

HP Professional

AN INDEPENDENT PUBLICATION FOR USERS OF HP COMPUTERS ■ VOL. 3 ■ NO. 8 ■ \$4.00

AUGUST 1989

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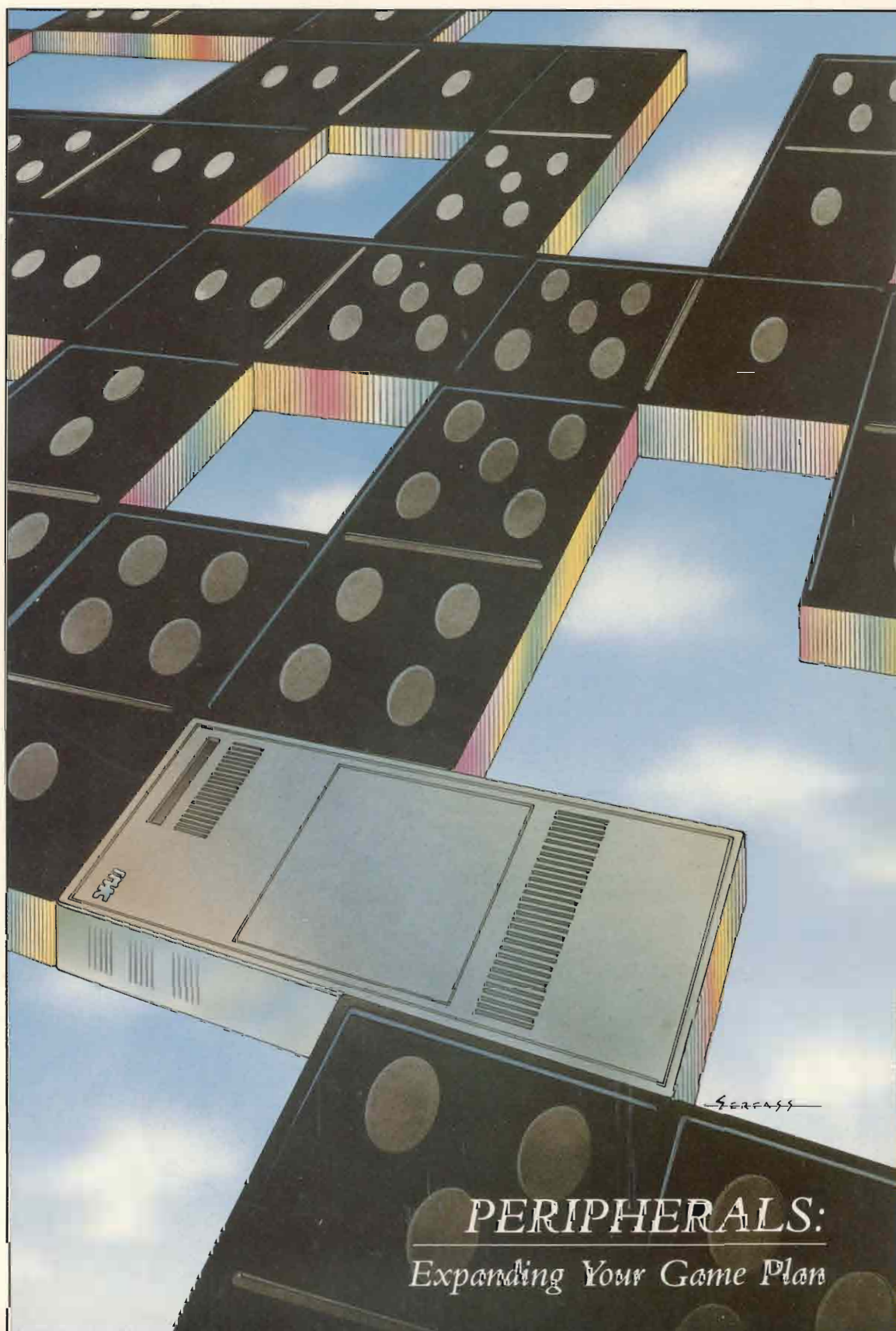
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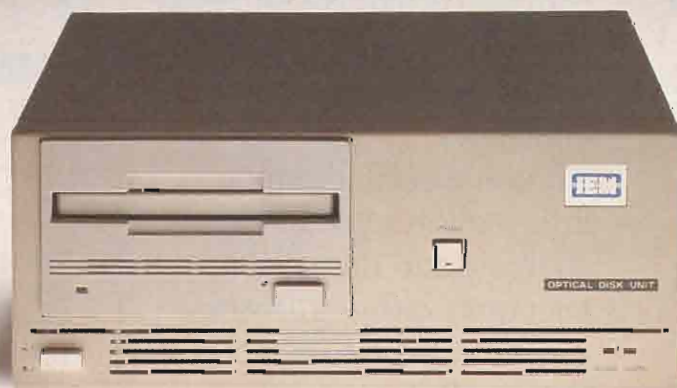
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C ONTENTS

AUGUST 1989

VOL. 3, NO. 8

32 FOCUS: Need More Memory?

by Peggy King

A Guide To Buying Add-On Memory.

42 FOCUS: Optical Integration

by Jay Woodruff

Its Time Has Come.

50 FOCUS: A Printer For Every Need

by Lynn Haber

Today's Printers Offer Greater Speed, Flexibility, Functionality And Now, Color.

58 Create Your Own Forms

by Wendy Hewitt

Computer-Generated Forms Offer Flexibility.

72 Programming The CI 'Shell'

by Christopher Nelson

A Programming Environment Worth Consideration.

80 SQL: The DBMS Standard

by Larry Kemp

The Waiting Is Over.

C O L U M N S

FROM THE LAB:

HP LaserROM

by Del Lukens.....87

Adaptable Printing

by David B. Miller.....92

SECURITY: What Should You Protect?

by Jeffrey Caldwell

Complete Security Requires Protecting Data,
Programs And The Operating System96

FIELD SERVICE: Take Good Care Of Your Desktop

by Ron Levine

Desktop Computers Require A Friendly
Environment98

PC TIPS: Batch File Programming

by Miles B. Kehoe

An Introduction To The Environment100

HP-UX: Vi Editing Techniques

by Andy Feibus

Vi Configuration, Complex Commands
And Multiple File Editing104

RDBMS: Referential Integrity Is Also Critical

by Fabian Pascal

Shifting The Responsibility Of Integrity From
The User To The DBMS110

DEPARTMENTS

Editorial 8

Letters 10

ARISTALK 12

Industry Watch 16

News & Trends 18

New Products 26

Product Showcase 122

Consultants Directory 125

Software Directory 126

Advertisers Index 128

Calendar 128



INDUSTRY WATCH:

Options For
Disc Interfaces.....(p.16).

On The Cover:

This month's cover
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of airbrush artist Jim
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U.S. V.I.

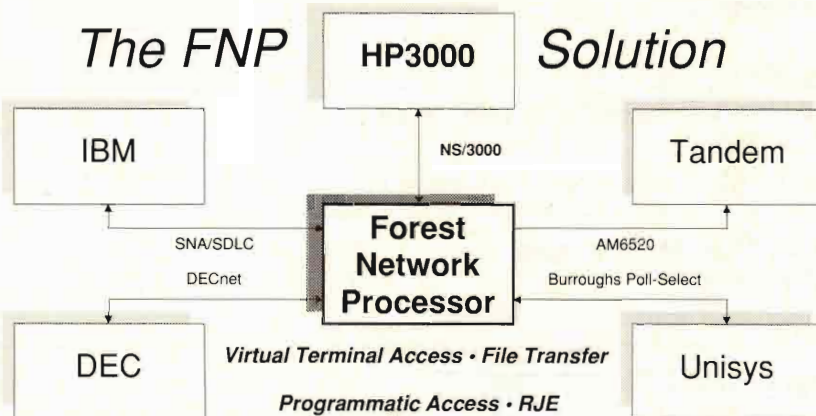
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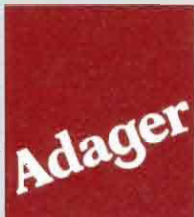
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50 Years Of Looking To The Future

It all began 50 years ago in the infamous "garage," now a certified historic landmark. The company began on Jan. 1, 1939 when Bill Hewlett and Dave Packard flipped a coin to decide the name of their new business partnership. Shortly thereafter, their first product, the 200A audio oscillator, was introduced for \$55. The young engineers selected the model number "200" so prospective customers wouldn't think they were buying from a garage-shop operation.

The rest, as they say, is history.

Next month at the annual INTEREX HP Users Conference in San Francisco, Mr. Hewlett and Mr. Packard celebrate their 50th anniversary. From a rented garage in Palo Alto where they whipped up an inexpensive gizmo that measured the frequency of sound, to a multinational company with 1988 sales in the neighborhood of \$9.8 billion, HP has become one of the top companies in the world.

Impressive.

But, as any corporate executive worth his salt knows all too well, you're only as good as your last quarter. In this respect, HP is poised for the challenges that lie ahead. Gone is the "What if..." slogan; today, it's "There Is A Better Way." Slogans aside, HP currently is carrying out and planning strategic moves that will drive the company well into the 1990s—and beyond.

Long criticized for its stodgy personality and weak marketing skills, HP now is rallying its troops out of the trenches to engage the competition head-on.

The proof is in the pudding:

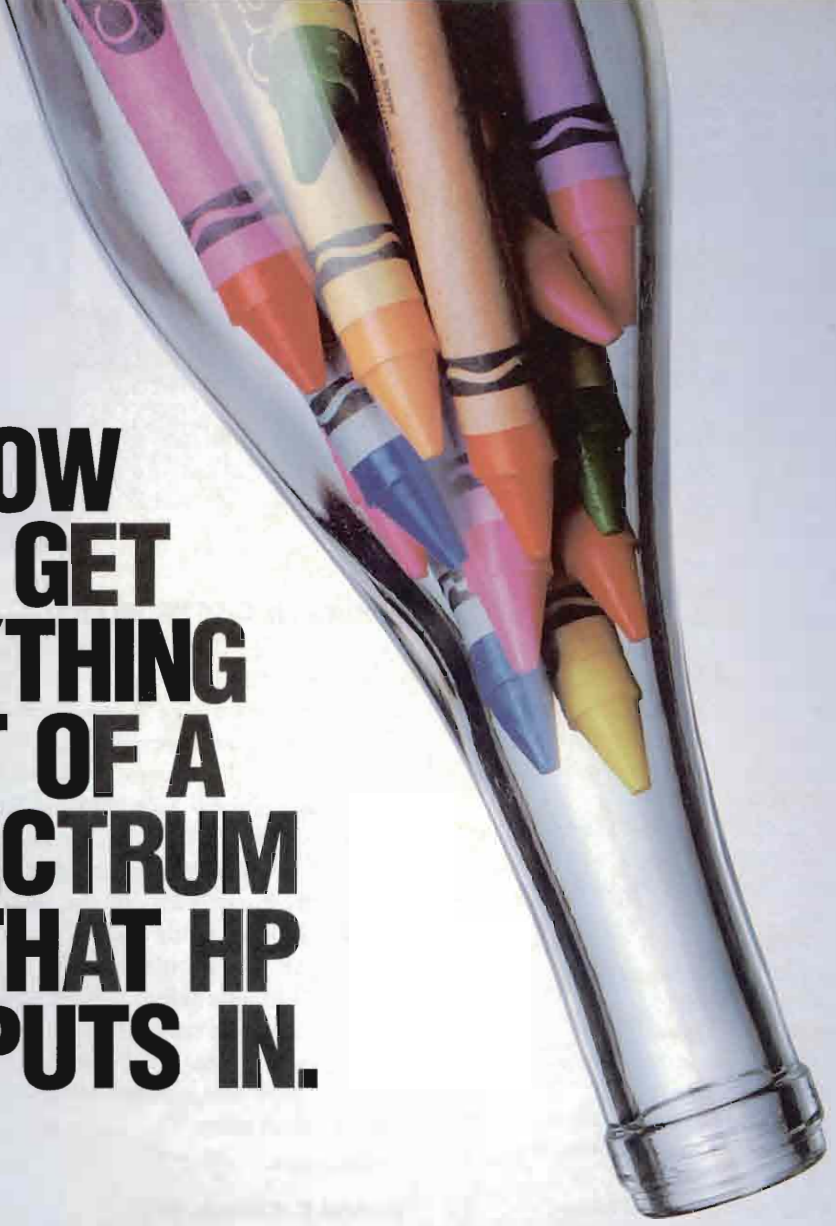
- Almost overnight, HP jumped from an also-ran third position to No. 1 in the workstation market following its acquisition of Apollo.
- HP has become the flag bearer of open systems and standards-based technology.
- Recently, HP has aggressively campaigned to lure DEC and IBM customers into its fold by offering loaner multiuser systems to entice them over to HP's camp. Moreover, HP will provide technical assistance to help such customers port their data over to an HP system and, even help the user resell existing equipment.
- Internationally, HP has taken an active role in the numerous European standards committees that are working to transform Europe into a unified common market by 1992.

As Hewlett-Packard positions itself to compete in the highly-competitive global market in the years ahead, *HP Professional* will be there to keep you informed—informed about the systems, peripherals, third-party vendors and cutting-edge technology you need to know to help your business compete and prosper.

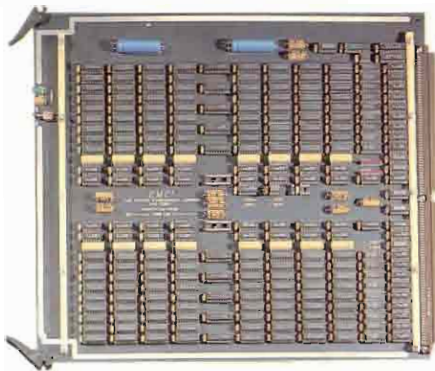
While at INTEREX, stop by our booth (No. 212-14) and let us know how we can serve you better. Talk to us. Tell us your concerns. Tell us what we can do to continue bringing you pertinent, interesting and informative coverage of your market.

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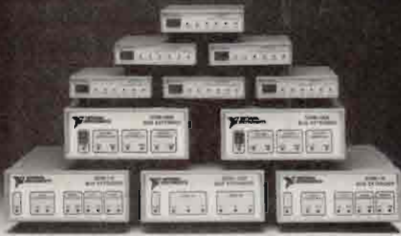
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LETTERS

CURING LIF DISC PROBLEMS

In the article "Curing LIF Hard Disc Indigestion," (March 1989) by Don Person, the figure on page 78 appears to be wrong. The system sectors (Sector Nr. 9) of two LIF directories on my 310-based system show an additional four bytes in word 6&7 (Base 0) between the recorded value of the beginning sector of the directory. "BBBB" in the figure, and the recorded value of the directory size, "EEEE." In both cases the 8-bit unsigned numeric values of these bytes are 16,0,0 and 0 in order of their occurrence in the sector. Mr. Person's code given on page 80 is correct with respect to this observation.

Sincerely,

**Durand R. Kinloch, MTS
Solon, OH**

Dear Durand:

Your observation is correct. While all systems contain the "base" and "extent" double words, there's an additional gap for what is actually redundant data. The extra information is the number of the first DATA sector on the disc, but surprise, it's stored in reverse order. That's why the 16 comes first. You'll notice that the base (usually +2) plus the extent of the directory ('14' by any chance?) yields this extra value.

Many systems don't implement the superfluous information you have discovered. To my knowledge, it's only of consequence on so-called "multi-volume" tape of the 3000 series. In practice,

none of HP's disc based systems will die without it.

You could manipulate the volume control fields in a number of interesting ways. In my image backup program, I reserve the entire base of the disc, using the extension field for partial image control. Let's say you have a disc with 1,024 sectors. You could set a base of 1,000 and an extent of 2. The value that goes in your phantom field would be 1,002, leaving a miniscule data area. The block from sector 0 to 102 couldn't be accessed by a standard HP operating system, making the unit sector 1 - 999 invisible and thus unable to be written (except of course by physical utilities and assembly language disc calls.) If you do try this sort of customization, remember to initialize the new directory sector you carve out.

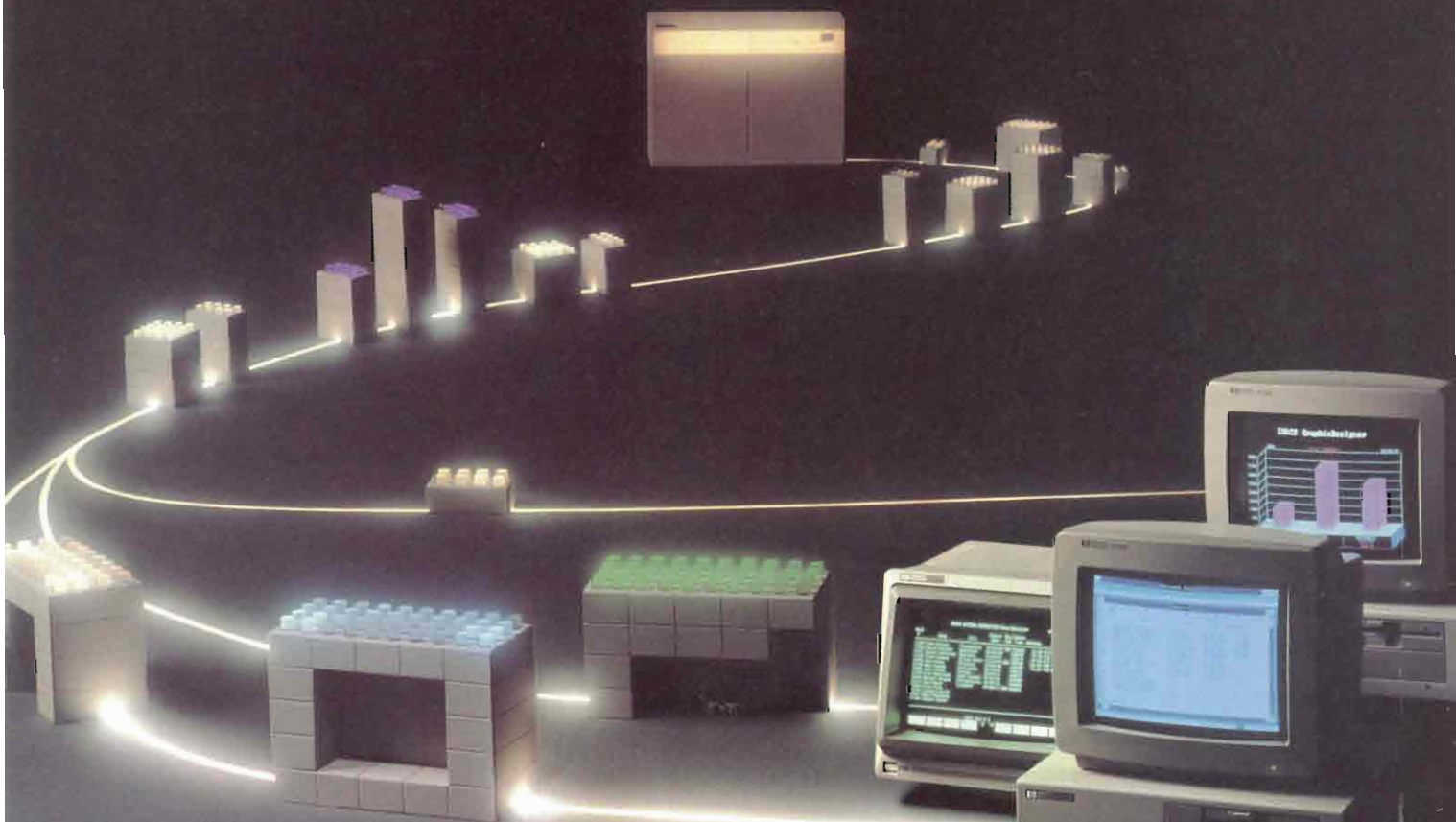
Volume word #10 carries the version number of the medium, and you will find the HP-UX system do use locations after the directory extent field for combined LIF/UX volumes too. These appear to have proprietary release dependent definitions, because the number of words filled in varies with the version.

Thanks for your interest,

Don Person ■

Address letters to the editor to the HP PROFESSIONAL magazine, P.O. Box 445, Spring House, PA 19477-0445. Letters should include the writer's full name, address and daytime telephone number. Letters may be edited for purposes of clarity or space.

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SETUP ERROR

QUERY:

Dave Schoeffel (SIG 11/MESS 13): I have a problem with my Vectra RS16 running Novell Netware Version 2.1. The system was up and running for a time when we decided to add more network printers. I added another multi-I/O board (1 par./1 serial port). When rebooted, the machine sent the error "Incorrect SETUP Infor." I ran SETUP and still received the error message upon rebooting the server. I removed the new board, but the error stayed. I know the SETUP file is correct. I have to press F1 to complete the boot, but I'm worried about having a power outage when no one's around. The machine will wait for someone to press F1 before it will boot.

REPLY:

Bill Sanderson (SIG 11/MESS 14): I have a similar problem on a Wyse 2112 PC, and two things work:

1. Disconnect the battery inside the PC, and leave it alone for a weekend. Then reconnect it and run setup.
2. Format a floppy with plain vanilla DOS, not config.sys or autoexec.bat (or minimal ones). Boot machine and run setup from this disc. This works for me.

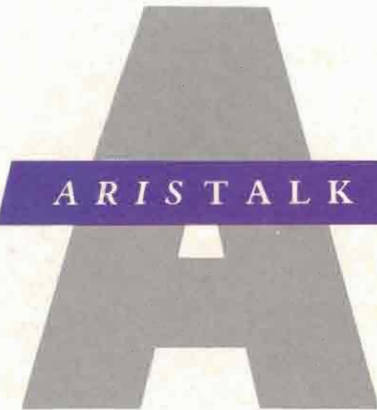
DOS RELEASE 4.01

QUERY:

Ron Levine (SIG 34/MESS 2): Is anyone familiar with MS-DOS Release 4.01? What has it added or fixed from release 4.0? Does it run on all PS/2 models or just the lower ones?

REPLY

Miles Kehoe (SIG 34/MESS 5): The major feature DOS 4.0 offers is a command-



How To Use ARIS/BB

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 - (415) 873-2135 - Northern California
 - (617) 863-5010 - Massachusetts
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The ARIS/BB symbol appears at the beginning of each program that's downloadable. Use these recommendations at your own risk. Professional Press is not liable for any damages to your system that might be caused by the hardware, software, programs or procedures discussed here.

XMODEM and KERMIT are available.

