ;but we have some jobs that are supposed to
                        ;run lower.  Now we have to go through the
                        ;program table (PTABLE), checking each program
                        ;name and its associated priority maximum.
OKPRI:  CMP     (R1),#^R        ;Check for blank program name, indicating that
        BEQ     NEXTLN          ;the table is done. If blank, check next line.
        CMP     NAME,(R1)       ;Not blank, check 1st 3 chars for match with
        BNE     NEXTPR          ;current table entry. If different, next line.
        ADD     #2,R1           ;Check next 3 characters of table entry for
        CMP     NAME+2,(R1)     ;a match with the current program name, if no
        BNE     NEXTPR          ;match, check next program.
        ADD     #2,R1           ;We got a match, this program has a specified
        CMP     PRIRTY,(R1)     ;priority maximum, check it with what's in the
        BLOS    NEXTLN          ;table.  If it's lower, check the next line,
        JSR     PC,HARASS       ;otherwise, HARASS the user first and then
        BR      NEXTLN          ;go check the next line to see what's there.

NEXTPR: ADD     #OFFSET,R1      ;Point R1 to the next program in PTABLE,
        BR      OKPRI           ;and check it.

NEXTLN: INCB    LINE            ;Increment the LINE argument in all three
        INCB    LINEX           ;EMT argument blocks which we are using.
        INCB    LINEZ
        CMPB    LINE,MAXLIN     ;Have we checked them all?
        BGT     SLEEP           ;Yes, take a snooze for a while.
        BR      CHECK           ;No, go check the next line.
SLEEP:  .TWAIT  #CLOCK,#TIME    ;Snooze for NAP minutes.
        BR      AGAIN           ;Wake up and police the system.

;               ***************************************************************
;               ********************* end main loop ***************************
;               ***************************************************************
        .PAGE
        .SBTTL  SUB-FUNCTIONS AND SUB-ROUTINES
;               ***************************************************************
;               ******* process any error from JSTAT sub-function #0 *********
;               ***************************************************************

ERRTYP: CMPB    @#ERRBYT,#1     ;Which error is it?
        BLT     NEXTLN          ;0 ---> line not logged on, try next line.
        BEQ     DIE             ;1 ---> invalid sub-function code, give up.
        MOVB    LINE,MAXLIN     ;2 ---> line exceeded last valid line.
        DECB    MAXLIN          ;Largest valid line number.
        BR      SLEEP           ;Should only happen first time.

DIE:    .EXIT                   ;Invalid code should never happen, so we
                                ;might as well kill the WARDEN.

;               ***************************************************************
;               ***************** annoy a naughty user ************************
;               ***************************************************************

HARASS: MOVB    LINE,CULPRT     ;Put the offending line number into the
        MOV     #ZAPIT,SHOUT    ;message EMT block along with the message
        MOV     #YELL,R0        ;address and the EMT code and send a nasty
        EMT     375             ;note to the creep.

;       This section places the digits of the offending line number in
;       the proper memory area for printing in the message to the system boss.
        MOV     #"  ,LINOUT     ;Make sure the area which will hold the line #
        MOV     #LINOUT+2,R2    ;digits is clear and point to the byte after
        MOV     LINE,R1         ;(we're going to put 'em in backwards).  Put
        CLR     R0              ;the line number in R1 & get ready to divide.
        DIV     #10.,R0         ;Divide by ten (quotient in R0, remainder in
        ADD     #60,R1          ;R1).  Make R1 (units) ASCII and move it to
        MOVB    R1,-(R2)        ;the correct location, then make R0 (tens)
        ADD     #60,R0          ;ASCII and move it to the tens place. (Since
                                ;TSX will not handle more than 30 lines, the
                                ;line number'll never be more than 2 digits.)