SIG Identification

- The SIG categories referenced in this month's ARISTALK are:
- 11.....Networking
 - 32.....MPE-MPE/XL
 - 34.....MS-DOS

menu interface like PAM on HP Vectras but not as flexible or friendly. If you picture a DOS 3.3 system with batch file menu screens, then you've seen 4.0.

I believe it runs on any system compatible with previous off-the-shelf MS-DOS. The Vectra does fall into that category. But, unless you really want to spend bucks for very little extra benefit, I'd "Just Say No" to DOS 4.0.

HP TERMINALS

QUERY:

John Korondy (SIG 32/MESS 2): I like your bulletin board almost as much as I like your magazine. However, my backspace key acts as a Return, and my Vectra displays some strange characters as I read a page, such as 1;22HJ. Can you help?

REPLY:

Miles Kehoe (SIG 32/MESS 3): HP terminals are great, but usually they're set to HP mode rather than VT100/ANSI type. You can set your mode to ANSI for the duration of the session and do much better. Depending on which version of Advancelink you have, do something like this:

Select Config key (F6) Select Global Config, (F1). The field labeled 'Personality' should have ANSI set to use this board. When you save the Config (F1), your terminal is now VT100. Change it back after you log off, or it won't work on your 3000 or 800. You can pick the backspace key to be DEL rather than CTRL-H; on ANSI terminals and VAXen, leave the backspace key as DEL. You'll be much happier. ■



FULL SPECTRUM.

BackPack/XL

System backup on a 900 Series HP 3000 is a big job ... and with inevitable file expansion, it gets bigger all the time. BackPack™/XL is a high-speed and unattended backup alternative that can keep backup chores under control. BackPack/XL runs over twice as fast as HP's TRANSPORT mode STORE, and faster than native mode as well. BackPack/XL also reduces tape use by half, and supports unattended backup. This approach reduces or eliminates user downtime.

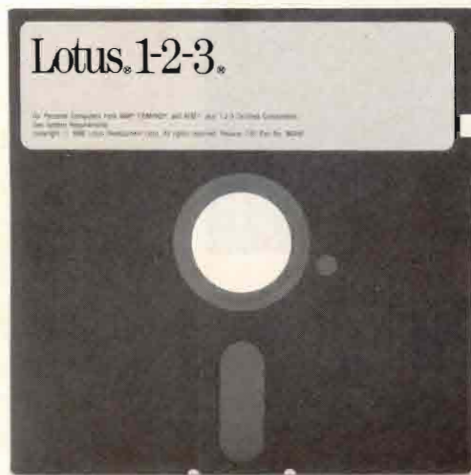
BackPack/XL uses the same tape format as BackPack/V, so tapes created on a 900 Series HP 3000 can be restored on a stack system, and vice versa. HP's native mode STORE produces tapes which can't be restored on a stack HP 3000, and TRANSPORT mode, which produces compatible tapes, is very slow.

Use the system backup approach that's as dazzling as your new HP hardware. Call for your free demo today.

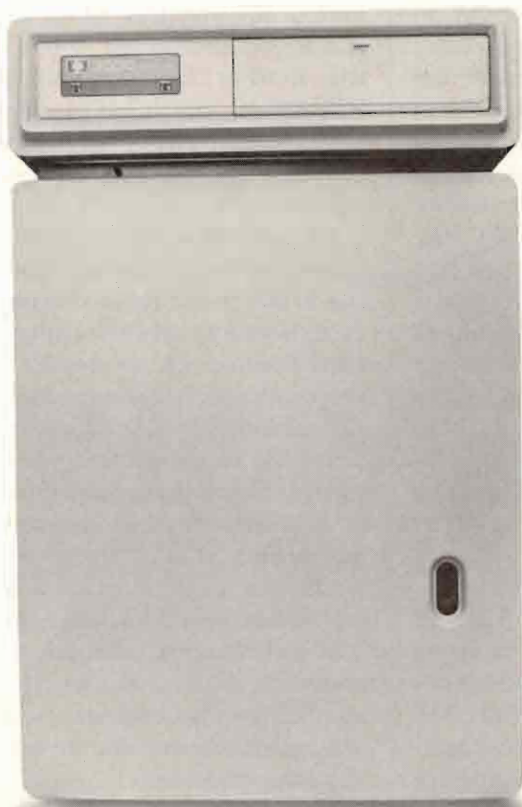
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Options For Disc Interfaces



INDUSTRY WATCH

Peggy King

Until recently, HP had a very simple disc interface strategy.

All systems had an HP-IB interface card and all peripherals that HP sold could connect to HP-IB. It's ironic that in the days when HP's computer business was "sectored," the HP-IB interface made it possible for commercial and technical systems to use most of the same peripherals. Now there are three disc interfaces but no systems that provide all three of these interface options.

In 1988, HP began shipping the two other disc interfaces, one proprietary and one industry standard. In April 1988, the SCSI (small computer systems interface) disc interface made its debut as an option on all but the oldest models in the Series 300 workstation family.

HP has announced plans to make SCSI available on the HP-PA Series 800 machines, but they haven't said when it will be available. Says Steve Folster, product manager for SCSI Interface, "HP will provide SCSI interface on all HP 9000 systems because our technical customers demand open systems."

Approximately one month after the SCSI interface option was introduced, HP-FL (fiber link), a fiber optic disc interface specifically designed for HP-PA systems, became available for customers who need more discs per CPU, longer cables or growth potential. According to Melanie Armstrong, product manager for HP-FL, "HP-FL is designed to meet the needs of commercial customers with large configurations." HP does not intend to make HP-FL available to customers with "classic" (MPEV) HP 3000s or to HP 9000 customers.

As far as disc interfaces are concerned, it sounds like commercial and

technical sectors revisited. Without a doubt, HP-FL has more to offer customers with large multiuser systems than HP's first implementation of SCSI, an interface designed for smaller systems. For example, HP-FL allows a maximum cable length of 500 meters compared to six meters in HP's current implementation of SCSI/1, and a data transfer rate of 5 MB per second compared to 1.5 (in asynchronous mode) for HP's SCSI/1 card. Nevertheless, it looks to me as if MPE and MPE XL customers are locked into a proprietary disc interface and a limited choice of peripherals because HP has not said if or when a SCSI option will be available to them. By contrast, HP-UX customers get the advantages of an industry standard system and a larger choice of peripherals.

A Policy Is A Policy

It was in keeping with HP's policy of supporting and promoting emerging industry standards to have a SCSI interface option for the Series 300 family. The SCSI/1 standard, adopted in 1986, is gaining wide acceptance. But it doesn't seem fair that customers who purchased the costlier Series 800 systems will have to wait over a year and a half to share the same advantages. To make matters worse, HP has just begun shipping an Optical Erasable Drive that has SCSI but no HP-IB — the first peripheral not to offer HP-IB since the standard was established eight years ago.

This decision to promote industry standards comes at the expense of a large installed base of HP 3000, HP 1000 and HP-PA customers. Because there's no choice of interface, the only potential customers for the Model 650/A optical drive are those who purchased workstations in the relatively inexpensive Series 300 family. But are they the only customers who could benefit from having an

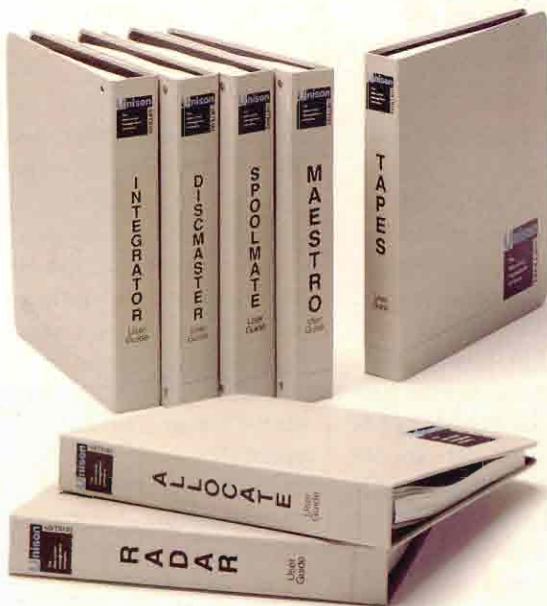
erasable optical drive? IEM and Herstal Automation Ltd. don't think so. Customers who still depend on HP-IB will have to buy from IEM, which recently announced an erasable optical drive with an HP-IB interface or from Herstal Automation, which has introduced a SCSI drive that can be used along with a converter that translates between SCSI and HP-IB.

IEM marketing director Anita Sayed mentioned that HP is losing opportunities to sell in the HP 3000 market because it doesn't offer the option of an HP-IB interface on its erasable drive. Wayne Morrell, marketing director at Herstal Automation Ltd., believes that Series 800 customers will want SCSI erasable optical discs before HP provides an interface card for their system. He regards the SCSI-to-HP-IB converter that works with his company's SCSI optical drives as an interim solution and awaits SCSI for the Series 800 as eagerly as some customers do. Herstal uses HP's SCSI interface boards to connect Series 300 systems to the optical disc drives it sells. The company intends to use the Series 800 SCSI interface card from HP when it's available.

HP is still in the process of determining its disc interface strategy and recently formed a task force for interface technology to track emerging interface standards such as SCSI/2. The task force includes representatives from all of the computer systems divisions and from the various peripherals divisions. Its mission is to study interface strategy by considering both the interfaces and the peripherals that will be connected by them.

Perhaps this task force should also include a customer representative from each product line. ■

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CIRCLE 141 ON READER CARD

Interface Standards Help Government VABs Work Together

Application Sharing Possible Between Vendors For State And Local Governments

State and local governments run their operations on a variety of software and, in some cases, on several different types of computers. For instance, most cities use software to manage the issuance of permits and licenses, prepare payroll checks for employees, control the city's inventory of supplies, manage the fleet of public vehicles and perform general accounting. In addition, a growing number of cities and states are using workstations for Geographic Information Systems (GIS), civil engineering and design applications.

The HP Interface Standards for state and local government make it possible for applications from different vendors to share data with each another. In the past, there were two ways to insure that software from different applications would work together. One way was to purchase all software from the one or two vendors who had integrated government information management packages, even if that meant settling for second best in

some applications in order to have an integrated package.

The other approach was to have the city or state's own programmer/analysts write the interfaces between products and be responsible for resolving any incompatibilities.

Last fall, a group of eight HP VABs met together to find out what incompatibilities existed between their products and to rewrite parts of their applications to allow for more integration and shared data between their

products. Because the Interface Standards are incorporated into the existing products, there's no additional charge for the modifications that the VABS made to their products.

At the Government Technology Conference (Sacramento, CA) three HP VABs demonstrated how the HP Interface Standards make it possible for software from different vendors to work together even if some applications are on the HP 3000 and others are on the HP 9000.

Representatives of Delta Systems (Ft. Collins, CO), a supplier of GIS software for the HP 9000; Mitchell Humphrey & Co., an HP

3000 accounting VAB, and Sierra Computer Systems (Visalia, CA), a supplier of permit and land management software for the HP 3000, demonstrated the links between the software packages they sell. A city using the Delta Systems' Delta-map software to keep a record of all existing structures in the city can accept data about building permits and licenses assigned to a structure. The Deltacom file transfer utility accepts files from Sierra Computer Systems' PERMITS software. If a city uses this software to track the fees associated with licenses and permits along with General Ledger software from Mitchell Humphrey & Co., the fees recorded whenever permits or licenses are issued are automatically entered as revenue in the general ledger.

As more government VABs make their products conform to interface standards, the cities and states that use HP equipment will be able to choose products that best suit their needs without having to spend public funds on developing customized interfaces between their applications. — *Peggy King, West Coast Editor*

GTE Signs \$10-Million Contract For HP Vectra PCs

GTE Provides Microcomputers And LANs To Communications Industry

HP has signed a one-year, \$10-million agreement to supply its full line of HP Vectra personal computers to GTE Corp.

GTE will package the computers for resale as part of the company's program to provide microcomputers and LANs to its customers in the communications industry. GTE also will use the PCs internally for general office and commercial applications. Shipments, including HP computer-peripheral products, began during the second half of 1989.

How Kelly unleashes HP performance.

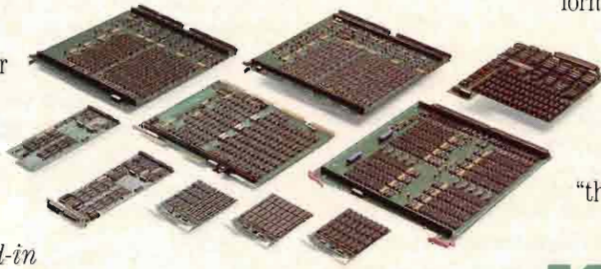
It's a Kelly tradition. Taking HP system performance to the maximum. Cutting through the restrictions. Overcoming the limitations — whether posed by CPU, memory or I/O.

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CIRCLE 173 ON READER CARD

SCRUG Extends Services To SIGs And LUGs

SCRUG Offers Help To User Groups In LA

Most RUGs (regional users groups) can get by with a volunteer staff, a bank account and perhaps an answering service. SCRUG, however, has its own office and two full-time employees and is therefore in a position to help the smaller SIGs (special interest groups) and LUGs (local users groups).

In California, even the smallest user group is required to take out liability insurance and incorporate in order to disperse funds. These costs make it difficult for small groups with no paid staff to survive. SCRUG comes to the rescue for groups in and around Los Angeles.

LUGs and SIGs in Southern California can pay SCRUG an annual fee to participate in their liability insurance plan, have one of SCRUG's office managers set up a DBA (doing business as) arrangement, and take advantage of the other benefits

of having experienced office managers handle the administrative details of running the group. By affiliating with the incorporated SCRUG, the smaller groups get the business services that are available only to incorporated groups without passing the high costs of incorporation on to their members.

Currently the San Fernando LUG is the only local users group affiliated with SCRUG. Other organizations affiliated with SCRUG include a very active chapter of SIGconsult (an independent association of consultants with experience in HP systems), users groups for MM and HPDesk, SIG Powerhouse and LABTec, the Los Angeles area users group for HP 1000 and HP 9000 technical computers.

For more information on SCRUG's services to other groups, call (213) 450-3383. — *Peggy King, West Coast Editor*

IISI Contracted By GAF Chemical

Customization And Implementation Support Provided To Cardinal Data

Innovative Information Systems Inc. (IISI) has been contracted by GAF Chemical to provide customization and implementation support for Cardinal Data Corps. financial and distribution packages. IISI is a systems integration/consulting firm specializing in the HP 3000 commercial applications in-

cluding MPE, MPE XL, HP-UX and associated third-party products.

Contact Innovative Information Systems Inc., 63 Nahatan St., Norwood, MA 02062; (617) 769-7511.

Circle 370 on reader card

IBI Becomes Authorized Gold Reseller

Ashton-Tate's SQL Server And PC/Focus Sold Together

In an agreement between Ashton-Tate and Information Builders Inc., IBI became an authorized Gold Reseller for the Ashton-Tate/Microsoft SQL Server.

SQL Server will be sold in conjunction with the PC/Focus Fourth Generation Language/DBMS, allowing OS/2 and MultiUser Focus applications to work transparently with SQL Server data.

The full range of Focus facilities, including color graphics, application and report painters, object-oriented development tools, statistics and Focus Report Writer, will operate with both Focus and SQL Server data.

Contact Information Builders Inc., 1250 Broadway, New York, NY 10001; (212) 736-4433.

Circle 368 on reader card

HP Begins Volume Shipment Of High-End HP-PA 955 Systems

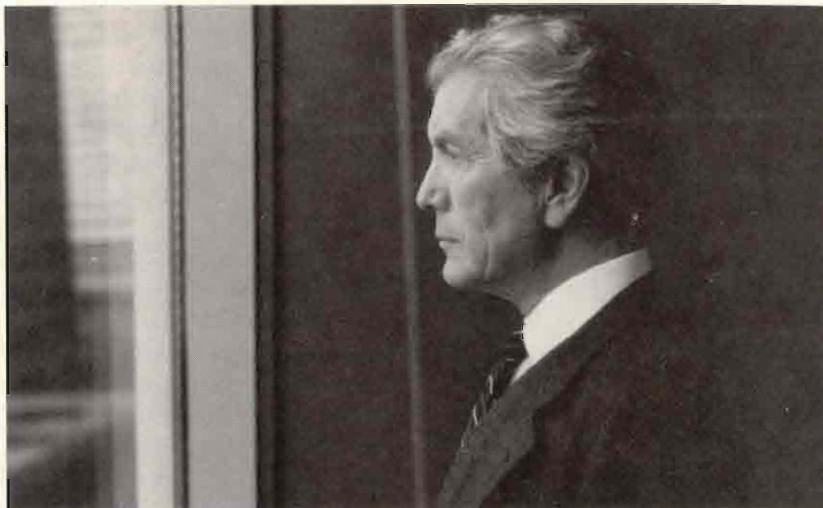
Performance Brief Compares 955,950 And 70

HP has published a Performance Brief that explains comparative measurements that the company has made between its highest performing business system, the HP 3000 Series 955 and two other HP systems, the Series 950 and the Series 70. With a cache twice as large as that of the Series 950, the Series 955 would provide about 50 percent greater throughput and support from 400 to 600 users. The Series 955 also provides sufficient capacity and more than twice the throughput of two Series 70 systems.

Benchmarks for the system were performed in both batch processing and on-line transaction processing (OLTP) environments using MPE XL release 1.2 in Native Mode. In a manufacturing

application the Series 955 processed 50 percent more transaction and supported 56 percent more users than the Series 950. Systems are being shipped with 96 MB of memory, but HP currently supports up to 160 MB. The system has two memory controllers and each one has a memory backplane that holds eight slots for 16 MB expansion boards.

The floating point performance of the Series 955 was also measured with the industry standard LINPACK benchmark. Floating point coprocessor on the Series 955 provided more than three times the floating point performance of the Series 950. — *Peggy King, West Coast Editor*



Why you should agonize over your choice of financial software.

Face it. There's a lot more riding on your choice of business systems than the price of the software. Like the effective financial control of your organization. And your bottom line.

So look carefully and thoughtfully. A little time spent up front can save you years of aggravation and hundreds of thousands of dollars down the road. Not to mention your job.

Know your software vendor. Remember, you're not just buying software, you're investing in a long term relationship. Keep in mind all accounting software *is not* created equal. Be sure the package you select is right for your organization's requirements.

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To take a closer look at what our software can do for your organization, call Ken Benvenuto at 800-237-0028. Or write us at 11720 Borman Drive,

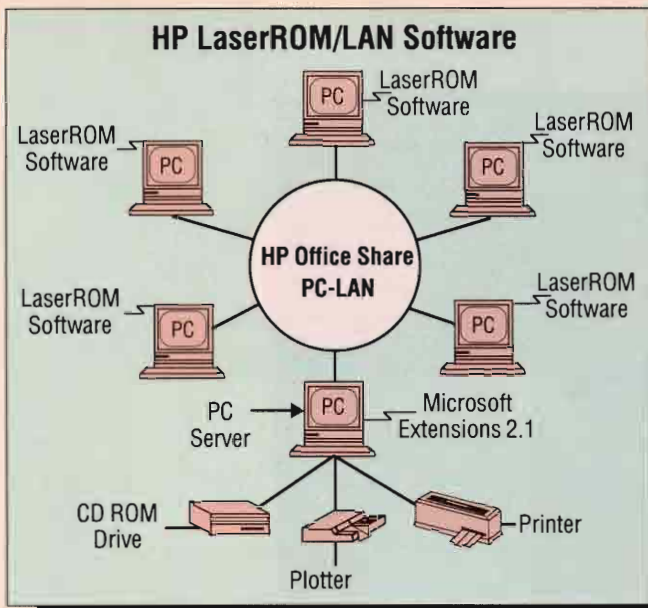
St. Louis,
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CIRCLE 197 ON READER CARD



HP Introduces Networking Capability For Its CDROM Products

LaserROM/LAN Enables Access To HP CD ROM Products From A LAN

HP has announced HP LaserROM/LAN, a product that enables up to eight users to access any of HP's CD-ROM information products from a local area network.

HP LaserROM/LAN, which consists of a standard CD ROM drive and Microsoft Extensions Software, operates on a MS NET, HP Office Share network.

The CD ROM drive that accompanies HP LaserROM/LAN can also be used to run other CD ROM products that

adhere to the industry accepted High Sierra/ISO 9660 file structure standard.

To install HP LaserROM/LAN, the user connects the CD ROM drive to the network like any other peripheral device and copies Microsoft Extensions to the PC server. At this point, any HP Office Share networked personal computer with the HP LaserROM/LAN retrieval software can access the HP LaserROM product on the CD ROM drive.

HP Introduces CASEdge Products

Service And Software Products Help Scientific And Engineering Users

HP has introduced the first three products of its CASEdge family of products for software engineering environments. The new HP CASE products complement those of Apollo Computer

and the third-party products that run on HP and Apollo platforms. The CASEdge family consists of both service and software products.

HP Software Engineering Requirements Analysis is a consulting service

brought to the customer site. HP consultants evaluate suitability of tools, methodologies, project management and metrics currently used by the software-development teams.

HP SoftBench is a C and FORTRAN software-development environment that includes an integrated set of development tools and a platform for integrating these tools. The tools include editors, automated compilers, a program debugger, a static analyzer and a version control facility.

These products feature a consistent user interface based on the OSF/Motif user interface. SoftBench's integration platform allows for remote execution of tools and distribution of data in a Distributing Computing environment.

HP Encapsulator provides a program-interface language allowing you to extend and customize HP SoftBench with your own

command-line tools and UNIX system utilities. Incorporation of these user-developed and operating system tools requires no source code modification if the tools adhere to the standard-in/standard-out communication protocol.

The Encapsulator Description Language defines interfaces to windows, messages, event triggers and actions that control encapsulated programs. All encapsulated tools can be accessed through the tool-integration platform in HP Softbench.

HP SoftBench and HP Encapsulator run on HP 9000 systems with the HP-UX operating systems. These CASEdge tools will run on Series 340, 350, 360 and 370 workstations with a recommended 12 MB of physical memory and on Series 800 systems with a recommended 24 MB of memory.
— Peggy King, West Coast Editor

China Hewlett-Packard Named In Top 10 Joint-Venture Companies

Award Presented To CHP For Second Year In A Row By Economic Daily

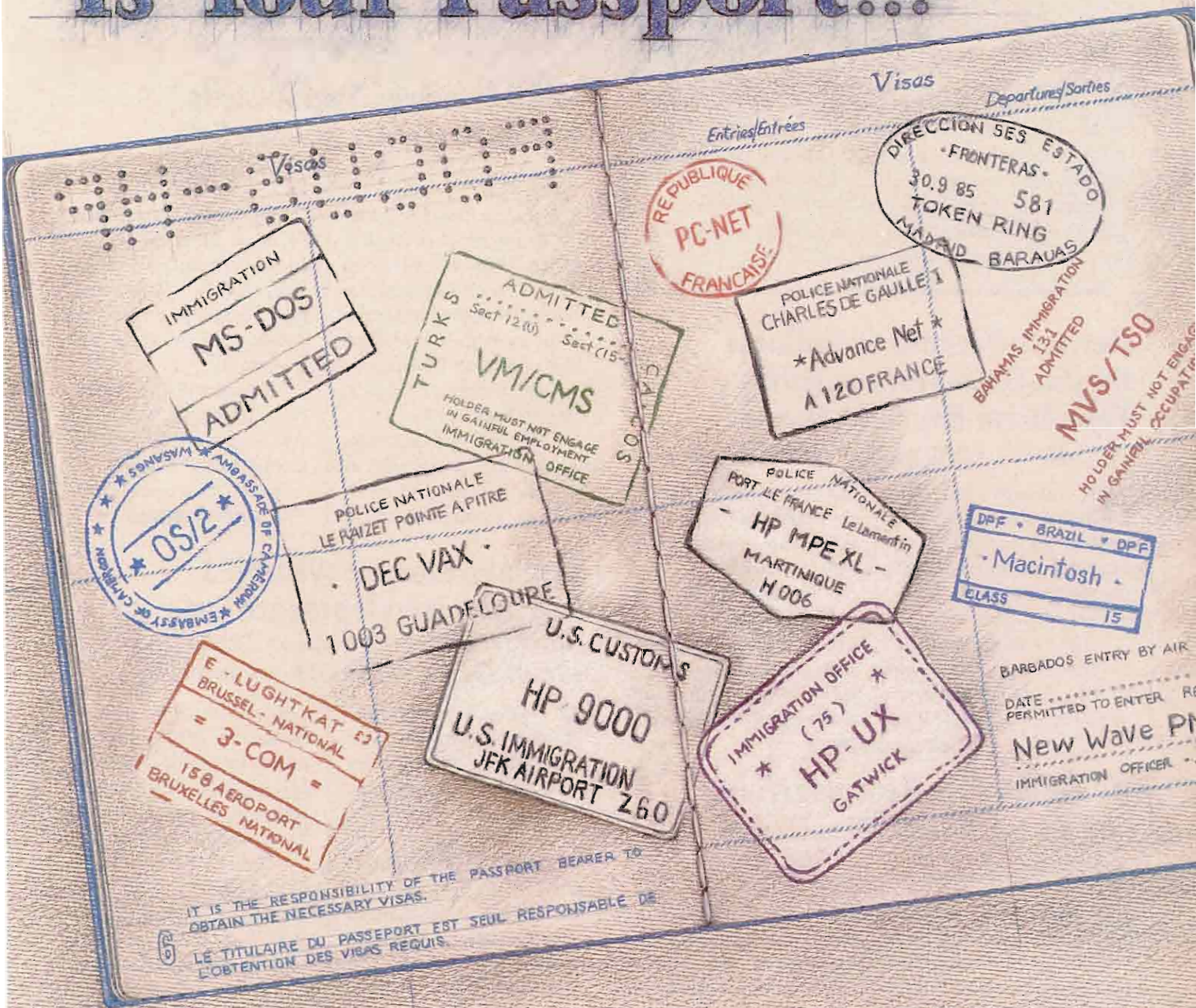
For the second year in a row, China's leading business newspaper has named China Hewlett-Packard (CHP) one of the 10 best joint-venture companies among more than 7,800 such enterprises in the People's Republic of China.

The annual competition is sponsored by the Economic Daily. The newspaper

evaluates joint-venture companies on the basis of such economic indexes as financial investment, profit, productivity, management skills, export orientation and commitment to transferring technology.

The award recipients represent major corporations from the nations of West Germany, France, Switzerland, Thailand, Hong Kong and the U.S.

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CIRCLE 171 ON READER CARD

3M Purchases 50 HP 3000 Precision Architecture Computers

Upgrade Will Include HP Models 925, 950 and 955

A contract has been signed by 3M to purchase 50 HP 3000 HP-PA minicomputers worth over \$15 million. During the next 15 months, 3M will upgrade many of its current HP 3000 systems to the new HP-PA systems that include the HP 3000 Models 925, 950 and 955.

The 3M applications network combines HP manufacturing software, office automation and personal computers. This combination gives 3M's manufacturing sites quick access to information from multiple sources and timely processing of data.

Hewlett-Packard Introduces Digital-Data-Storage (DDS) Tape Drive For OEM Market

HP 3545DA Utilizes Fast Search Facility

HP released its first digital-audio-tape (DAT) product for original-equipment manufacturers (OEMs), the HP 35450A digital-data-storage (DDS) tape drive.

The 5 1/4-inch form-factor drive features a built-in small-computer-systems interface (SCSI) controller

and uses industry-standard DAT cartridges, which store up to 1.3 GB of data using the DDS format.

The drive randomly accesses data in an average of 20 seconds using a fast-search facility that operates up to 200 times the drive's normal read/write speed.

HP Offers Five-Year Warranty For Its 5 1/4-Inch Disc Drives

Reliability Is Goal Of Disc Drive Program

HP announced a new five-year warranty and 150,000-hour mean-time-between-failures (MTBF) rating for its 380 MB-class and 760 MB-class 5 1/4-inch disc drives for OEMs and distributors.

The warranty applies to all HP 97530 and 97540 disc drives shipped under contract on or after May 1, 1989 and doesn't affect current pricing.

HP based its 150,000-

hour MTBF rating on actual field-failure data collected from more than 100,000 discs shipped to OEMs, distributors and HP customers.

Providing high reliability is the basis of HP's disc-drive design and manufacturing program. The program includes: stress/life testing to force failures so problems can be identified and resolved, simplified design and use of very large-

scale integration (VLSI) to reduce the number of components and tools that track the rate of MTBF improve-

ment in the drive throughout development and estimate the product's reliability at introduction.

WRQ Receives Two Awards For Reflection Software Sales

Recognized For Million Dollar Plateau

Walker Richer & Quinn Inc. received two ICP Million Dollar Awards for its Reflection terminal emulation software products at the 18th Annual ICP Million Dollar Awards Ceremonies at The Pointe at Tapatio Cliffs (Phoenix, AZ).

The ICP Million Dollar Awards were established in 1971 to give recognition to software products that have

reached one million dollars or more in sales. Walker Richer & Quinn received the Ten Million Dollar award for Reflection 7 and the Million-in-One award for Reflection 4.

Contact Walker Richer & Quinn Inc., 2825 Eastlake Ave. E., Seattle, WA 98102; (206) 324-0350.

Circle 372 on reader card

Tymlabs Merges With HPS Software Developments Ltd.

Combined Efforts Produced The Session Family Of HP Terminal Emulators

Tymlabs Corp. has signed an agreement to acquire HPS Software Developments Limited (London, England). The merger is a result of the cooperation between the two firms on the Session family of HP terminal emulators. HPS collaborated with Tymlabs on the development of Session for Windows. This product successfully combined HPS's Windows-based emulation technology with the user interface and file transfer facility of Tymlabs Session for Macintosh line.

The result of the merger is a new corporate entity, Tymlabs (U.K.) Ltd., which will represent Tymlabs in Europe. Headquartered in

London, Tymlabs Ltd. will undertake sales, support, promotion and development of the Tymlabs product line, as a full partner with Tymlabs Corp. in the U.S.

Contact Tymlabs Corp., 811 Barton Springs Rd., Austin, TX 78704; (512) 478-0611.

Circle 369 on reader card

Note: If you have any questions regarding a Hewlett-Packard announcement mentioned in News & Trends, please contact the Hewlett-Packard sales office listed in the white pages of your telephone directory.



Spooling Across The Great Divide

Today computing is solution not manufacturer orientated. Which means that you could be working in a mixed hardware environment.

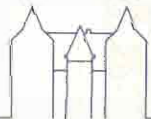
The problem is you may want to use printers attached to non-HP systems; but you don't want to get involved with the technicalities of different operating systems.

So how do you cross the great divide?

It's easy. UNISPOOL provides you with the options to spool to printers attached to IBM and other hardware systems and to spool to HP Desk or telex machines.

It also enables you to spool to Unix based systems such as HP9000.

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CIRCLE 168 ON READER CARD

Softforms Laser Printing Streamlines Production

Westcorp Software Systems Inc. offers a PC-based data processing software system called Softforms Laser Printing System, a laser document and encoding system that allows users to produce financial documents. The system eliminates the need for commercially printed forms and checks. You can print customized documents, complete with logos, names, addresses, sequential numbering and signatures.

Contact Westcorp Software Systems Inc., 2865 Arnwiler Rd., Suite 100, Atlanta, GA 30360; (404) 448-9709.

Circle 400 on reader card

Progress Software Releases Progress V5

Progress Software Corp. has released Progress Version 5, its fourth-generation

language and relational database management system (4GL/RDBMS).

Features include improved performance through the implementation of a multithreaded, multiserver architecture; support for ANSI standard structure query language (SQL); encrypted source functionality; a DOS memory saver; an extended data dictionary and more.

Progress Version 5 is transparently portable across VAX/VMS, MS-DOS, UNIX, XENIX, ULTRIX, AIX, A/UX and CTOS/BTOS operating systems as well as networks using protocols such as NetBIOS TCP/IP, DECnet, openNET and SPX/IPX.

A full application development copy for HP 9000 Series 300 and 800 ranges from \$3,000 to \$74,000.

Contact Progress Software Corp., 5 Oak Park, Bedford, MA 01730; (617) 275-4500.

Circle 389 on reader card

MTI Adds Manager Subsystem To Management System

Management Technology International Inc. (MTI) introduced a new module for its Management System for Distributors (MSD), the Manager Subsystem. It provides planning, reporting and graphics capabilities, step by step financial planning assistance and a variety of decision-support applications.

MSD runs on HP 3000 computers including the precision architecture based systems. MTI is affiliated with HP through HP's VAR program.

The Manager Subsystem module is available for \$8,500.

Contact Management Technology Int'l Inc., 16 Inverness Place East, Englewood, CO 80112; (303) 790-7734.

Circle 399 on reader card

Infotek Memory Boards Useful For HP 9000, 340/360

Infotek Systems offers memory boards for users of the HP 9000 Models 340 and 360 workstations. The HP Model 340 is a 68030-based entry level UNIX system workstation.

Infotek's new EM340, a 4 MB RAM add-in board, offers value to HP Series 300 users as does the EM360 product, offered in 4, 8 and 12 MB configurations. Contact Infotek Systems, 1045 S. East St., Anaheim, CA 92805; (714) 956-9300.

Circle 393 on reader card

Artisan/3000 Improves Productivity Time

SCSSOFT has announced the release of Artisan/3000 Version A.01, a collection of file utilities designed to optimize the productivity time of programmers and data processing personnel.

Artisan/3000 includes the capability



Progress Software Corp. released the latest version of its 4GL/RDBMS.

to manipulate and review MPE and KSAM files in addition to IMAGE datasets, define the internal layout of an MPE or KSAM file, sort up to 20 fields within a file, and more.

Artisan/3000 now is available on MPE V/E systems or MPE XL systems in compatibility mode for \$995 on the first CPU and \$400 for each CPU thereafter. Maintenance is free for the first year. Contact SCSSOFT, 800 S. Pacific Coast Hwy., Suite #8-312, Redondo Beach, CA 90277; (213) 519-2948.

Circle 397 on reader card

Print Manager Offers Printer Sharing Device

Print Manager Inc. (Watertown, MA) offers a 10 port printer sharing device that handles workloads in office or workcluster environments with multiple PCs and several different printers.

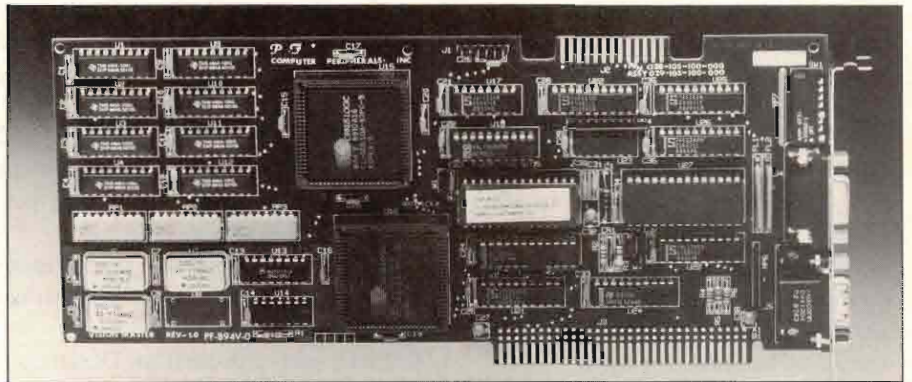
The Print Manager PM10 Printer Sharing Device lets you select a printer from within all application software and provides concurrent input/output processing with automatic form feed at job end separation. Featuring a standard 256 KB buffer memory, it's field expandable up to 4 MB in 256 KB or 1 MB increments to accommodate growth, heavy workloads and diverse applications.

Utilizing popup menus for selecting resident printer fonts, copy and control functions, the PrintManager PM10 Printer Sharing Device is provided with resident fonts for HP LaserJet Series II, Epson, QMS and IBM printers. For more information contact PrintManager Inc., 108 Water St., Watertown, MA 02172; (617) 924-3952.

Circle 395 on reader card

Computer Peripherals Introduces VGA Display Board

Computer Peripherals Inc., an OEM manufacturer of enhancement products for IBM PC, PS/2 compatible microcomputers and HP LaserJet printers, has introduced VisionMaster, a graphics dis-



Computer Peripheral's VisionMaster, VGA graphics board

play adapter card supporting seven IBM display standards.

Graphics modes support include VGA, all three EGA modes, CGA, MDA and Hercules monochrome display standards. All video modes are supported on VGA-type monitors and are software switchable.

VisionMaster is available for \$499. Contact Computer Peripherals Inc., 667 Rancho Conejo Blvd., Newbury Park, CA 91320; (805) 499-5751

Circle 394 on reader card

Appic's Magician Aids Program Accessibility

Appic has released Magician, a utility program designed for the HP 3000 classic that lets you load up multiple applications at the same time and switch instantly among them. Using the break key as a hot key, you can access programs you need.

Contact Appic USA, 7901 Havenwood Dr., Austin, TX 78759; (512) 346-0962.

Circle 396 on reader card

Spool9000 Permits Spooling Between 3000 & 9000

Holland House has announced enhancements to Spool9000 allowing spooling to and from HP 9000 Series 300 and 800. Spoolfiles can be sent from an HP 3000 Series (MPE V and XL) to an HP 9000 and from the HP 9000 to the HP 3000. Additional profiles can be sent from HP 3000

Series 300 to HP 9000 Series 800 and vice-versa. Spool9000 runs in conjunction with Unispool and must be purchased as an add-on module to Unispool. For more information contact Holland House, P.O. Box 1749, Beeville, TX 78102; (512) 287-3417.

Circle 392 on reader card

Graphicus Enhances Software Products

Graphicus Inc. offers new releases for its software products, Grafit, Statit and Drawit.

Graphit 4.0, a technical graphing system, includes features to aid the interpretation and presentation of technical data. Statit 2.0 enhancements focus on improved performance, new statistical procedures and improvements in the SQC procedure. Drawit 2.0 is a drawing system for technical presentation graphics.

All Graphicus products support HP 9000—UNIX 300 and 800 Series and 100 A-Series computers.

Contact Graphicus Inc., 150 Lake St., Suite 206, Kirkland, WA 98033; (206) 828-4691.

Circle 391 on reader card

HP NodeLocator Documents Node Location On LANs

HP introduced an add-on device, the HP 4992A NodeLocator for the HP LanProbe distributed-analysis system.

The HP 4992A NodeLocator is designed to automatically document, in real time, the physical location of nodes on Ethernet-based LANs that use coaxial cabling schemes.

The HP NodeLocator enables HP ProbeView software, which is part of the HP LanProbe system, to create an accurate physical map of all nodes residing within a monitoring segment of the network. Each nodes' distance from an HP LanProbe segment monitor is accurately recorded in feet in HP ProbeView configuration database.

CIA/Extract Allows Access To CIA Offline Data Files

Facer Information Design has announced the addition of CIA/Extract to CIA, a CIA Performance Analysis System for the HP 3000.

CIA/Extract is a group of subsystems that allows access to and manipulation

of the CIA offline data files. The reports and functions performed by CIA/Extract are in addition to those performed and produced by CIA Offline and are designed to allow summarization, storage and flexible selection of data.

CIA/Extract produces reports and graphs that can be used for management reporting, capacity planning, and performance "trouble shooting."

CIA/Extract consists of several modules that allows archiving, downloading and conversion processes.

Contact Facer Information Design, c/o Tres Associates, P.O. Box 9802-231, Austin, TX 78766; (512) 440-8488.

Circle 390 on reader card

Data Technology Ships CrystalPrint Series II

Data Technology Corp. began dealer shipments of its CrystalPrint Series II, a second-generation CrystalPrint page

printer targeted at single-user, desktop printing and high resolution graphics applications.

The CrystalPrint Series II is a six page-per-minute printer that features 300 x 300 dpi resolution for high-quality text and graphics output.

For more information contact Data Technology, 2551 Walsh Ave., Santa Clara, CA 95051; (408) 727-8899.

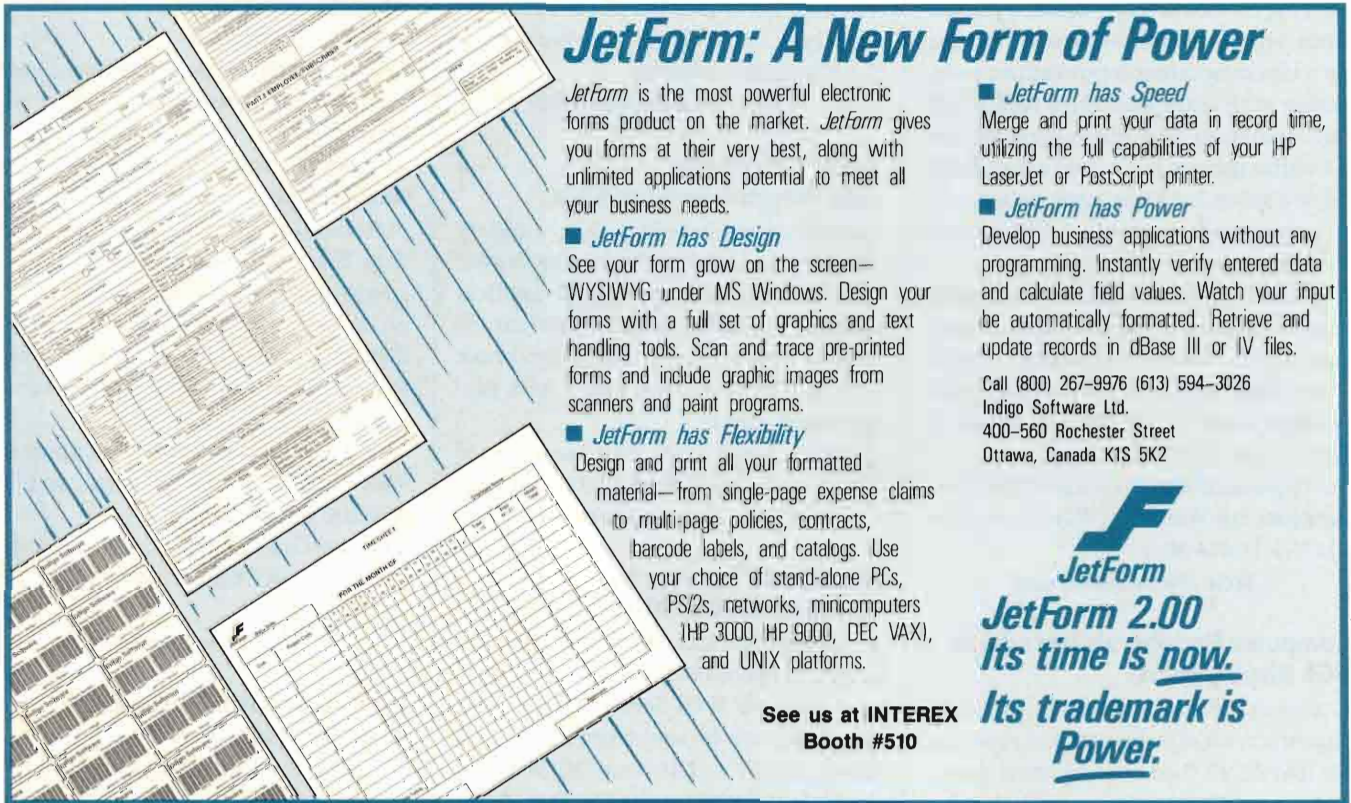
Circle 388 on reader card

Link Electronics Provides Printing Solution

Link Electronics' model L-258(LYNX) provides the HP 3000 classic or spectrum user an alternative printing solution.

The LYNX printer protocol converter enables an independently supplied printer to emulate the HP256X family of matrix printers. The LYNX uses HP standard IEEE-488, 24 pin connector cable and

Continued on page 114



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The Cumulus logo features a stylized cloud above the word "CUMULUS" in a bold, sans-serif font.