;       This section places the digits of the offending priority in the proper
;       area of memory for pinting in the message to the system boss.
        MOVB    #'  ,BPRI      ;Put three spaces in the area where the bad
        MOV     #"  ,BPRI+1    ;priority (BPRI) will go (clear it out) and
        MOV     #BPRI+3,R2      ;make R2 point to it.
        MOV     PRIRTY,R1       ;Put the priority amount in R1 and
DIV10:  CLR     R0              ;get ready to divide by 10.
        DIV     #10.,R0         ;Do it,
        ADD     #60,R1          ;and make the remainder ASCII and
        MOVB    R1,-(R2)        ;put it in its proper spot in BPRI.
        MOV     R0,R1           ;Then move the quotient into R1 and see if
        BNE     DIV10           ;we're done.  If not, do it until we are.
        .PAGE
;       This section converts the bad program name from RAD50 to ASCII and
;       places it in the proper area of memory for printing in the
;       message to the system boss.
        MOV     #2,R0           ;Make R0 a counter set to process two words.
        MOV     #NAME,R3        ;R3 points to where the RAD50 NAME lives.
        MOV     #BJOB,R2        ;R2 points to where the ASCII NAME is going.
REPEAT: MOV     (R3)+,R5        ;Move a word of the RAD50 name into R5 and
        CLR     R4              ;get ready to divide by 50 to extract the
        DIV     #50,R4          ;table offset for the last character of the
        MOV     R5,R1           ;word.  Save the offset (remainder) in R1 and
        MOV     R4,R5           ;move the quotient for the next division.
        CLR     R4              ;Get ready to divide and
        DIV     #50,R4          ;now we have the first and second characters.
        MOVB    R50T(R4),(R2)+  ;First character (quotient).
        MOVB    R50T(R5),(R2)+  ;Second character (remainder).
        MOVB    R50T(R1),(R2)+  ;Last character.
        DEC     R0              ;Un-bump R0 to see if we've done it twice (for
        BNE     REPEAT          ;both words of the RAD50 program name).

        MOV     #TALE,TATTLE    ;Now that everything is in its proper place
        MOV     #SNICH,R0       ;in the message area, we can tattle to the
        EMT     375             ;system boss.
        RTS     PC
        .PAGE
        .SBTTL  GENERAL DATA STORAGE AREA
; ***************************************************************************
; ***************************************************************************
; *****                   data storage area                             *****
; ***************************************************************************
; ***************************************************************************

;               ***************************************************************
;               ****************** general data area ******************************
;               ***************************************************************

MEMTOP: .BYTE   0,SETSIZ        ;Argument block for MEMTOP EMT.
        .WORD   HILIM           ;Upper address limit.

PRISET: .BYTE   0,PSET          ;Argument block for PRISET EMT.
        .WORD   MYPRI           ;Set priority of WARDEN job.

JSTAT:  .BYTE   0,STAT          ;Argument for JSTAT EMT.
LINE:   .BYTE   0               ;Storage for TSX line number to be checked.
        .BYTE   STACO           ;EMT sub-function to get job status.
        .WORD   STBUF           ;Address of 2-word buffer for returned value.
STBUF:  .BLKW   2               ;2-word buffer for returned value.

NMCHK:  .BYTE   0,STAT
LINEZ:  .BYTE   0
        .BYTE   PRGNAM          ;EMT sub-function to get program name.
        .WORD   NAME
NAME:   .BLKW   2

PRICHK: .BYTE   0,STAT
LINEX:  .BYTE   0
        .BYTE   GETPRI          ;Sub-function to check current priority.
        .WORD   PRIRTY
PRIRTY: .BLKW   2

YELL:   .BYTE   0,MESSAG        ;Argument block for SEND EMT.
CULPRT: .WORD   0               ;Offending line number stored here.
SHOUT:  .WORD   ZAPIT           ;Beginning of message to be sent.

SNICH:  .BYTE   0,MESSAG        ;EMT block for message to system console.
        .WORD   WARDEN          ;It's going to line WARDEN.
TATTLE: .WORD   TALE

MAXLIN: .BYTE   30.             ;Maximun # of lines allowed. (Will be altered
        .EVEN                   ;to hold max valid line #.)