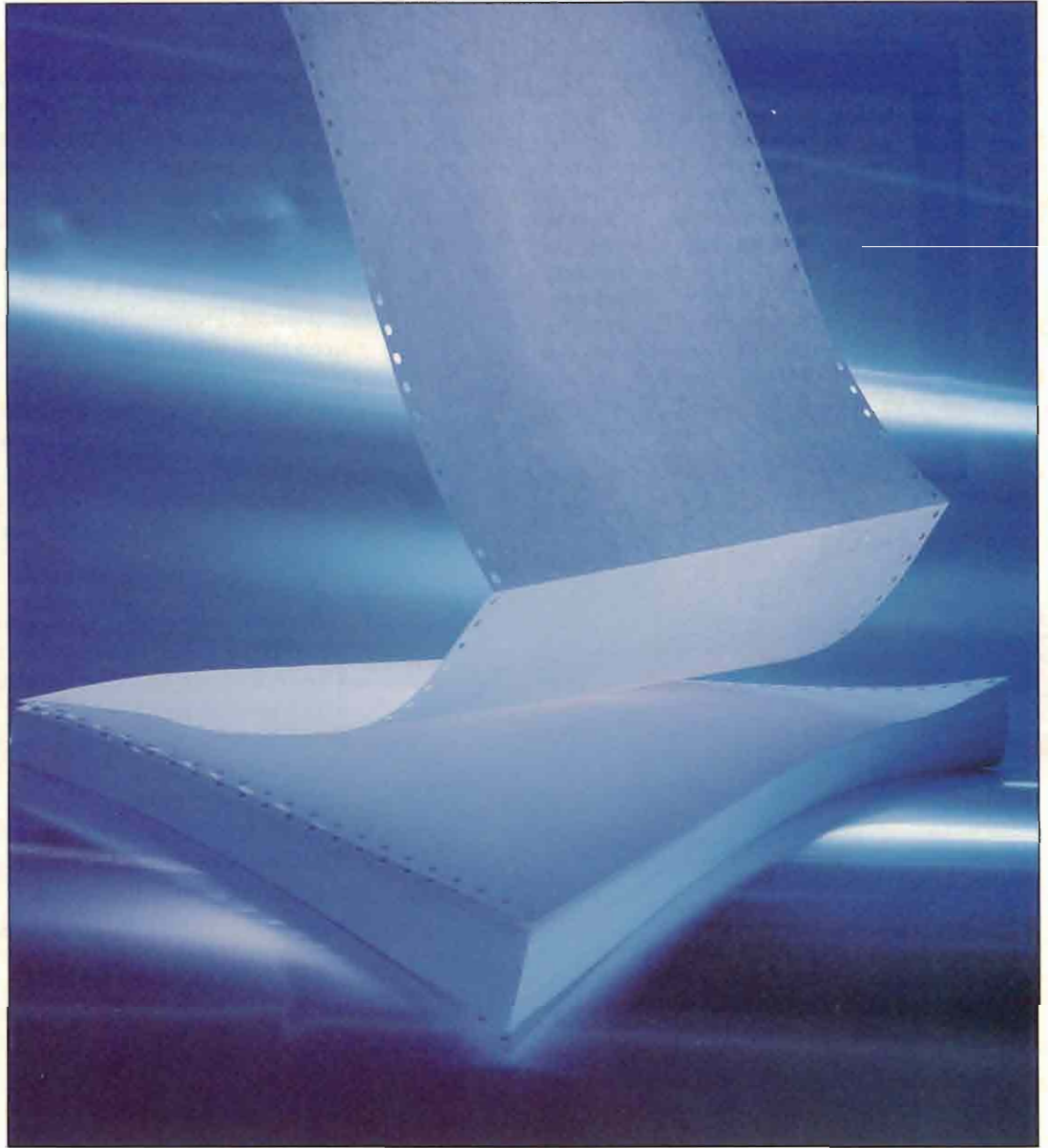
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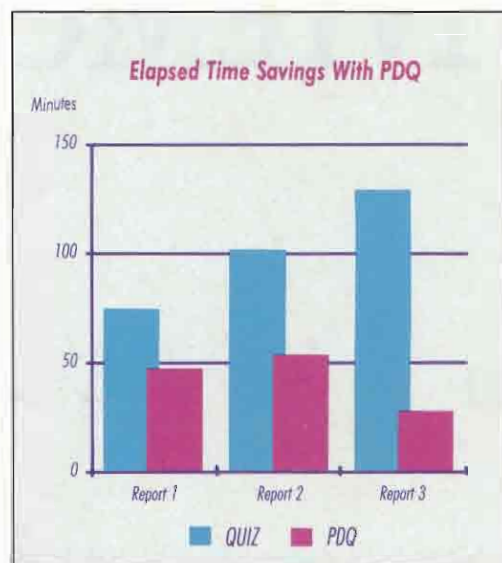
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A Guide To Buying Add-On Memory

NEED MORE MEMORY?

[By Peggy King]

It's a widely held belief that a computer with open expansion slots must be in need of more memory. Whether you use HP 1000s

on the factory floor, manage a departmental HP 3000 that has double the number of interactive users that it had when it was first installed, or work in a lab where you use an HP 9000 or memory-intensive applications, you may need more memory.

Slow response time because of disc "swapping" (the process of suspending a program and putting it to disc to make up for lack of system storage), is a sign of inadequate memory. More memory can help an HP 1000 used for industrial monitoring and process control download large application programs to a shared disc drive. Additional memory also can make graphics packages run better on your workstation.

On MPE V systems ("classic" HP 3000s), there are limits to the amount of memory you can add: 4 MB for the Series 37, 16 MB for the Micro XE, 8 MB for the "midrange" Series 39 through 58 and 16 MB for the Series 64. If a software patch is added to Series 68 or 70, it's possible to increase the memory to 32 MB. According to Larry Kelly of Kelly Computer Systems, increasing the memory controlled by MPE V beyond 20 to 24 MB usually doesn't increase performance enough to justify the expense of the add-on memory.

Although the classic HP 3000s reach a saturation point for memory, HP-PA machines love memory and can use as much as you can afford. According to an HP Performance Brief, increasing the memory beyond the standard configurations of 64 MB

for the Series 950 and 96 MB for the Series 955 provides no significant performance degradation.

There are eight slots that can be filled with 16-MB boards and, for future expansion, both machines have second memory controllers with an additional eight slots. It's possible to put 256 MB of memory in a Series 955, but Bob Thomas, product manager for the Series 955, believes that very few customers need more than 128 MB. He said that HP is advising its HP-PA customers not to buy more than they need.

IT TAKES MONEY to keep those expansion slots filled with memory. At current HP prices for 16-MB error-correcting boards, you can spend well over \$100,000 and still have empty slots. With workstations, HP prices for add-on memory easily can double the cost of the system.

How much memory costs depends on when and from what company the memory is purchased. Although HP has relatively fewer vendors competing to sell printers, disc drives or terminals, there's a growing list of vendors offering add-on memory for the HP 1000, the HP 9000 and Precision Architecture machines. During the first half of 1989, for example, five of the nine vendors offering memory for HP systems announced new product lines.

Why are HP customers, even those who buy other peripherals exclusively from HP, willing to turn to other vendors for memory? The principal reason is cost. A glance at the accompanying charts for the various product lines shows that HP usually sells its add-on boards for at least 20 percent more than other vendors charge. It's important to remember, however, that customers who buy extra memory when they purchase their systems get a significant price break over the add-on prices used to compute the percentages shown in the charts.

In some instances, another reason for purchasing from a third-party vendor is availability. In the early part of 1988 when

there was a worldwide shortage of dynamic random access memory (DRAM) chips, HP-PA computers were being shipped to customers with 32 MB of memory and were promised more boards when they became available. These customers could get faster delivery of HP-PA memory from Kelly or EMC.

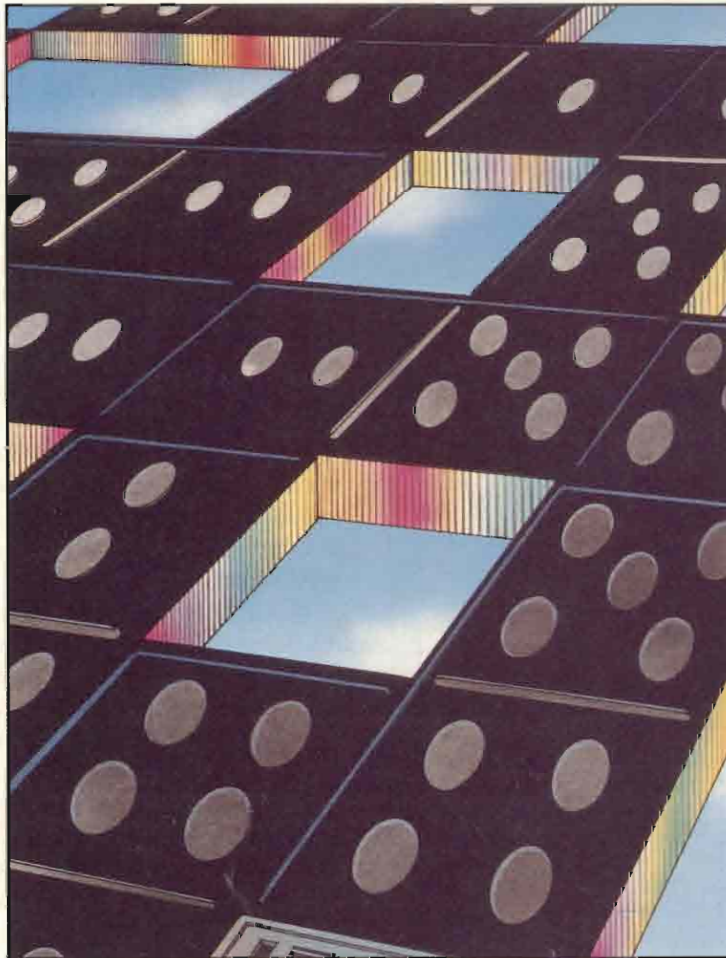
Memory vendors also offer memory in capacities not sold by HP. On the price comparison charts, the "not sold by HP" indicates products available exclusively through third parties. For example, HP sells only 1-MB add-on memory boards for its older Series 310 and 320, but four vendors offer boards ranging from 2 to 8 MB. It makes sense that HP would prefer customers to buy an upgrade rather than supercharge the slots in their old machines.

Although it's in HP's best interest to have customers buy new machines, add-on memory vendors stand to gain from having customers stay with the older systems. GFK, for instance, has found a way to expand a machine that HP designed without expansion slots.

All nine vendors who sell expansion memory for HP computers provided information about capacities and price. The information is printed in the accompanying charts for each of HP's product lines except personal computers. The charts show prices in percentages instead of dollar amounts. The HP prices are based on lists that were current at press time, but remember that HP usually makes price change announcements in November and August.

When HP announces price changes, some of the percentages on the chart will change, but not significantly. Add-on memory vendors generally adjust their prices downward in response to reductions from the systems vendor. For example, Clearpoint will lower its Apollo memory prices if Apollo announces any reductions.

Board prices often fluctuate according to availability of DRAMs. Although DRAMs are still more expensive than they were before the shortage, none of the vendors reported prob-



lems with obtaining them this year. In the case of GFK, the exchange rate also will affect how much its American customers pay for boards. All GFK prices shown on the charts are calculated at the exchange rate of two marks to a dollar.

Also remember that vendors change their prices at various

times of the year and that vendors who are trying to win a large order often bid the order at prices substantially below the ones published on price lists.

Once the memory is plugged into the CPU slots or attached via a daughterboard, brand names make little difference if everything is working correctly. Price shouldn't be the only criteria when deciding which vendor's add-on memory to purchase. It's also important to consider the manufacturing and testing processes, the vendor's warranty and replacement policies and the kind of customer support available.

The following is a brief buyer's guide with questions to consider when purchasing add-on memory. For each of these considerations, the vendors in the HP marketplace are categorized for quick reference.

**Expansion Memory for the HP 1000
Series A400, A600, A700, A900, Series E and F**

Herstal Automation and GFK both manufacture memory for the entire line of HP 1000 computers, and IEM recently began shipping memory for the A400, A600+ and A700 Series.

Products in the aging Series E and F can support no more than 2 MB of memory. Herstal and GFK both sell add-on memory for these Series in .5 MB increments.

The "midrange" Series A400, A600, A600+ and A700 can have up to 32 MB of addressable memory on four boards. The largest capacity boards to date have been the 10-MB boards from Herstal, but IEM recently announced its intention to sell 16-MB boards.

The Series A900 also allows up to 32 MB of addressable memory. HP, GFK and Herstal all sell 8-MB boards. Because up to eight boards can be used in these machines, there's little demand for boards of higher capacity.

Multiplatform Memory Vendors

THE MARKET: EMC sells minicomputer and mainframe memory for HP, DEC, IBM, Wang and Prime. Clearpoint sells workstation memory for Apollo, Apple, Sun, IBM, DEC and memory for DEC VAXs.

Advantages: Vendors who sell in other markets are better able to get volume discounts for components, and their discounts may be passed along to the customer. If you work in a multivendor environment, you may find that you can bargain for price cuts on HP memory in exchange for buying other product lines from the same vendor.

Disadvantages: Vendors whose main business is with systems from other manufacturers are less likely to have engineers and technicians with extensive HP experience. Therefore, they may be less familiar with HP design rules and manufacturing specifications.

Multiplatform memory vendors may use fewer ICs and other parts from HP's preferred parts list, opting instead for the suppliers who give the biggest volume discounts. For example, HP uses RAM from Toshiba, NEC and Hitachi on its HP-PA add-on boards, but these may not be the chipmakers most likely to give such discounts.

If you're in doubt about whether or not your vendor uses HP-preferred parts, simply study the components from the HP-supplied board in your system and ask to look at the other vendor's board for comparison purposes.

**High Volume Vs. Low Volume
Memory Vendors**

THE MARKET: A large-volume vendor is one who has sold at least 10,000 add-on memory boards. The definition doesn't take into consideration the size of the company or product lines other than memory.

By this definition, high-volume vendors include Clearpoint, EMC, Infotek and Kelly Computer Systems.

Company	Model Type	Capacity	% Below HP's Price
Herstal	A400, A600, A700	.5 MB	24
GFK		16 above	
Herstal		1 MB	36
GFK		3 above	
Herstal		1.5 MB	Not Sold
GFK			
Herstal		2 MB	32
GFK		8	
Herstal		4 MB	36
GFK		17	
IEM		price not announced	
Herstal		6 MB	Not sold
GFK			
Herstal		8 MB	33
GFK		16	
IEM		price not announced	
Herstal	10 MB	Not sold	
IEM	16 MB	Not sold	
Herstal	Series E,F	.5 MB	64
GFK		36	
GFK		1 MB	Not sold
GFK		1.5 MB	Not sold
GFK		2 MB	Not sold
GFK	Series A900	1 MB	Not sold
GFK		2 MB	Not sold
GFK		3 MB	41
Herstal		4 MB	Not sold
GFK			
Herstal		8 MB	64
GFK		24	

Note: In each category where both companies offer the same capacity board, companies are listed in ascending order according to prices of the boards.

Two Steps To Great HP Price/Performance:

1. Buy HP 332/340/360



2. Buy Infotek Memory

You're going to need more memory for your HP-UX and other memory-intensive applications. For maximum capacity, improved performance and quick delivery, you're going to need Infotek, the HP memory specialist.

We've been manufacturing memory for HP workstations longer than anyone else and offer the most complete line at a substantial price savings.

Infotek memory boards for your HP Model 332,

Model	Description	Compatibility
EM300	4 MB Controller	330, 350, 370
EM300+4	4 MB Add-on	350, 370
EM300+12	12 MB Add-on	350, 370
EM360+4	4 MB RAM	360
EM360+8	8 MB RAM	360
EM360+12	12 MB RAM	360
EM340	4 MB RAM	340
EM332+1	1 MB RAM	332
EM332+4	4 MB RAM	332

340 or 360 range from 1 to 12 MBytes, depending on your computer. Utilizing parity-check error detection, they are 100% compatible with HP memory boards. And our full five-year warranty

is an assurance of the quality built into every board.

So, when you want maximum performance out of your HPs, go to the HP memory specialist—Infotek.

Call (800) 227-6218, or in California, (800) 523-1682.

Infotek Systems, 1045 S. East Street, Anaheim, California 92815, (714) 956-9300, TELEX 678870, FAX: (714) 758-0289.

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Expansion Memory for the HP 9000, Series 200/300

There are several reasons why there's more competition among vendors selling the memory for single-user, Motorola-based workstations than among those selling memory for larger systems. One reason is that HP's policy of maintaining high prices and a limited selection of capacities makes it easier for a vendor to compete in this market. Another is that the startup costs are lower because the workstations needed for R&D and testing cost much less than multi-user systems.

In addition, memory is in high demand because workstations are often dedicated to one application, and this one application may require more memory than it used to. In applications such as mechanical engineering or electronic design automation, each successive version of a software package tends to become more memory-intensive as it adds more features and capabilities.

Infotek has been selling HP 9000 memory longer than other companies and estimates its share of this market at 75 percent.

Series 200, 310, 320: Third-party vendors are the only source of boards larger than 1 MB for the Series 200 and older Series 300 workstations. HP no longer sells higher capacities of memory for the Model 310 because the board upgrade to the new Model 332 costs \$3,000, less than a 2-MB board from HP. The 256-KB boards that HP no longer sells are available as remanufactured boards from Martinsound. Although HP only supports between 7.5 and 8 MB of memory for these models, there can be up to 16 MB of addressable memory.

Models 318 and 319: The Model 318 was designed as a nonexpandable 4-MB machine. This summer, GFK announced that it's developing a daughterboard that can be attached directly to the CPU so that users can bypass HP's limitations. The Model 319 is expandable, but HP recently took the 4-MB and 8-MB add-on boards for this model off the price list when they quit selling the CPU.

Models 330/350/370: These three models have the same memory

Company	Model Type	Capacity	% Below HP's Price
GFK	Series 200, 310, 320	.5 MB	not sold
Martinsound		1 MB	62
IEM			61
Infotek Systems			55
GFK		2 MB	40
Martinsound			not sold
IEM			
Infotek Systems			
GFK		4 MB	not sold
Martinsound			
IEM			
Infotek Systems			
GFK	Series 318	8 MB	not sold
Martinsound			
Infotek			
GFK		4 MB	not sold

Note: The Series 318 has no expansion slot, but GFK has developed a daughterboard that is attached directly to the CPU.

GFK	Series 319	4 MB	not sold
GFK		8 MB	not sold
GFK	Series 332	4 MB	17
DTACK	Series 340	4 MB	32
Infotek			28
GFK			17
Martinsound		8 MB	not sold
Infotek	Series 330,350,3704	4MB Controller	19
Infotek			

Note: HP deducts \$250 when the board is used with the Model 330 because the three-slot system bus connector isn't needed.

configuration, but the Model 330 has only 8 MB of addressable RAM. HP deducts \$250 when it sells a 4-MB board for this model because the three-slot system bus connector isn't needed. The standard configuration for Models 350 and 370 is a 4-MB RAM controller board that occupies one slot and one 4-MB daughter-board that communicates with the CPU via a system bus connector. Last year, Martinsound's memory upgrade was the first product for the Model 350. The company exchanges the customer's original 4-MB daughterboard from HP and adds 8 MB of memory to upgrade to a full 16-MB configuration. This spring Infotek began shipping daughterboards for these machines, and a few months later IEM announced daughterboards with the same capacities.

Model 332: Model 332 is the newest member of the Series 300. One design innovation it features is a Memory Management Unit located on the 68030 processor chip for faster access. The highest capacity board for this Series is the 8-MB. Both Martinsound and GFK have announced that they are developing memory for this model, but to date neither has begun shipping products.

Model 340: Model 340 comes with 4 MB of memory and can hold up to 16 MB. Although the 340 prices start at under \$5,500 for a monochrome workstation, one memory board from HP can cost the customer almost as much as the CPU. It's not surprising that this model, already has attracted four add-on memory vendors. To date, DTACK is the only one to have begun shipping boards.

Model 360: The Model 360, another relatively new product that comes with a standard 4 MB of memory, has quickly attracted an aftermarket for add-on memory. In the Model 360, main memory is connected to the CPU via a 32-bit bus used only for memory. There's no need for a memory controller on this system because the 4 MB of on-board main memory operates synchronously with the CPU. HP supports up to 12 MB of add-on memory on a daughterboard.

DTACK's first memory product is a socketed daughterboard that allows a customer to add up to 16 MB. A customer who wishes to upgrade can buy RAMs and an upgrade kit and place them in sockets or let DTACK do the upgrade.

GFK	Series 350/370	4 MB	21
IEM		daughterboard	21
Infotek			21
Infotek		8 MB	not sold
		daughterboard	
IEM			37
GFK		12 MB	23
Infotek		daughterboard	15
Martinsound			31
		12 MB expansion	
		of 4 MB HP add-on	

Note: This price comparison was obtained by adding the cost of an HP 4-MB board to the cost of Martinsound's 8-MB expansion.

DTACK	Series 360	4 MB	33
GFK		daughterboard	21
Infotek			17
DTACK		8 MB	29
Infotek		daughterboard	27
GFK			20
DTACK		12 MB	34
Infotek		daughterboard	30
GFK			23
DTACK		16 MB	not sold
		daughterboard	

Advantages of high volume: High-volume vendors are better equipped to offer nationwide or worldwide service. All of these vendors except Kelly have an 800 number for service and all but Infotek have customer support technicians on call 24 hours a day. EMC has set up a response center at its headquarters.

Large vendors have the personnel and resources to get spare parts to customers in 24 hours or less without taking people away from their regular duties. All the high-volume vendors except Infotek offer some type of policy to selected customers who need four-hour replacement time for failed parts.

Large vendors also are more able to devote R&D funds and engineering resources to developing customized testing procedures and test instruments for the various boards they sell. Clearpoint has developed a Universal Memory Tester that emulates various operating systems and can test up to 256 boards at one time. EMC calls its testing device an Intelligent Burn-In (IBI) rack and uses it to subject boards to different operating environments. Kelly built a PC-based custom tester that emulates the backplane of an HP 3000 Series 950 or 955.

All of these companies have sales offices in different parts of the U.S and Europe, and most of them keep a supply of spare parts on hand. Kelly Computer has local supply depots in Canada, England, Belgium and New Zealand, and Clearpoint keeps a stocked Federal Express spares depot in Memphis, TN.

Expansion Memory HP-PA Systems HP 3000 Series 900 and HP 9000 Series 800

Last year Kelly shipped the first memory boards for the high-end HP-PA machines (HP 3000 Series 950/955 and HP 9000 Series 850/855), and EMC began shipping several months later. GFK's product for the same systems isn't scheduled to ship until October.

To date, HP is the only vendor of memory for Series 925/935 and Series 825/855 machines. These boards would be harder to produce because they include an HP-designed proprietary chip that would need to be reverse-engineered. GFK is currently considering whether or not to offer a memory board for the smaller HP-PA systems and plans to announce its decision in August.

Company	Model	Capacity	% Below HP's Price	First Shipments
Kelly	950,955	16 MB	21	April 1988
EMC GFK	and 850,866		20 NA	October 1988 October 1989

Advantages of low volume: Low-volume vendors may be more responsive to special orders and may be more willing to develop a specially configured board to meet your needs. Her-

T A B L E

Vendor	Clearpoint	DTACK	EMC	GFK	Herstal Automation	IEM	Infotek Systems	Kelly Computer Systems	Martinsound
Location	Hopkington, MA	Anaheim Hills, CA	Hopkington, MA	Dedham, MA (GFK America)	Berkley, MI	Ft. Collins, CO	Anaheim, CA	Mountain View, CA	Alhambra, CA
Yr. Founded	1982	1988	1979	1963(Germany)	1980	1979	1976	1984	1985
1st HP Memory Shipped	1987(Apollo)	1989	1985	1981	1986	1985	1980	1984	1980
Assembly Subcontracted?	yes	yes	yes	no	no	yes	no	yes	no
If yes, Location	Japan and US	CA	Puerto Rico			Japan		CA	
Hrs. of Burn-in (min)	72	72	100	72	72	not given	24-48	100	200
Board Tested On System?	first on simulator then on system	yes	yes	no	yes	yes	first on test machines then on system	yes	no for Series 200/310/320, yes all others
Length of Warranty	lifetime	2 yrs.	lifetime	10 yrs.	2 yrs.	lifetime (w/instructions)	2 yrs. for 200/310/320	lifetime	2 yrs.
Time To Replace Defective Board?	24 hrs.	when old board is received	24 hrs or less	24 hrs.	24 hrs.	not given	5 years or newer-24 hrs.	24 hrs. or less	24 hrs.
Tradeup Policy	yes, market value on old board	yes, board is expandible	yes, credit across product line	yes-return credit for HP's list price	yes-exchange permitted	yes 35% of original price	no set policy	yes, tradein allowance	yes, on daughterboard product
Product Support Hrs.	24 hrs.	8:30 a.m.-5:30 p.m. PST wkdys	24 hrs.	9a.m. - 5 p.m. EST wkdys	6:30 a.m.- 7 p.m. EST wkdys	9 a.m.-5 p.m. MST wkdys	8 a.m.-5 p.m. MST wkdys	24 hrs.	6 a.m - 5 p.m PST wkdys
800 Number For Support	yes	no	yes	no	no	yes	yes	no	no

Expansion Memory for the HP 3000 (MPE V)

In 1981, GFK opened the HP 3000 third-party add-on market with a 1 MB chip for the Series III. About half of the HP 3000 products on GFK's price list are upgrades of boards manufactured by HP.

In the fall of 1985 EMC began offering boards for Series 39 through 58, and Kelly began shipping its products a few months later. EMC gives customers who have these midrange HP 3000s the choice between standard memory arrays and their Turbo Memory which takes advantage of the asynchronous bus on the Series 39 through 58.

Memory for the 6x and 70 systems became available in 1986 at a time when many users who had outgrown their system's capacity were impatiently awaiting the Spectrum (HP-PA) machines. EMC was the first to expand Series 68 and 70 systems from 8 to 16 MB, and Kelly soon followed. Any customer expanding a system beyond HP's limit of 16 MB needs to use a software patch. All three of the add-on vendors sell or provide such a patch, and Larry Kelly mentioned that some customers figure out how to write their own.

About two years ago, memory for the micro versions of the HP 3000s (the Series 37, 37XE and Micro XEs) became available from third-party vendors. All HP micros have two slots for memory. HP's highest capacity board in this series is 4 MB, but Kelly and GFK offer up to 8 MB on a board.

Kelly's SLOTSAYER device for the Micro XE allows each of the slots to be expanded to 8 MB. The Series 37 and 27XE can use .5-MB and 1-MB boards, but the Micro XE won't support HP boards of less than 2 KB.

Company	Model Type	Capacity	% Below HP's Price
EMC	Micro XE,37	1 MB	66
EMC		2 MB	27
Kelly			27
EMC		3 MB	not sold
Kelly		4 MB	52
EMC			43
GFK			17
Kelly		6 MB	not sold
Kelly		8 MB	not sold
EMC		Series 39, 4x, 5x	1 MB
Kelly			same price
EMC	2 MB		27
Kelly			27
GFK			23
Kelly	3 MB		not sold
GFK			
Kelly	4 MB		56
EMC			47
GFK			22
EMC	Series 6x, 70	1 MB	75
Kelly			58
Kelly		4 MB	60
EMC			44
GFK			26
Kelly		8 MB	not sold
GFK			
Kelly		12 MB	not sold
Kelly		16 MB	not sold

stal, Martinsound, GFK and DTACK are willing to accept trade-ins of HP boards and to sell remarketed boards.

When you buy from a low-volume vendor and call in with a problem, you stand a better chance of speaking directly to the person who designed the board. Your suggestions for product enhancements are more likely to reach the people who make product design decisions.

Contracted Vs. In-House Assembly Of Boards

VENDORS WHO assemble in-house: GFK, Herstal, Infotek and Martinsound.

Advantages: Since all vendors, even those who subcontract the assembly of boards, have indicated that they test boards at their site, it makes little difference to customers whether boards are assembled off-site.

For vendors, the benefits of using contract labor are that they can adjust workload to meet demand without keeping idle assemblers on the payroll during slack times or paying overtime salaries during busy periods. In some instances, lower overhead can translate to lower prices.

Disadvantages: Vendors who use contract assemblers have less ability to pinpoint problems in the manufacturing process and therefore it may take them longer to correct problems with quality. Vendors like Kelly and DTACK who subcontract locally have an easier time overseeing subcontractors than companies who use overseas production facilities.

If the company has adequate test procedures, the customer isn't affected since quality problems caused by assemblers will be detected, but the vendor may have to write off a large number of scrapped parts. A company that needs to spend its engineering resources to correct quality problems will have fewer manhours to devote to designing new testing procedures or developing new products.

Burn-In And Testing On The System

BURN-IN: All vendors. Testing on the system: All vendors except GFK. Burn-in of chips and boards is a way to detect and eliminate the chips that are destined to fail early in the life of the memory. The RAM is accessed dynamically, often at high temperatures, to accelerate the failure rate so that bad chips are replaced before the boards are shipped.

Burn-in isn't a precise term. In the chart, a "yes" answer to whether or not the vendor does burn-in may mean merely that the company buys burned-in memory chips. A more substantial burn-in process requires that the RAM chips be tested after they're put on boards. Ask your vendor whether the boards are burned in at their on-site testing facility.

Most vendors restrict their product offering to one or two

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series of HP computers because of the high cost of having systems for testing memory boards on the CPUs for which they're designed. Having the board run in the actual system is the only way to do a thorough diagnostic that tests how the memory functions when it is being accessed by the operating system. At EMC, for example, each board spends three days in the system

it was designed for.

Price is the reason most customers choose to buy non-HP boards. Nevertheless, each of the vendors pointed to advantages other than price. Several said that their warranties were longer than HP's, others mentioned how quickly they shipped orders and some of them described a technical innovation that they felt improved HP's design. For example, Herstal Automation provides an extra plug-in replacement RAM chip with every memory board it sells. Because its RAMs are socketed rather than soldered, the customers can replace a failed chip without having to send in the board or pay for a repair.

You really do have a choice of where to obtain HP memory. Add-on memory for a system is expensive even if you aren't paying HP prices. That extra board you need in your system may cost more than a terminal, a printer, a disc interface or even a disc drive for the same system. Shop carefully! If you're buying a high-capacity board or making a large order, consider paying a visit to the site where the vendor does testing and product design. At the very least, take a close look at the board and reread the warranty limitations before you sign a purchase order. You can never have too much memory, but you always can pay too much for it.

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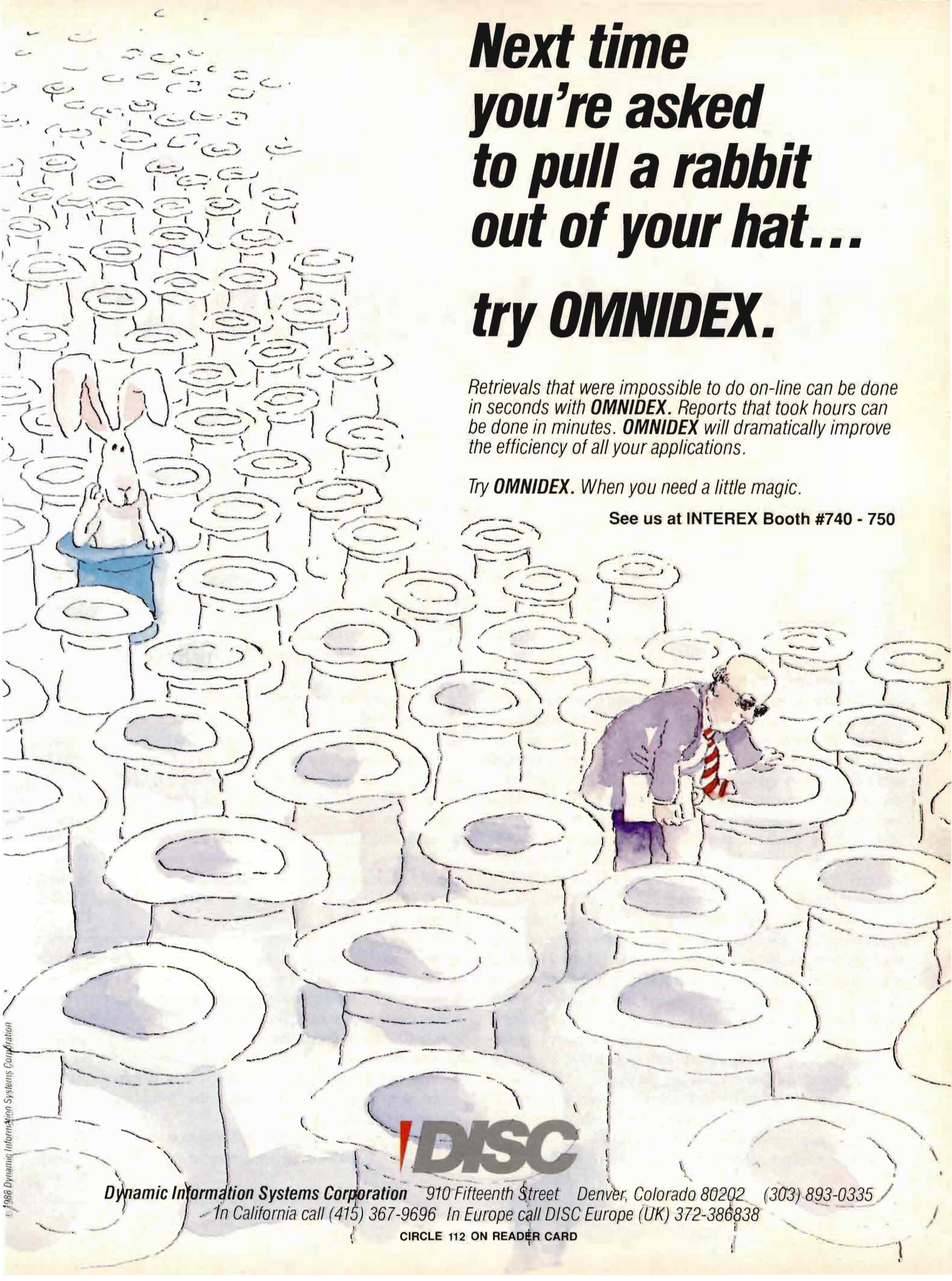


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Optical Integration

Its Time Has Come

In the four years since optical disc drives were introduced, workstation network administrators have been eagerly examining the technology.

Their interest in optical integration can be traced to the widening gap between increasing performance levels in workstations and computers, and slower increases in the capacity of low-cost magnetic discs. The problem is exacerbated by the arrival of powerful workstations like the HP 9000, large graphics-intensive applications and high-speed computers. Users have expressed tremendous interest in optical storage, particularly in its erasable form, and HP has responded with erasable optical peripherals with more related products on the way. But for all the interest in optical storage, this low-cost, high-capacity optical medium has seen minimal use in workstation environments. Users are waiting for an integration strategy that provides the high-capacity, high-speed on-line storage that they've grown to expect.

Several changes in the workstation environment have elevated users' interest in optical integration. Workstation computing power has increased from its initial (in 1981) one-half million instructions per second (mips) to 20 mips and beyond. In fact, it's possible to run workstation applications at speeds up to 60 mips or so on specialized network computers. Meanwhile, users must soldier on with the storage capacity of magnetic discs on file servers, limited to a steady 25 to 28 percent per year growth rate over the same eight years.

New software applications are being written with several times the amount of code used only a few years ago. Much higher graphics capability — with the additional data storage requirements it imposes —

combines with large Ethernet-based networks of workstations to complicate the storage strategies of most workstation facilities.

Workstation Users Survey

IN AN EFFORT TO understand the increased storage needs of networked workstation users, Epoch Systems Inc., (Marlboro, MA) has sponsored annual surveys of a large workstation user group and conducted interviews of more than 100 large-scale workstation users. The company found that more than 90 percent of all workstation sites use file servers to serve individual workgroups. Also, system administrators annually purchase centralized online magnetic disc storage in quantities of five GB at the department level to 20 GB at the facility-wide level. These storage purchases are driven by the enormous increase in storage requirements of individual workstation users.

The average facility surveyed by Epoch has approximately 30 workstations in a single location and is divided into workgroups of about seven workstations each. In 1987, the average workstation used approximately 100 MB of online storage space. One year later, it had climbed to 150 MB. Conservative estimates indicate that the per-workstation storage requirement will rise beyond 210 MB late this year. Survey respondents frequently requested larger disc storage capacity when asked to list the enhancements they would like to see in their next data storage server.

While workgroup file servers are indispensable for workgroups, they're expensive resources

[BY JAY WOODRUFF]

when used primarily just to hold data. While all magnetic servers cost users from \$25 to \$40 per MB of storage, optical storage promises a cost per MB, in a system configuration, of less than \$5 per MB. However, optical discs aren't directly comparable to magnetic discs, so their integration poses a serious barrier.

How can the user integrate this new technology, either in its original write-once form or using the emerging technology of the erasable optical discs? There are four methods, one of which could be right for you:

- Tape Emulation
- Disc Emulation
- Application-Specific Integration
- Application-Transparent Integration.

Tape Emulation

THIS APPROACH INTERFACES an optical disc to a computer via a standard tape interface. It operates the disc with sequential read/write tape software and supports standard UNIX system tape utilities. Tape emulation provides an attractive path to integrate optical discs, because one GB of optical disc space gives the user the data storage equivalent of 10, 2,400-foot reels of 1/2-inch tape. Tape emulation can easily use WORM [write-once, read-many] and erasable optical technologies, and it requires no software changes on the host computer system. (Figure 1)

Tape emulation allows users to add optical discs as an archive storage medium for little more than the cost of drives and media. It's best used as a permanent archival medium, where sequential searches for files and time they take can be accommodated without hampering workstation productivity. However, like tape, all data written to optical discs are essentially

offline and must be managed with a separate labor-intensive storage and retrieval procedure. Tape emulation, with its lower speed access, minimal cost and offline nature, is appropriate for storing history, but not for high-speed access to important data files.

Magnetic Disc Emulation

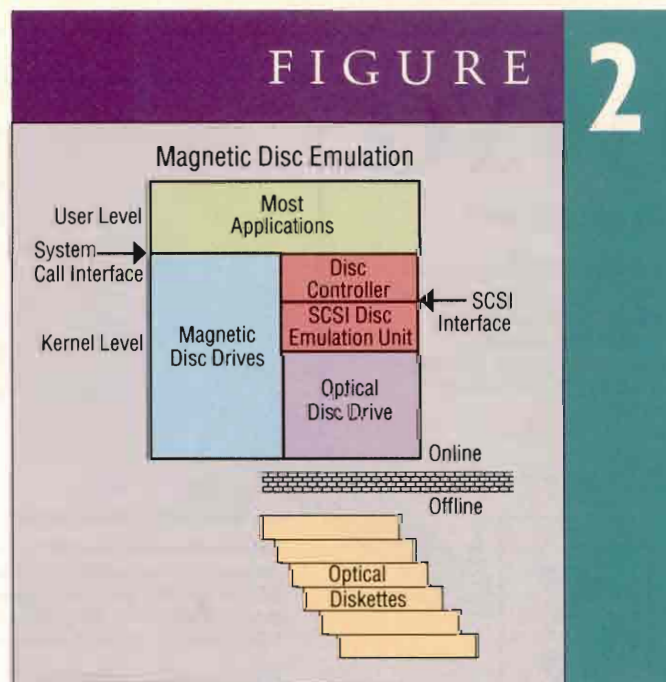
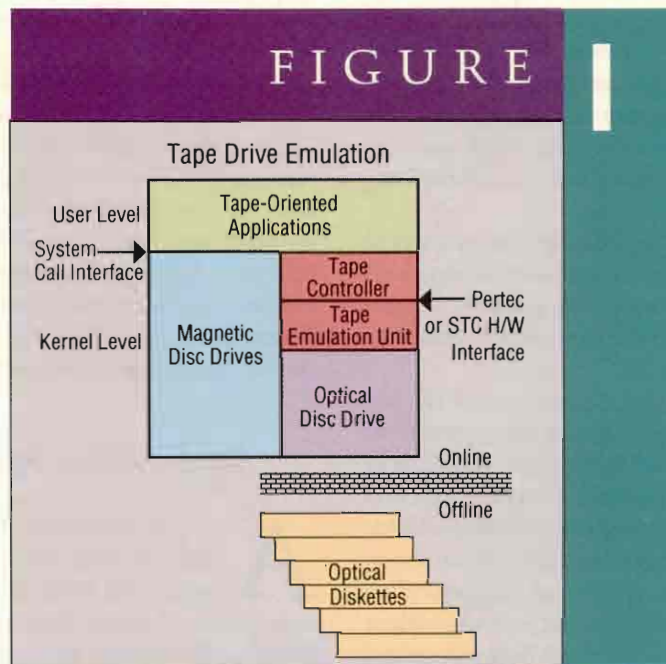
IN THIS MODE, THE OPTICAL disc is made to appear the same as a magnetic disc. It can be written to and read from through a special microprocessor-based disc controller and software driver. In the case of WORM technology, it gives the user and application the appearance of an erasable disc. (Figure 2)

The controller and driver usually copy the disc directory into magnetic disc to make file access speeds tolerable and to absorb the directory writes that occur during each file access. Before the cartridge is ejected, the directory must be written onto a blank part of the optical disc. When a disc is loaded, the controller and driver must search the disc for the most recent directory.

Write-once discs offer a unique drawback to the user who chooses magnetic disc emulation: It "burns" up the available disc space very quickly. Each update to any

file makes the entire file obsolete, including the space required to write a new directory before the disc is ejected. According to Maximum Storage Inc., (Colorado Springs, CO) which has measured overhead rates of WORM magnetic disc emulators, overhead typically runs from 20 to 50 percent, with some as high as 80 percent.

Erasable opticals also must emulate the function of magnetic drives. This is usually handled by the controller firmware. Hewlett-Packard recently introduced separate drives and



an optical library unit ("jukebox") for use primarily with the HP 9000 Series workstations. While erasables don't get "burned up" and therefore won't require replacement, they remain slow. This is a problem that is more pronounced on erasable opticals than WORM optical discs. Because they can't be directly overwritten, a separate erase pass is required for write operations.

Slowness, a fact of life in optical technology, goes counter to the workstation user's expectation that all online storage will be available at Winchester disc speeds. Why purchase a high-speed graphics workstation just to wait for one's optical data storage device to catch up?

One technique used to help reduce the optical disc's access speed to online files involves copying files from optical to magnetic storage for quicker access. While manual tracking of the most recent version of a file is possible on a single-user station, the spectre of multiple copies circulating through a multi-user workgroup opens the possibility of revision control chaos.

However, an enhancement to this basic magnetic disc emulation technique eliminates the revision control problem by automatically copying files back and forth between optical and magnetic disc drives. A device driver uses the magnetic

disc drive as a file cache for the files mounted on an optical disc. (Figure 3)

While caching helps solve file access performance problems, the removable nature of optical discs creates an unacceptable administrative burden in most departmental workstation environments. When discs are removed from their drives, all of their files and directories disappear from the magnetic disc's directory structure. These offline files then must be manually organized, labeled and maintained. Keep in mind that there are as many directories being maintained as there are disc sides. Because each side of a disc is a separate volume, it effectively doubles the system administration workload.

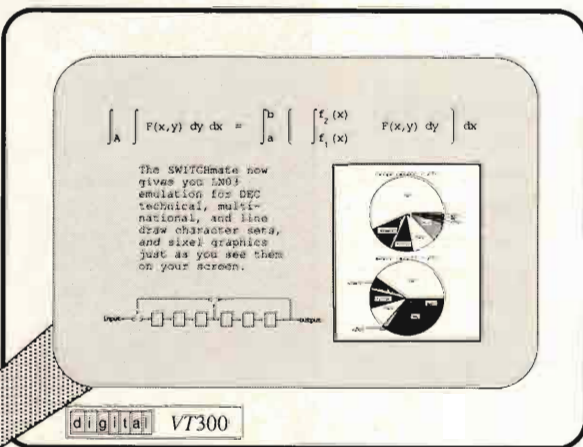
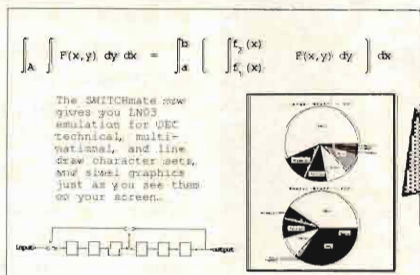
Application-Specific Integration

APPPLICATION-SPECIFIC INTEGRATION puts optical discs under the control of an application program. The application itself automatically creates and maintains a database for file information, and moves files between optical and magnetic disc media without operator intervention. This approach to optical integration has met with some

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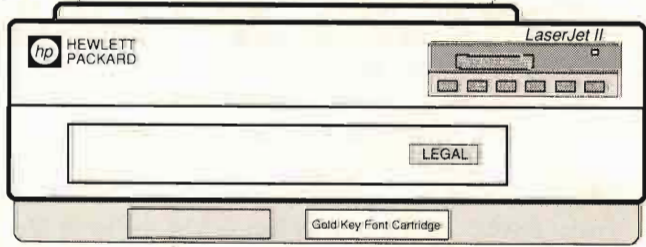
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success in the image storage and retrieval market, particularly when it has incorporated optical library units ("jukeboxes"). Usually, users aren't directly aware of the optical subsystem because they don't have to deal with it directly. (Figure 4)

Application-specific optical integration combines the speed of magnetic storage and the high capacity and low cost of optical discs. Its major shortcoming lies in its application-specific nature. In a multiple workgroup workstation facility, other applications like CAD, CASE and electronic publishing can't share direct access to the jukebox's 10s of GB of capacity.