CLOCK:  .BLKW   2               ;.TWAIT argument area.
TIME:   .WORD   0               ;Time - high word.
        .WORD   NAP*60.*60.     ;NAP minutes * 60 sec/min * 60 ticks/sec

        .NLIST  BEX
R50T:   .ASCII  / ABCDEFGHIJKLMNOPQRSTUVWXYZ$. 0123456789/
        .EVEN
        .LIST   BEX
        .PAGE
        .SBTTL  OUTPUT MESSAGES
;               ***************************************************************
;               ****************** output messages ********************************
;               ***************************************************************
;               There are some VT-1xx specific control codes in this data
;               section.  You can change them, if you need to.  Use .EVEN
;               here and there if necessary, to avoid odd address traps.

        .NLIST  BEX
TALE:   .ASCII  <BELL><LF><CR><ESC>/[7mLine /
LINOUT: .ASCII  /   is running /                ;Receives bad line number.
BJOB:   .ASCII  /       at priority /           ;Receives bad program name.
BPRI:   .ASCIZ  /   ./<ESC>/[m/                 ;Receives bad priority.
        .EVEN
ZAPIT:  .ASCII  <BELL><ESC>/[2J/<ESC>/[10;5H/<ESC>/[7mTHIS JOB IS RUNNING IN /
        .ASCIZ  /AN ILLEGAL MODE - LOG OFF IMMEDIATELY/<ESC>/[m/<BELL>
        .LIST   BEX
        .EVEN
        .PAGE
        .SBTTL  SPECIFIC PROGRAMS TO BE POLICED (SPECIAL PRIORITY LEVELS)
;               ***************************************************************
;               ****************** programs to be checked *************************
;               ***************************************************************

;       Program Table

PTABLE: .RAD50  /MS    /        ;Names of programs to be checked go here,
        .WORD   20.             ;along with the maximum priority allowed.
        .RAD50  /RFD   /
        .WORD   20.
        .RAD50  /TAD   /
        .WORD   20.
        .RAD50  /CC    /
        .WORD   20.
        .RAD50  /QUADS /
        .WORD   20.

        .RAD50  /      /        ;This is a null-program entry to mark the end
        .EVEN                   ;  of the table of programs.