In fact, none of the traditional approaches to optical integration described above responds directly to the needs of workgroups and departments of workstations who seek an increasingly large, online, high-performance data storage system. A recent approach to optical integration addresses the special data storage and performance needs of workstation users more exactly.

Application-Transparent Integration

THE APPLICATION-TRANSPARENT integration approach implements a storage hierarchy of silicon memory, magnetic discs and optical library units. This approach closely applies virtual memory concepts to manage files on high-speed Winchester discs. Virtual memory principles are applied to the next storage resource that's scarce: magnetic discs. File system software uses optical discs as backing storage to the magnetic discs to give the user the practical illusion

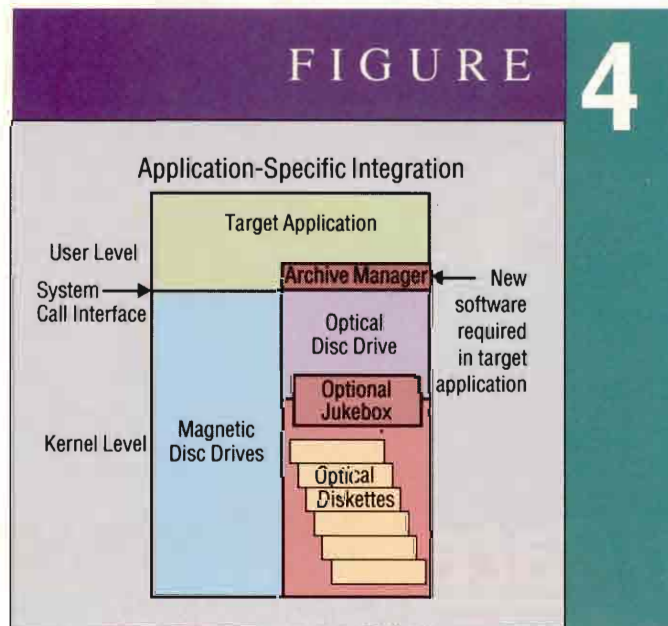
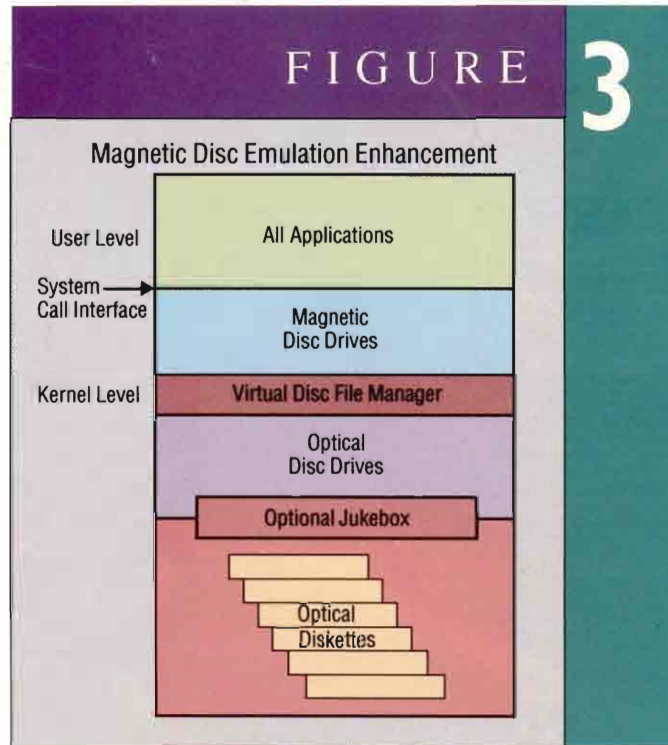
of unlimited Winchester disc storage space. (Figure 5)

A virtual disc file manager uses adjustable parameters to copy or "stage out" (directly analogous to virtual memory's page out) files from Winchester discs to optical discs. Files actually can be staged out to optical in advance of the requirement for space. Winchester disc space then can be reallocated instantly for use in order to respond to sudden requirements for Winchester file space.

File aging and frequency-of-use algorithms move inactive files onto optical discs to ensure that adequate high-speed Winchester disc storage space is available. When an application calls for a file that isn't on the Winchester disc, a virtual disc file manager locates the needed file in optical discs and automatically transfers it back to the Winchester disc. Because all directory information is kept on magnetic discs, all data on optical discs is always visible to users, even if the discs aren't in a drive.

Application-transparent integration answers many of the questions that arise when considering how to integrate optical discs into a storage subsystem. This high-level integration technique delivers the high capacity and low cost users want, regardless of the application they're running, while solving the issues that surround access to data that sits on discs that have been removed from the system.

It ensures that Winchester discs are dedicated to provide fast access to users' most frequently used files, while infrequently used or specifically identified files can be accessed online from optical discs. One implementation of such a system routinely measures access rates of greater than 99.5 percent to silicon and magnetic discs levels of the hierarchy, with the remainder of the requests



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requiring access to files stored on optical discs. By design, optical discs are so rarely accessed that their slower performance is effectively hidden from the user.

WORM drives can be used very efficiently in this environment. Only files that have become inactive — and therefore have a low likelihood of being recalled and rewritten — are staged out to optical discs. And, when a WORM disc needs to be replaced, the media cost is reasonable at between 17 cents and 30 cents per MB.

Erasable discs also can work particularly well in the application-independent architecture described here, particularly where permanent, unchangeable data isn't a critical requirement, and reuse of optical storage disc space is needed because of the specific nature of an application.

The biggest bonus of application-transparent optical integration lies in the minimal operator intervention required to run such a system. Because the server automatically manages the movement of files between magnetic and optical discs, the optical discs themselves need no direct day-to-day management, and they don't need to be managed separately from magnetic storage. Hierarchical storage can be so attractive to workstation users because it combines the look and feel of an all-Winchester-discs system with a larger capacity and better-per-MB economy than an all-magnetic storage strategy.

NO DISCUSSION OF optical disc integration is complete without considering how to protect all the data that any of these strategies can store. Even in today's all-magnetic online storage systems, much better backup subsystems are required. Traditional backup techniques demand enormous operator involvement because ordinary one-half-inch tape media is now proportionally much smaller in capacity than the typical magnetic discs. Every workstation network system administrator is well aware of the time it takes to complete a backup

...the ideal optical integration solution will require only minor changes...

and how many units of half-inch backup media are required. With optical integration offering the potential of several times as much storage capacity, frequent backups using traditional methods are likely to be even more difficult to complete.

Ideally, backup should be an automatic process, and both incremental and full backups should be supported. Automated backup also means that users will continue to be able to access

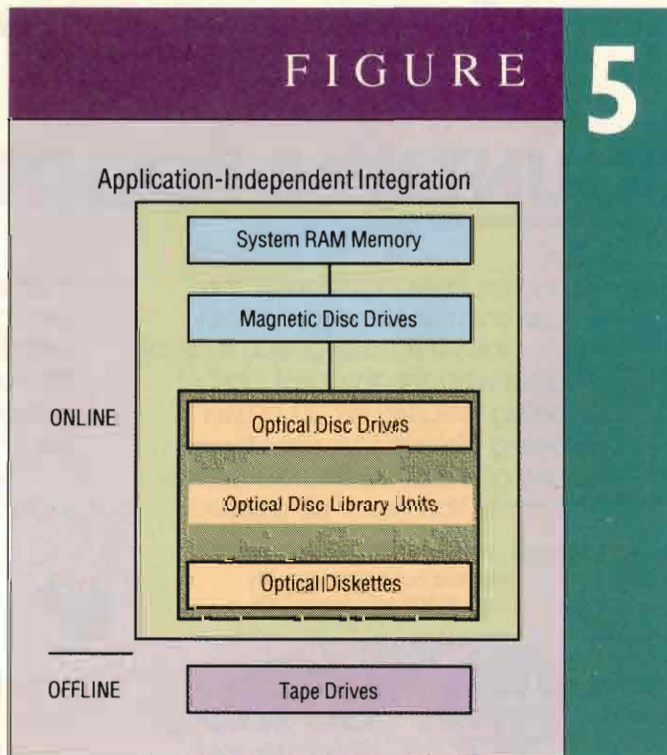
files during the backup process. The use of high-density backup media can reduce media costs and operator involvement in the process.

If a system failure occurs, it's crucial to have a straightforward restoral method in place. Database catalogs and automatic discs restore utilities can dramatically simplify the return to normal operations without a substantial loss of workstation computing time.

THE GREAT PROMISE of optical storage lies in its stability and lower per-MB cost when compared to Winchester disc storage. Workstation network administrators have considerable knowledge of optical technology, but rarely have incorporated it into their own systems except as an offline archiving tool. Even that path is rarely taken.

From a practical standpoint, the ideal optical integration

solution will require only minor changes in the working habits of workstation users and network computing administrators. The closer a vendor can come to achieving lower cost storage and greater capacity, while eliminating some of the most irritating aspects of network workstation data management, the more rapidly users are likely to embrace the benefits of optical integration. —Jay Woodruff has more than 10 years experience covering the computer industry and is now marketing communications manager of Epoch Systems, Marlboro, MA.



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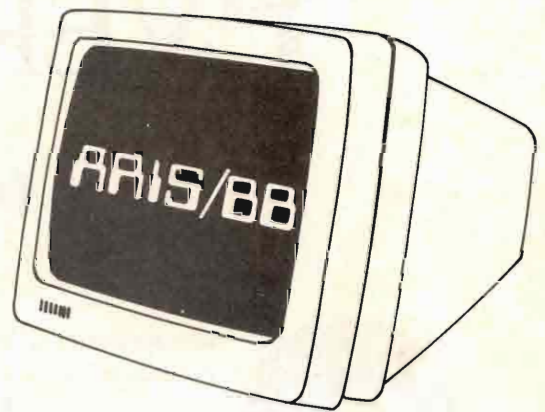
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Today's Printers Offer Greater
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[BY LYNN HABER]

Office applications haven't just spurred a greater use of printers but they also are driving the demand for newer, more versatile print technology. According to BIS CAP International, a market-research company located in Norwell, MA., the U.S. printer market is undergoing a shift in technology away from traditional impact devices to newer non-impact printers.

For users, this shift represents increased product functionality, as well as a wider selection of product options at various price/performance levels for output requirements, ranging from interoffice correspondence to business reports to professional color presentations.

While impact technology is expected to outsell non-impact laser and inkjet devices by more than 2-to-1 this year, impact printers are experiencing flat unit growth. On the other hand, non-impact printers are capturing an increasing amount of market attention and market share, according to BIS CAP.

Over the last year, the color printer market has grown significantly in both the impact and non-impact print arenas. According to Gregory Porell, director of the color hard copy market requirements service at BIS CAP, applications such as CAD/CAM/CAE, desktop presentations and business graphics, as well as increased user acceptance and improved system capability, are factors fueling this increased level of activity rather than the products themselves.

According to BIS CAP, impact printers make use of any technique that involves the striking of the final medium, typically a paper or form. The four major impact printer technologies are serial character or daisywheels, serial matrix, line character, and band and line (dot) matrix.

Maureen McManus, director of the electronic impact printer market requirements service at BIS CAP, says that the attractiveness of the dominant serial matrix printer is its functional flexibility, ability to exist in environments (heat, humidity and dust) that are unsuitable for their non-impact counterparts, and the fact that these devices offer the best price/performance.

For a several hundred dollar street price, serial matrix printers offer, according to

McManus, low cost of ownership, proven reliability, printing speeds of 200 characters per minute (cpm) or two to four pages per minute (ppm), graphics capability, ease-of-use, improved paper handling features and the ability to handle multiple part forms.

While nine-pin devices were the bread and butter of the serial matrix market, says McManus, they are being squeezed by more advanced 24-pin products. Nine-pin, 18-pin and 24-pin are the three basic serial devices.

Epson's FX/LQ Series and IBM's Proprinter devices are popular products that represent this market. Other vendors include Brother, Okidata, Panasonic, Seiko and Star Micronics, to name several.

Non-impact printers, according to Dave Hudson, industry analyst at BIS CAP, employ any technology that doesn't actually strike the final print medium. Page-printers include laser/electrophotographic, inkjet and thermal transfer devices.

The only application where a non-impact printer can't substitute for an impact device is for multipart forms.

But for applications where the hardcopy must cross organizational boundaries,

(mailings and professional correspondence), a laser printer best fits the bill, says Hudson. While 300 dot-per-inch (dpi) laser quality can be found in serial matrix devices, the norm for impact printers is 180 dpi, he notes.

Laser printers, the most popular of the non-impact technologies, which gained market acceptance in 1984 with the introduction of Hewlett-Packard's LaserJet, are fast, quiet, have good paper handling capabilities and produce sophisticated monochrome text and graphics.

Laser printers use a focused beam of laser light to expose a rotating, light-sensitive drum inside the printer. The beam of light strikes the drum and applies an electric charge to its surface. Pulsating on and off at high speeds, the laser beam draws an image of the page directly onto the photoconductive drum.

Inside the printer, black toner is applied to the drum as it rotates. The image on the drum is attracted to an oppositely charged sheet of paper, and, when heat and pressure are applied, the toner becomes fused to the paper, creating a permanent image.

Hudson breaks down the laser products into three markets: 5 to 10 ppm, 11 to 20 ppm, and 21 ppm and higher. He also notes that approximately 70 percent of laser printers are used as a shared device.

More than two dozen vendors offer laser printers including HP, who along with Apple Computer command 75 percent of the 5 to 10 ppm laser market; AST, C.Itoh Electronics Inc., Dataproducts Corp., Fujitsu America Inc., IBM, QMS Inc., Texas Instruments Inc. and Xerox Corp., to name several.

Laser printers are divided between PostScript and non-PostScript devices. Known as page description languages (PDLs), industry standard PDLs such as Adobe Systems' PostScript and HP's Printer Command Language (PCL) tell the printer where to place text and graphics on a page. PDLs also allow fonts to appear in any size, style and orientation.

Graphics-intensive applications, such as electronic printing and publishing types of applications most likely need the functionality of a PostScript device while text-intensive applications, such as word- or data processing, can use HP's PCL. The majority of laser printers sold today use HP's PCL, according to Hudson.

Last year, the introduction, of HP's DeskJet and Canon's BJ-130, both featuring 300 dpi and plain paper handling capabilities, provided a big boost to the inkjet market, according to Hudson.

"Now, for a street price of between \$500 and \$1,000, users can get 300 dpi and near-laser quality," he says.

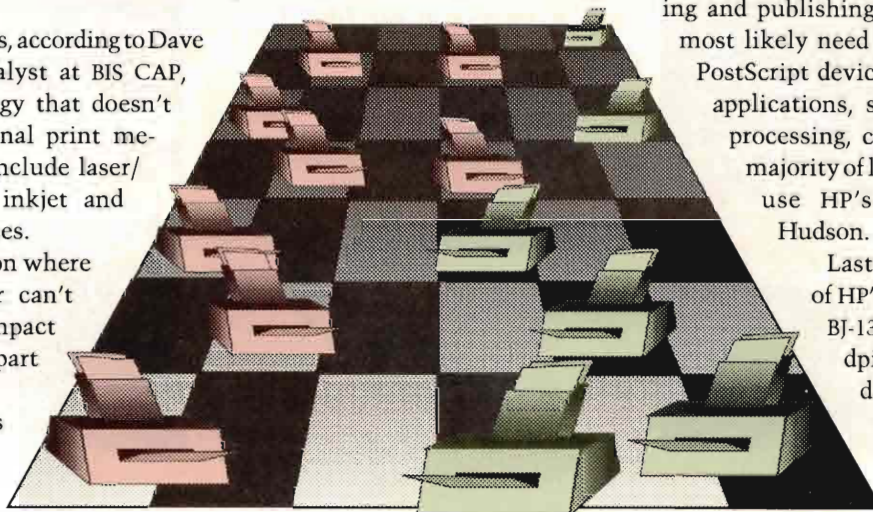
Most inkjet printers use a technology called "drop on demand," which works by shooting tiny droplets of ink from fast-moving nozzles contained in their printheads. The droplets form a dot-matrix pattern by effectively painting text and graphics directly on the paper.

These low-end inkjet printers, says Hudson, compete against serial matrix devices. Inkjet printers are ideal for office applications, particularly those requiring graphics and for overhead transparencies.

Two-to-four ppm inkjet printers are, like serial matrix devices, considered a personal printer. These devices are good for users requiring a monthly output of 500 to 600 pages per month (ppm) versus the monthly output capacity for lasers which ranges between 3,000 to 4,000 ppm and up.

Color

ACCORDING TO PORELL, the demand for color output is expanding from the traditional science/engineering market to graphic arts, printing and publishing, and to the office for overhead transparencies, annual reports and to highlight financial information.



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Color unit placements were approximately 728,000 by year-end 1988, accounting for \$1.7 billion in revenue. By 1993, unit placements are expected to reach more than two million, representing \$5.6 billion in revenue, according to BIS CAP.

Serial matrix printers dominate the color printer market accounting for over 50 percent of installed devices. By 1992, however, color serial matrix printer placements are expected to drop to approximately 45 percent of the total color printer market with inkjet technology accounting for almost 26 percent, followed by pen plotters at 16 percent, thermal transfer with 8.5 percent and the remaining 4.5 percent accounting for photographic, electrophotographic, electrostatic and other print technologies.

According to McManus, for users with applications that require color highlighting, serial matrix devices are cheap, easy-to-use and accessible. However, if a user is looking for true full color, serial matrix devices fall short of the vibrancy offered by inkjet printers, she points out.

HP's PaintJet printer, priced at \$1,395 is responsible for the improved image of color inkjet devices, says Porell. Color inkjet printers are particularly good for presentation graphics

and overhead transparencies, he notes. The PaintJet offers near letter-quality, 180 dpi and holds four inks.

Howtek Inc. offers the Pixelmaster, which uses what the company calls thermo-jet technology. According to Porell, Pixelmaster is based on solid inkjet technology while other inkjet devices utilize liquid ink.

According to Howtek, the Pixelmaster utilizes standard office paper, while most inkjet printers require a special paper. The Pixelmaster is priced at \$7,500 and includes PostScript compatibility.

Thermal (wax) transfer printers, historically used in high-end engineering environments, also are gaining favor in the office for overhead transparencies and presentation graphics.

Thermal printers use a thermal imaging head with a thermally sensitive ink ribbon housed in a cartridge. The thermal imaging head melts the ink onto the ribbon, thereby transferring the ink onto paper or film.

For users looking for very high image quality where paper type isn't an issue, thermal transfers printers may be the answer. Thermal transfer devices require a special heavy paper stock.

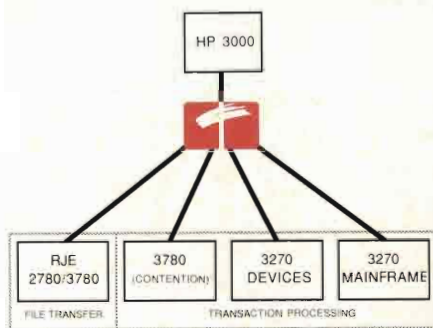
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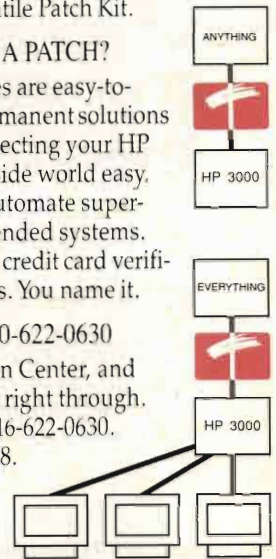
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Vendors marketing thermal transfer printers include CalComp, QMS and Seiko, to name a few. Thermal transfer printers are a more costly color printing solution.

BIS CAP identifies three office operating environments for color hardcopy: low-end workstation/PC characterized by a 1-to-1 user-printer relationship and devices priced between \$0 and \$7,500; midrange or shared resource characterized by three to four users via a multiplexer or network capability and devices priced between \$7,500 and \$20,000; and a high-volume, high-end production environment with printing devices costing \$20,000 and more.

Color printing speeds are slow compared to monochrome. Thermal transfer devices offer the fastest printing, about 45 seconds for an 8 1/2 x 11-inch sheet, while inkjet technology takes about two-to-four minutes for an 8 1/2 x 11-inch paper, and approximately eight minutes for an overhead transparency, according to Porell.

To date, one of the greatest stumbling blocks to the growth of office color printing has been the absence of affordable color copying capability to facilitate distribution. But Porell notes that products are emerging from vendors such as Brother,

Canon, Panasonic, Seiko and Sharp.

Russel Buschert, market development manager at HP's LaserJet division, says that HP recognizes the popularity and dominance of serial matrix devices and is working on bringing non-impact printers to the masses.

He notes that while laser printers still face a price barrier to wide acceptance, the company's inkjet devices represent a milestone in bringing true laser-quality output to the office environment for about \$1,000.

"The 24-wire printer is the last hurrah of the impact printers," he says.

Vendors such as HP expect technology improvements and lower prices will create a more widespread acceptance of non-impact devices.

According to Porell, while the color hardcopy market is still in its early stages and is relegated to specialized niche applications, it's being prepared for major growth. He says that three things need to take place for the color hardcopy market to grow:

- The infrastructure needs to be completed. Many software packages, he says, aren't set up to support color devices



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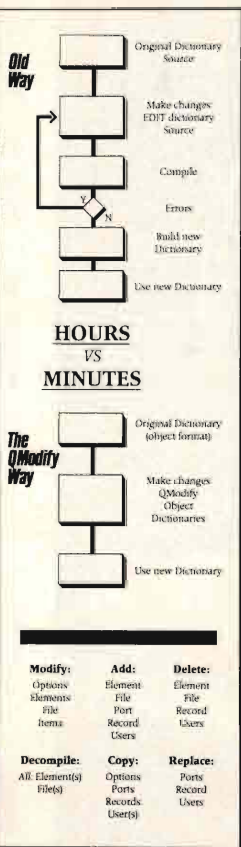


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beyond simple six to eight colors.

- The availability of inexpensive color copiers.
- Improved networking capability, that is, greater bandwidth, because a file for a color image could take up to 20 MB of memory. —Lynn Haber is a freelance writer specializing in computer and communications technology based in Boston, MA.