HILIM:  .END    START
```

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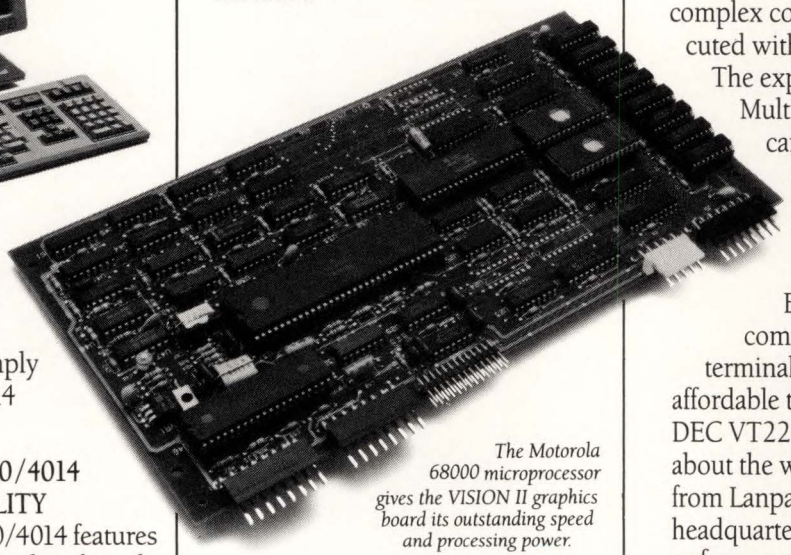

The Motorola 68000 microprocessor gives the VISION II graphics board its outstanding speed and processing power.

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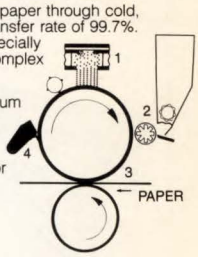

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THE BACK END

By John C. Dvorak

Today's Technology Is Tomorrow's Junk

I was depressed by technology. I figured it was time to visit my personal guru, Swami Sri Swish Nanda, in his San Francisco tree house.

Earlier in the day, I roamed through a bad part of town and noticed a near-dead TV repair place. It had fallen on bad times — the windows were filthy and the signs were worn and chipped. It was kind of pathetic. Dust had gathered on old Zenith and RCA tube sets. There was a Muntz and a Curtis-Mathes TV in the window. I could see an old Sylvania round tube set in the store next to the owner who had propped up his legs on the thing. He was knitting! A cat sat nearby.

"Sheesh!" I thought to myself. "Is this the fate of technology — dead boxes? Nah, couldn't be."

It's then that I decided to visit the Swami to see what was in store for the microcomputer revolution.

I arrived at the Swami's tree house a little after five. The Swami was fiddling with his Mitsubishi Crystal Vision projection crystal ball. He spotted me. "Don't say anything!" (Pause) He stared. "Yeah, yeah, I've got it — you're worried about the future again, eh, Dvorak? Well, let me adjust this thing and we'll take a look."

As I sat on the deep pile Persian rug, the projector came to life. Smoke clouded the room and somehow I was transported into the future. It seemed as though I was in the same neighborhood as before. It had changed. It looked as though the area had been yuppified and then evolved further into a slum. The store front again was a dusty, dirty mess. The sign was faded. The words "New Byte Shop" were crossed out and "Junk Store" was painted on the window. It was weird!

I walked in and found myself among what must have been . . . a computer graveyard?? "What can I do for ya, sonny?" said an old man who ambled up to me. He was holding his cat, methodically stroking its neck.

"Uh, just looking," I said.

He stared at my attire as though I were somehow out of place. "Go right ahead. Have any questions — you just feel free to ask."