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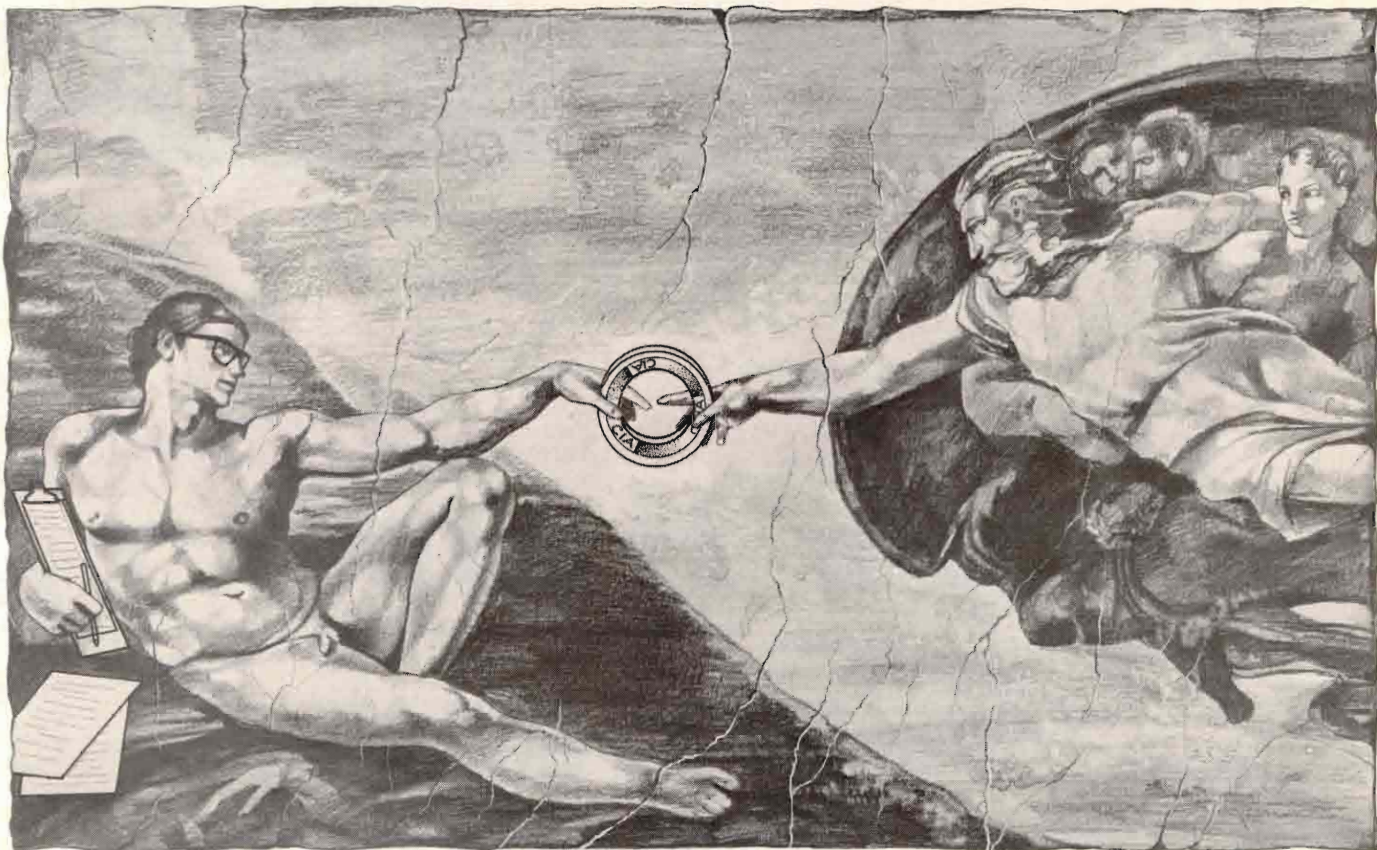
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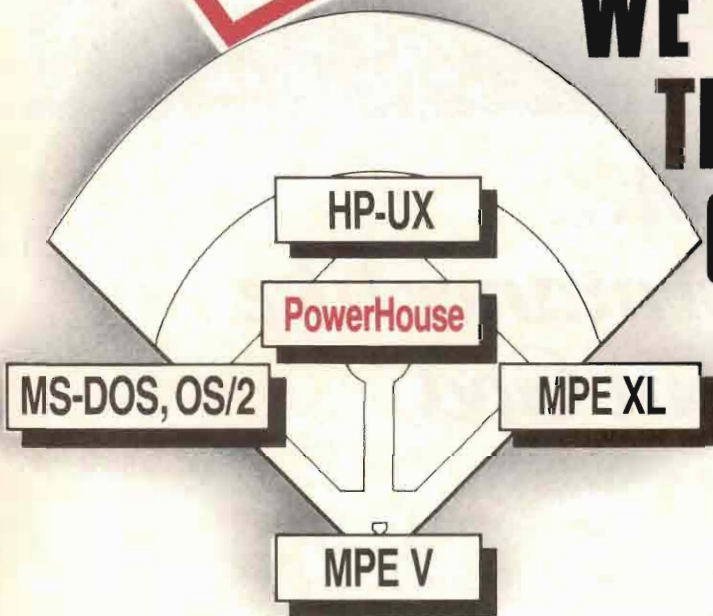
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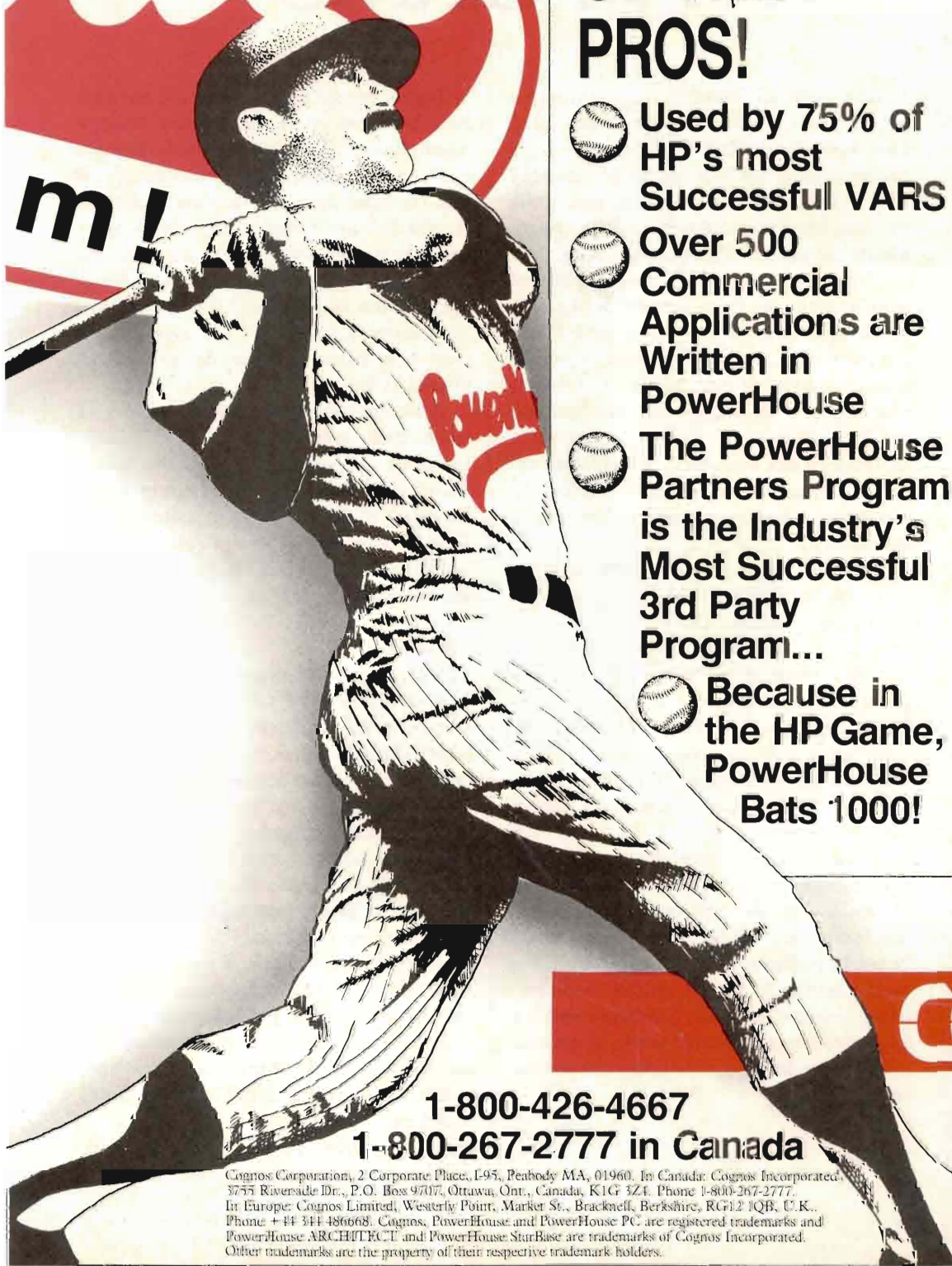


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In this seemingly computerized world, the simple task of filling out a form appears to have been overlooked in the quest for the "automated office." Often, an old standby like the IBM Selectric typewriter sits stoically on even the most modern desktop just to satisfy the need to fill out a basic form.

Typically, forms are specified and ordered from a stationery supply house. In the data processing environment, data and forms management are separate issues. For example, the data required for an invoicing system is maintained with an application system. But the invoice on which the data is printed is maintained as a stock item. Computer-generated data and forms are merged via an output device on which preprinted forms have been loaded.

However, the gap between conventional and computerized form usage is beginning to narrow as software packages are developed that address electronic forms management and data merging. The use of computer-generated forms eliminates stock monitoring, storage and disposition of obsolete on-hand stock. Further advantages are realized with increased flexibility and control of design and a faster turnaround time for modifications.

A form is a combination of text and graphic elements. As in any graphic design, a variety of typefaces (fonts), type styles (bold, underline, point size, etc.) and elements such as boxes, lines, logos and shading are required to create forms. In the HP environment, the advent of new software, combined with an expanded line of laser and LaserJet printers, is opening the door for widespread use of electronic forms.

Forms design packages for the HP 3000 have been around for some time. Using a combination of IDSFORM, IFS and HPDRAW can bring about satisfactory results. But unless you are more than just an occasional user, they're tedious, complex and confusing to use. The manuals provide the necessary information to successfully create a form and compile the environment file, but with a high learning curve, it's often easier and more cost effective to use design services offered by HP.

After examining the demonstrations of some new software packages, Fantasia, LaserSoft and StarJet, it appears that forms design is evolving into the realm of "user-friendly." With three different packages, you would expect three different approaches to designing forms. This holds true with Fantasia, LaserSoft and StarJet.

Fantasia

Fantasia's text and page formatting capabilities are similar to HP's TDP/3000; the inclusion of format commands to define lines, boxes, shaded areas, etc., make forms design possible. Forms are defined by entering format commands into a text-editor file or by using the Screen program, which includes a graphics window to draw the form. The resulting files are interpreted for printing on the LaserJet by a formatter program, Laser.

Formatting commands in Fantasia are preceded by a backslash. If you're familiar with TDP, you'll have an edge understanding the formatting concepts of Fantasia. A box is specified by defining the line thickness (in dots) and the height of the sides of the box:

- \THICK 4 — sets the thickness of the line to four dots.
- \BOX 1.8 — draws a box 1.8 inches high with



SOFTWARE

Wendy Hewitt

the sides of the box drawn at the current left and right margin settings.

A variation of the BOX command:

■\OBOX draws just the sides of a box at the margin.

A line is specified by defining the length and thickness (in dots).

■\LINE 1.4 6 — draws a horizontal line 1.4 inches long and four dots thick.

■\VLINE 2 9 — draws a vertical line two inches long and nine dots thick.

Lines can be centered using the \LINEC command; the width of a centered line is determined by the current setting of the \WIDTH command. The \LINER command right justifies a line. Tab and margin settings are used to control the placement or width of lines and boxes. (A line or box drawn within an active tab will default to the \WIDTH of that tab.)

In addition to having its own drawing program (SDRAWP for creating line drawings), Fantasia provides utility programs to handle placing graphics created with other applications into a form. Also, a company logo, created with graphic commands, can be incorporated into a form.

Font usage is controlled with the "f" escape command. Typefaces are numbered and listed within a file called Fonts. The escape command is followed by the number of the font that corresponds to the style, point size, orientation and typeface of the font you wish to use: ^F13.

Figure 1 is an example of what a text file containing Fantasia formatting commands looks like.

Using the Screen program in Fantasia, a screen representation of a form can be drawn in a graphics window using the line-drawing character set available on most HP terminals. A screen image can be printed in landscape orientation with Fantasia. Use of screen output in language mode involves no more than changing two font definitions on the first line of the file. [Note: A program in the new release will generate a file for the laser program from a V-PILs forms file.]

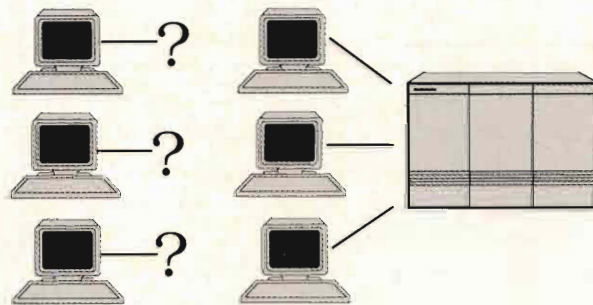
Softkeys (F1-F8) provide access to many

of the line-drawing set characters most frequently used in forms design. A listing that cross-references keyboard characters to the corresponding line-drawing characters can be printed out; this helps when a line-drawing set character not accessible by the preset softkeys must be used. The Screen program is a quick

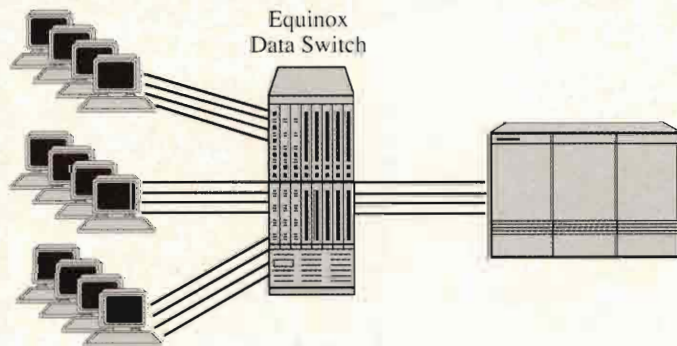
way to create a simple grid-type form.

The image displayed in the graphics window is saved and written to a disc file. This file can be modified using any HP 3000 Editor to allow the addition of backslash (\) formatting commands for margin adjustment, font definition, etc. To print the form, the disc file is inter-

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to repeat the box a specified number of times down or across the page also is provided on the screen. Softkeys (F1 - F4) are set to allow you to return to the previous, skip or delete a box. The other softkeys refresh the screen or take you to other menus. Enter will save the current box definitions. A specification list can be printed that shows the values entered when each element of a LaserSoft form was defined.

A partial listing of element specifications is shown in *Table 1*.

Lines are added with the vertical or horizontal line add-entry screens. In addition to defining the starting and ending coordinates and line thickness, control over the position of the line within the grid cell is possible. Vertical lines can be positioned at the left, center or right side of the cell. Horizontal lines can be positioned at the top, middle or bottom of a cell. Lines can also end in the middle of a cell, at the bottom of a cell (vertical line) or at the right side of a cell (horizontal line).

Text coordinates include the starting row and column. The number of the font to be used, line spacing, adjustment for positioning text in the cell, font change characters (to change fonts within a line of text) and 'move to' characters (characters that can be embedded within a text block to act like tabs or indents) are also fields on the add-text screen.

The add-graphics entry screen is used for graphics definition. The file name, type of file, resolution of the graphic and positioning coordinates are included in the field entry. Row and column adjustment options, in increments of 720ths of an inch, are provided for precision placement of the graphics frame.

StarJet

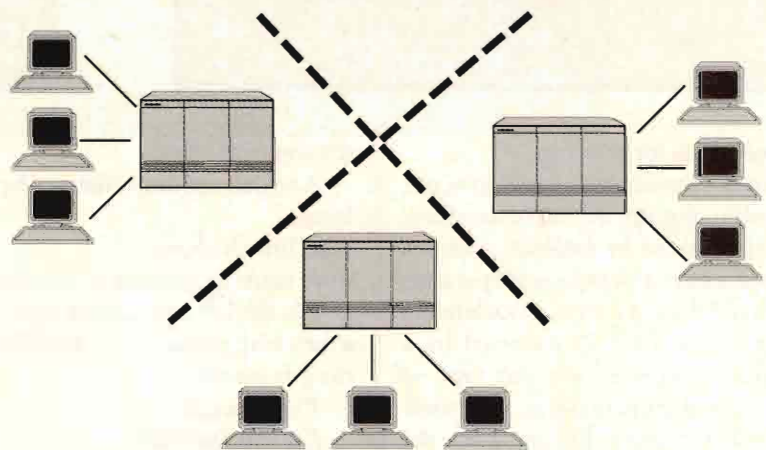
StarJet combines the visual with the textual in its approach to forms design. The Design program displays a list of design commands and provides a graphics window into which the elements of the form are drawn. After selecting a function, the program issues prompts and instructions for defining the ele-

ment within the graphics window; the resulting file is a command file. Fine-tuning the file is accomplished by editing the command file using any HP 3000 text editor. The command file is interpreted for compiling and printing by the StarJet program.

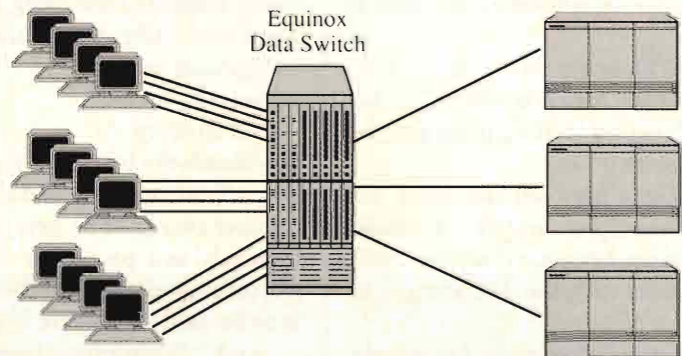
The Design program is used to draw all the elements of a form: vertical lines, horizontal lines, boxes, shaded areas, etc. When a Design program command

is selected, you are prompted to place the graphics cursor at the starting point for the element. Then you are prompted for the ending-point cursor position. Guided by a series of prompts, each element is drawn and displayed in the window. The program walks you through the design process interactively. When you're finished, a command file is saved to disc. The StarJet program is then used to read and interpret the

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Example of a Screen Form

	Exhibit A	Exhibit B
No.		
Time		
Place		
Other		

Input:

Vfontset r 1; fontset l 53

^fr^

```

^fl^  O:.....#.....W
^fr^  ^fl^: ^fr^ Exhibit A ^fl^: ^fr^ Exhibit B ^fl^:
^fr^  ^fl^: ^fl^:...../....."
^fr^  NO. ^fl^:.....:
^fr^  ^fl^:...../....."
^fr^  Time ^fl^:.....:
^fr^  ^fl^:...../....."
^fr^  Place ^fl^:.....:
^fr^  ^fl^:...../....."
^fr^  Other ^fl^:.....:
^fr^  ^fl^A:.....$.....S
    
```

TABLE

BOXES

ID#	Position				Thickness				Repeat		
	Top	Lft	Btm	Rt	Top	Lft	Btm	Rt	Shd	Dwn-Skp	Acr-skp
1	1	2	63	79	16	16	46	16			
2	2	3	5	76	12	12	12	12	A		
3	7	3	23	76	12	12	12	12			
4	25	3	23	76	12	12	12	12			
5	37	3	43	76	12	12	12	12			

HORIZONTAL LINES

ID#	Row	Thk	TMB	Beg Col	Hlf	End Col	Hlf	Typ	Rpt	Skp
1	11	12	T	15	N	23	N	H		
2	11	12	T	31	N	31	N	H		
3	16	12	T	4	N	11	N	H	3	2

TEXT

ID#	Row	Adj	Col	Adj	Font	Vis	Move Char	Font Swch	Text
1	4		10		2052		12.69		Hardware Equipment
2	26		5		2044		9.33		Maintenance Form
3	48		5		204G		8.00		Status Change (Circle

command file for printing.

Minor adjustments to the form can be made using any HP 3000 text editor. The file created by DESIGN contains the commands and associated parameters that define the form. A command consists of a slash (/) followed by a designator, representing the type of element, and the parameters for definition and placement. Elements are defined by specifying, in points (300 points-per-inch), the distance between the starting and ending point in relation to the left and top margins.

A command line for defining a box contains the following parameters:

- a character designator for the type of element
- the line thickness (in digits)
- the distance between the upper and lower left corner starting point and the left margin in points
- the distance between the upper left corner starting point and the top margin
- the distance between the lower right ending point and the left margin in points
- the distance between the lower right ending point and the top margin

For example:

```
/B3 0 0 1800 2400
```

defines a 6 x 8-inch box that has sides three points thick; the upper left corner of the box is located at the left margin at

the top of the page.

A horizontal line is defined by specifying:

- the line thickness
- the starting position of the line relative to the left and top margins
- the ending point of the line relative to the left margin

The command line:

```
/H2 300 600 1200
```

defines a three inch horizontal line that is positioned one inch from the left margin and two inches from the top margin of the page.

A set of downloadable fonts is supplied with StarJet. Fonts that are listed in the command file using the /C command are numbered and downloaded to the LaserJet printer.

The command:

```
/C2 tr140brp
```

downloads the 14 point, Times Roman, portrait-oriented font and assigns it the number two (2). The font number 2 is later used as a parameter for the text (/T) command to specify the font which is to be used for a string of text.

A text (/T) command is used to insert text. The command file entry includes the font number, positioning parameters, and the character string (text) that will be printed on the form.

In this line:

```
/T2 12 1200 This is a line of text
```

two, (2) is the font number, 12 is the distance between the starting point and the left margin, 1,200 is the distance between the starting point and the top margin and "This is the line of text" is the character string. Up to 128 characters may be entered in one command file /T line. Alternate fonts can be defined with the /U command. Once defined these alternate fonts can be turned off or on by embedding control characters—CONTROL0 and CONTROLN—within a line of text.

A StarJet command file might look like the following:

```
/w5
```

```
/c 3 tr140brp
```

```
/c 2 hv120brp
```

```
/h1 550 1480 1100
```

```
/h1 400 2210 630
```

```
/h1 560 2350 1540
```

```
/b2 20 1560 2380 1520
```

```
/b2 20 840 2380 1520
```

```
/b2 00 2400 3090
```

```
/t2 100 2210 Employee # Employee  
Name
```

```
/t2 80 2070 Add Employee Maintenance  
to HWDB
```

The RastJet program allows figure files created with HP graphics software to be converted for use with StarJet. The /F command is used for graphic (figure) element definition; resolution (75 to 300 dpi), positioning — distance between

the starting point and the left and top margins — and the raster file name are the required parameters.