I couldn't believe what I saw — piles of old microcomputers, terminals, even something called a Super MICROVAX IX! It was the size of a cigar box and was manufactured by the Digital Equipment Division . . . of IBM! "Wow!" I thought to myself.

"Only got one of 'em," said the old man. "A gen-u-ine collector's item! Last computer made by IBM b'fore it went broke."

"IBM went belly-up? When was this?"

"Where you been, sonny? Years ago! Right after Photon Dynamics introduced the KK-43 photonic biological supercomputer. Got one right here in mah pocket. See?"

He handed me what looked like a credit card with a weird connector attached. "Of course, it's a wee bit old-fashioned now."

"Well, I'm looking for some real old stuff."

"Oh, you mean the real weird junk that came out in the 1980s or so? Follow me."

In the back, there it was — piles of old Northstars, and PCs, and Rainbows. There was box upon box of floppy disks with faded labels. I flipped through a pack of 8-inch floppies. There was a copy of *WordStar* on one! The old man spoke up. "Don't know what in tarnation they used those big disks for. Ain't never found no holder for 'em. They called 'em 'disk drives' in those days. Some guy comes in once in a while and claims he has a use for those old 8-inch disks — a gray-haired nut case, that one. Keeps mumbling something about CP/M, whatever that was. Says the 8-inch disk 'marked the peak of quality.' A real screwball."

As I focused my attention on the pile of 5-inch floppies, the old man pulled out an Exidy Sorcerer computer. "Lookie here! You say you want a a collector's item? This one here's in mint condition and comes with all the books, too."

"Wow! How old?"

"Oh, 'bout a hundred, I suppose. Still works, too, but you'll need a special adapter, though — they used alternating current in those days. Can you imagine?"

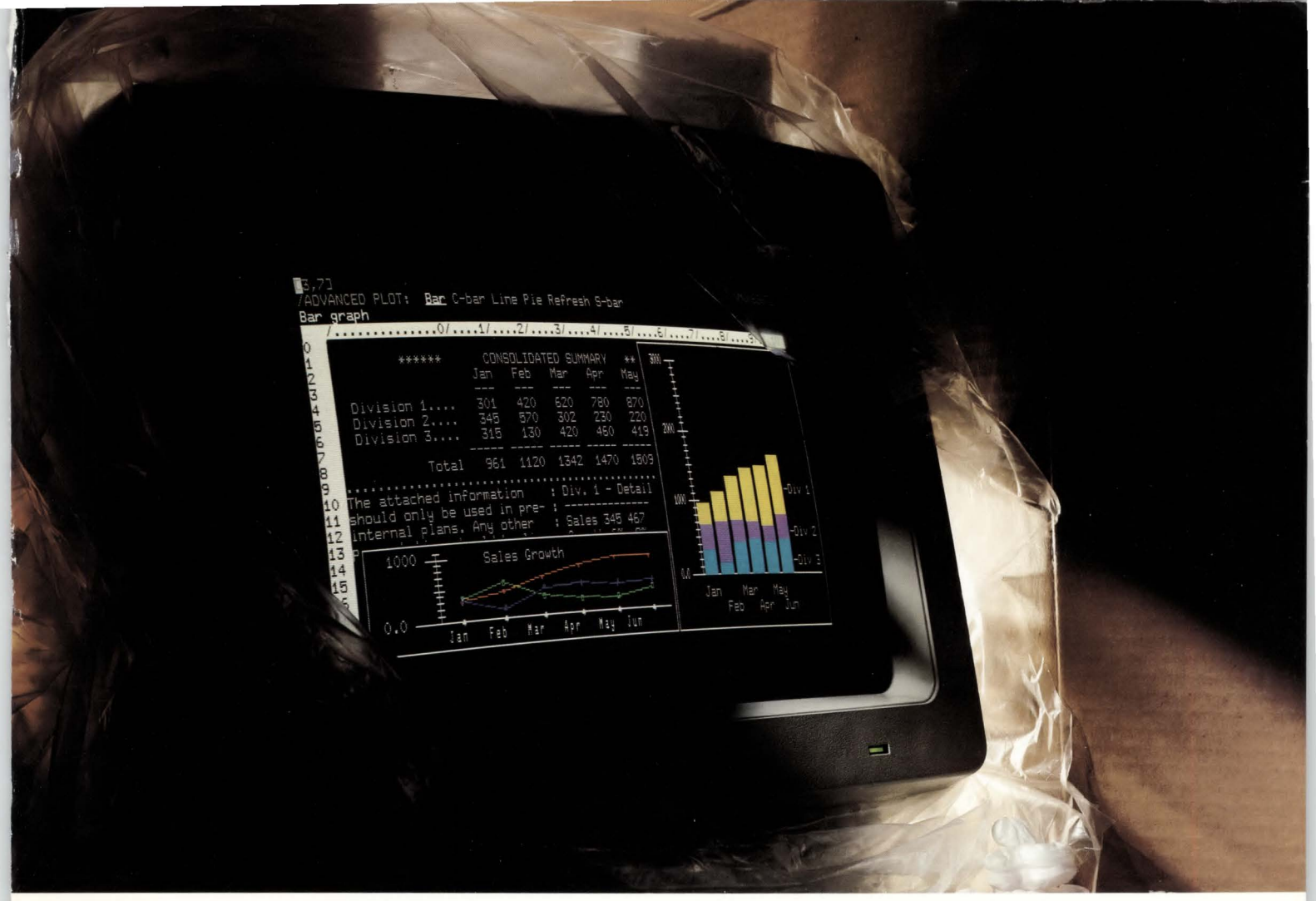
"Hard to believe," I said, as my eyes widened. "So are these things getting more valuable, or are they just so much junk?"

"Haven't you been reading the paper? Everyone knows that . . ."

Just then the cloud cleared and the Mitsubishi made a sp-sp-sputtering sound. The images faded and the meditation room returned. "Hey! What happened? I was just about to find out how valuable old computers will be in the future."

"Gosh," said the Swami, "damn thing shorted out. Did you find out anything at all?"

"Yeah, IBM buys DEC and goes broke!" I pondered the idea as I wandered home past the old TV repair store. "Gee, that guy in there looks familiar," I thought out loud.



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