Modifications

At some point in time, all forms require modification. Modifications to Fantasia forms are achieved by changing the format commands within the text-editor file; or in the case of a Screen-designed form, the form is called up using the Screen program and redrawn in the graphics window. Reading through a file of formatting commands and deciphering how the embedded commands relate to the printed form can turn into a challenge — especially with the more complex designs. Because a Screen-designed form can be redisplayed visually, less time is spent interpreting commands and the modifications seem easier. I experienced an "I-GOTCHA" with the Screen program during a modification to a form. The HP 3000 system I was working on had an automatic timeout for inactivity; while working in Screens, I was timed out and the modifications to the file were lost — I made sure I saved my file frequently after that.

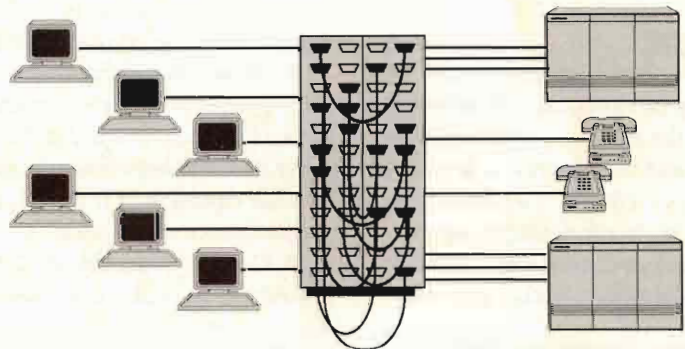
By selecting the Redesign Forms option on Forms Composition Menu of LaserSoft, edit mode screens for each element type can be accessed. The screens not only provide the means to change individual elements, but you can move, insert, expand, copy, delete or compress elements. Individual elements are called up for modification by the ID# assigned by LaserSoft. Groups of elements can be included in a move, copy or delete operation — that is, all elements originating within a specified edit frame will be moved or copied to a new specified location on the form, or deleted from the form. To make modifications easier, mark the ID#s, which were assigned to each element, by the program, on the form or sketch used to initially enter the form. This eliminates having to identify the element you wish to modify by translating its parameter coordinates from the specification listing. Overall, the ease of use and flexibil-

ity provided by the edit modes quickly are appreciated.

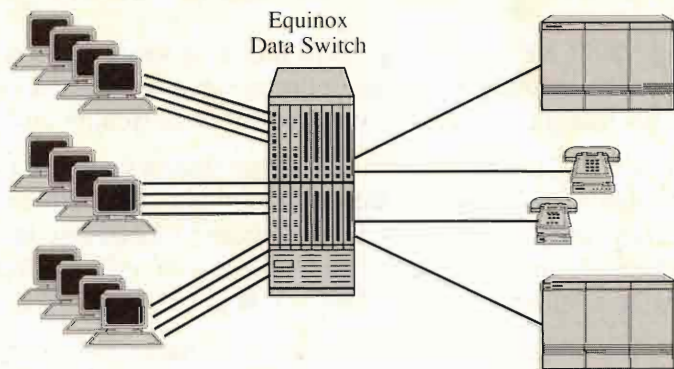
StarJet forms can be edited visually using the Design program or "textually" by editing the command file with a text editor. To edit a form visually, an existing file name is entered in response to the file name prompt issued by the

Design program; the form is displayed in the graphics window. An element is modified by typing the command name from the list of functions available. You then position the cursor on the element to be modified and answer M or D to the question: Do you want to delete (D) or to modify (M)? The form also may be

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edited textually with the use of a text editor. The command file for an existing form is opened in the editor and the parameters in the commands line for a specific element are changed.

When modifying the form textually, I became confused when trying to determine which command line in the file corresponded to the element I was trying to modify. Identifying the correct parameter of a command line to change, in order to accomplish the element modification, entailed referring to the StarJet commands and syntax in the reference manual.

Data Merging

Filling out forms electronically is achieved by merging data with forms. Typically, the form is downloaded to the printer and the data is merged with the form when it prints. To be effective, retrofitting an existing computing environment with electronic forms must be accomplished as painlessly as possible,

in terms of JCL and program source changes.

In the release of Fantasia that I reviewed, merging data produced from an application with a Fantasia form was not addressed. However, a more recent release of Fantasia includes a new command /CCTL that uses a disc file name for a parameter. This allows a print file from an application to be routed to disc using file equate and processed through Fantasia to merge the data with the form. Fantasia contains a font and font tracking system so as to avoid repeated downloading of forms to the printer. Downloading is automatic if the application references a form.

A StarJet command is provided to compile your form into an environment file. Once the environment file has been generated, it can be issued as part of an MPE file equation or it can be activated programmatically, from COBOL or PASCAL code, using the JETLOADENV procedure. In either case, the form is

downloaded to the printer and merged with the data sent for printing. If you have the luxury of dedicating printers for a specific applications, a form can be downloaded as a permanent form. A permanent form doesn't have to be downloaded each time data is sent; it remains resident in the printers memory. The /O (overlay) and /AO (activate overlay) are used within a command file to load, activate or recall forms previously loaded into the printer memory.

There are several methods for downloading forms using LaserSoft. The Printer Preparation Menu provides menus for loading (or removing) forms and fonts. By entering the appropriate selection criteria, font, groups of fonts, forms and groups of forms can be chosen for downloading. You can load forms interactively through the menus; or the option of produce and save a job stream containing the selection parameters chosen is provided. Font and form-loading programs and subprograms also are

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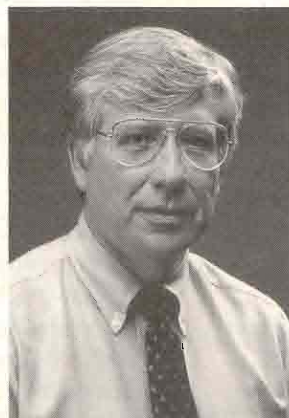


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provided that can be: run from MPE, created and activated as a son process, or called as a subprogram. A parameter file is required for these programs; the parameter file must contain the appropriate font and form-loading information. In addition, with a combination of creating a job stream and running a program that reads the parameters file, a Terminal Type file can be created that allows a form to be activated using the "ENV=" option on an MPE file equation. Data sent to a printer that has forms loaded and activated, (using any of these methods) will overlay the form.

Multipart Forms

Multipart forms have always been an issue as far as laser printing is concerned. The solution taken with IDIFORM and IFS is to create multiple pages of the same form that contain variables for destination (customer copy, file copy, accounting copy, etc.) and various shaded areas; for a three-part

form, three single pages are printed consecutively — each containing the appropriate data and variables. This remains the solution for these software packages. The form and data must be sent through the printer x number of times to print a form with x number of parts.

Basic Design Considerations

When designing visually, attention to pitch and spacing is important. Any form designed visually, whether using a WYSIWYG (What You See Is What You Get) environment or not has the potential of turning into a nightmare when it's rolled into a typewriter or printer for data merging. Line spacing and character pitch should be considered when a form is designed. Fantasia and StarJet provide windows in which to design forms visually; they also provide the appropriate grids on which to sketch the form or use as an overlay for defining an existing form. The use of these

grids is indispensable to convert a hardcopy form into an electric form or design a form that is to overlay existing computer-generated output. LaserSoft is not visual, but grid overlays are provided to make designing forms in standard pitch and line spacing combinations an easy task. The column and row basis of forms definition in LaserSoft prevents the designer from ignoring pitch and line-spacing.

Keep in mind that no matter what kind of form you're designing, expect surprises when you pick up your output. Entering incorrect formatting commands or parameters can produce some interesting and unexpected results. Printing your form frequently, and seeing how modifications to parameters or addition of format commands change the form, provides feedback on whether a command is being used correctly.

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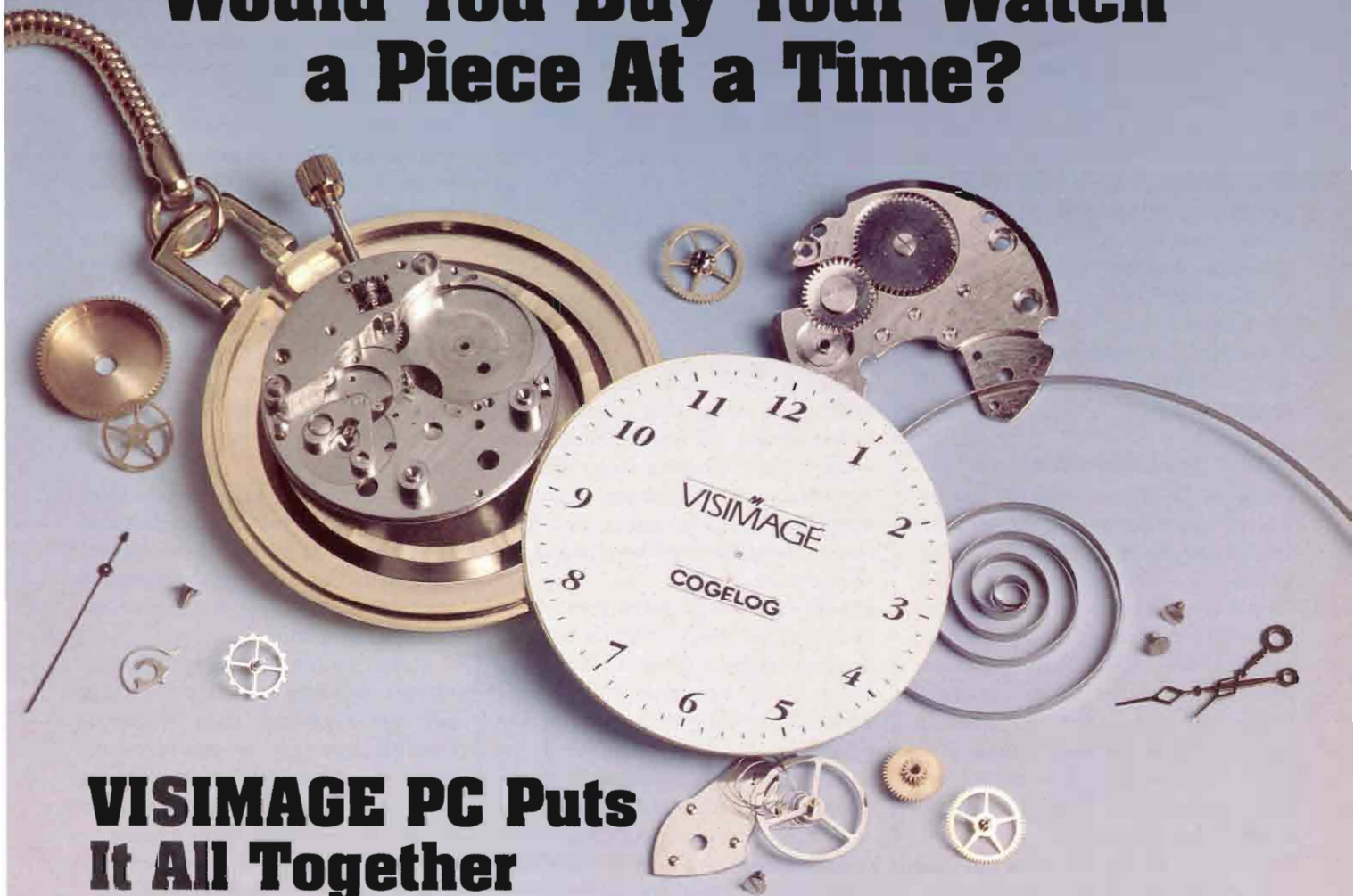
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the potential to become a forms designer. If a corporate image or standard is to be maintained, who will design the forms and how will forms design be controlled? If the forms are designed by an art department, who will translate the mechanical artwork onto an electronic form? How can printer usage be optimized in terms of downloading or permanently downloading forms? And one final question should be asked before selecting a package: Does this software fit into and satisfy current as well as future plans?

Overall Opinions/Preferences

Fantasia: In spite of my preference toward visual design, I found the non-visual method (entering formatting commands in an editor file) the best option for creating a complex form. With its powerful text formatting capabilities, Fantasia ranks high for designing forms, like contracts, that contain a heavy amount of text. Like TDP, reading through a file of Fantasia commands to make changes or additions becomes easier as familiarity with the backslash commands is developed.

LaserSoft: I quickly grew to like the non-visual method for element definition that LaserSoft uses. The menu-driven program makes the package user-friendly. With the use of the 10 or 12-

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pitch grids, translating a form design into columns and rows is straightforward. It isn't, however, so straightforward that you can expect perfect results immediately; adjustment and fine-tuning should be considered part of the design process.

StarJet: A person partial to either visual or non-visual design methods will find StarJet a handy compromise. The interactive design process is simple to use. Expect fine-tuning the form, by editing the command file as part of the design process. I found that making the correlation between the printed element and its corresponding command line in the command file slow; however, familiarity with the parameters used for defining each type of element would make the fine-tuning process faster.

Overall, the three packages accom-

plish the task of forms design as advertised. Compared to my experiences with IDIFORM and IFS, these software packages offer a more friendly and less frustrating means of producing electronic forms. In a world that is fast becoming inundated with personal computers, APPIC, BSI and Proactive Systems allows the the HP shop to keep up with the competition.

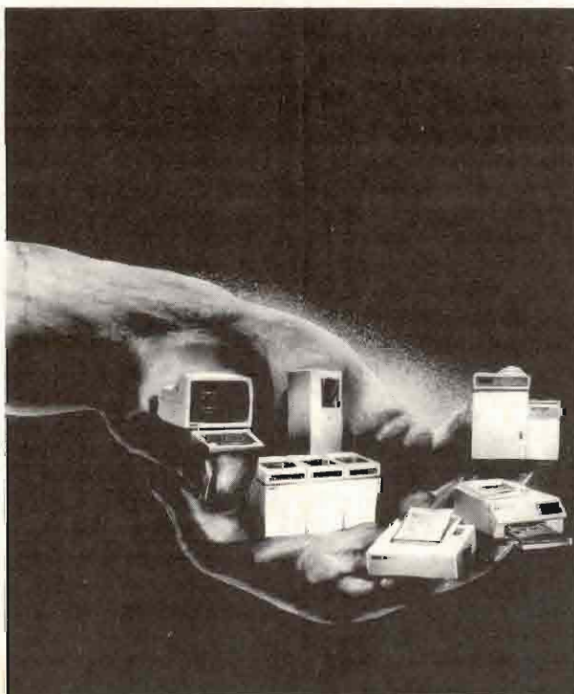
Although the products are well documented, don't expect perfect results immediately. Fine-tuning and retuning the form is as much a part of the process as designing and entering the commands to define the form.

Many aspects of each package were not addressed. The releases of the packages I looked at provided powerful design capabilities; enhanced versions of each of the packages mentioned are currently available.

Keep in mind that the software developers are open to and welcome suggestions regarding their products. Communicating your ideas to the developer may turn a package that almost meets your needs into the package that meets or exceeds your requirements. — *Wendy Hewitt is an IS consultant with Bose Corporation, Framingham, MA.*

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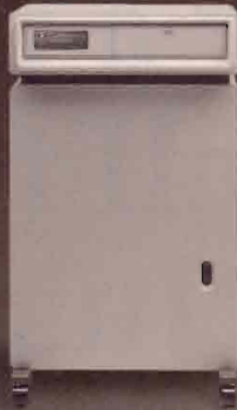
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P PROGRAMMING THE CI 'SHELL'

Programming Environment Worth Consideration

The UNIX operating system and work-alikes like HP-UX often are touted for providing a powerful programming environment. While RTE-A may not have pipes and I/O redirection, the CI "shell" provides more than adequate facilities for constructing utilities to aid programming and other activities. Parameter passing, environment variables, CI programming constructs, Edit/1000 and utility programs provide a powerful and productive environment.

Passing Parameters

Programs running under RTE-A have access to run string parameters in several forms. A call to GetSt or EXEC 14 (with a Read function code) returns the entire runstring as typed by the user or passed by the parent program. A call to RMPAR will return up to five integer parameters parsed from the runstring. Finally, RCPAR returns one text (character) parameter from the runstring at a time.

When a program terminates, it returns information to its parent program with a call to PRtn (parameter return) or EXEC 14. PRtn is the opposite of RMPAR and allows passage of up to five integer parameters back to the parent. EXEC 14 is used with a Write function code to return a text string to the parent program.

When a program is run from CI, interactively or in a command file, values returned with PRtn are put in environment variables \$Return_1 through \$Return_5 and text returned with EXEC 14 is put in \$Return_S. These values can be shown the ECHO or SET commands (e.g., ECHO \$Return_S).

A CI command file has access to its runstring just as a program does, but CI prepares the runstring into sequentially numbered

environment variables. The effect is much like making calls to RCPAR in a FORTRAN program with the results put in variables named \$1, \$2 and so on.

When a command file terminates, it can return five integer parameters and one text string to the parent command file or the interactive CI environment. The RETURN command is like a combination of PRtn and EXEC 14 in one statement: The first five parameters are integers and are put in \$Return1 through \$Return5, the sixth is a string that is placed in \$Return_S.

Environment Variables

Environment variables are to CI what INTEGERS and REALs are to FORTRAN — a place to store data and control parameters. Several predefined variables are used to hold system- and session-specific information similar to PATH and PROMPT in MS-DOS. In addition, user-defined variables can be created interactively or in command files.

Predefined environment variables include Auto_Logoff (whether or not to terminate the session after three device timeouts), Opsy (the RTE-A revision) and RU_First (whether to look for programs or command files first when RU or TR isn't specified). Others are described in the CI section of the *RTE-A Quick Reference Guide*.

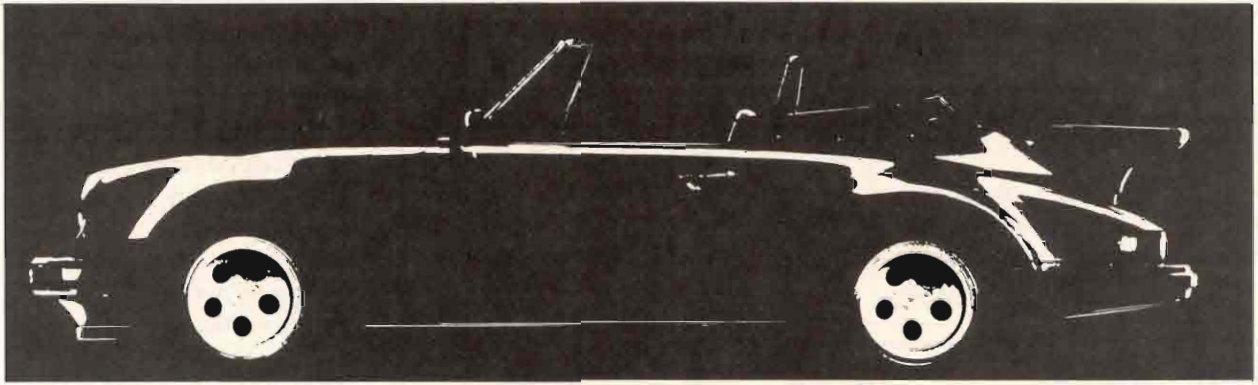
User-defined CI variables may have names of one to 16 characters, starting with a letter and consisting of letters, numbers and underscores. They're created with the SET command and may be disposed of or cleared with the UNSET command. The value of a CI variable is accessed by preceding the variables name with



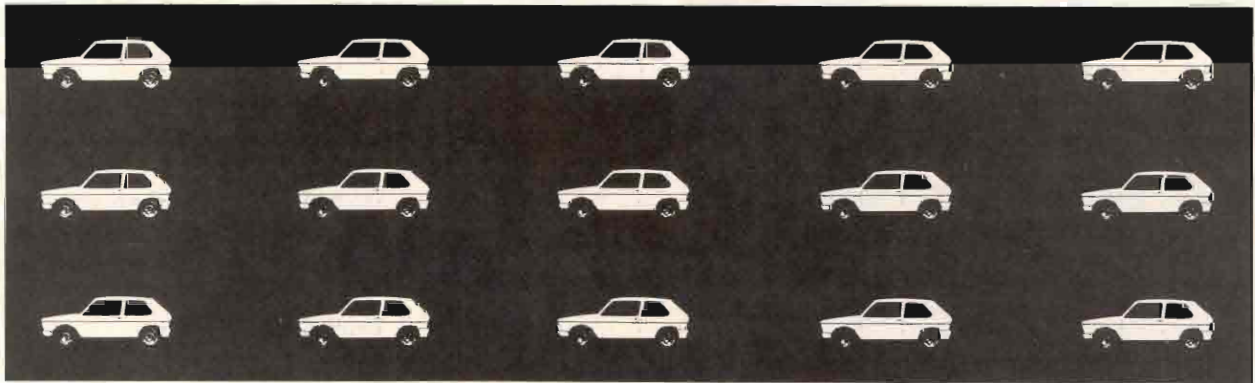
PROGRAMMING

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a dollar sign; for example:

```
SET Name = 'Joe User'  
ECHO 'Hello, '$Name  
UNSET Name
```

CI variables are global in scope for a single copy of CI. A command file and all other command files it may reference run in a single copy of CI. That means

variables in an interactive session are available to all command files run from that session, and variables created (SET) in a command file remain in the interactive session even after the command file terminates. If a second copy of CI is run, perhaps from within Edit/1000, that copy has its own environment variables that are released when the EDIT is resumed.

Abbreviating CI Commands

A convenient use of environment variables is to abbreviate long strings used in interactive commands. For example, to move quickly between the /SYSTEM/GENERATION directory and the /RELOCATABLES directory, variables might be set up as follows:

```
SET gen = /system/generation  
SET rel = /relocatables
```

Then the command `wd /system/generation` could be abbreviated `wd $gen`. To carry this a step further, the entire WD command could be assigned to a variable:

```
SET g = WD /system/generation  
SET r = WD /relocatables
```

Then typing `$g` or `$r` at a CI prompt causes a change in the working directory. Note that this is quite different from MS-DOS' handling of environment variables. MS-DOS does *not* substitute values for environment variables in interactive commands, only within batch files.

Quoting

Dereferencing environment variables is only one of several operations that CI performs when it preprocesses a command or runstring. Other operations include shifting all text to uppercase, compressing all strings of multiple blanks and substituting commas in place of blanks as parameter separators. In the example shown above, the set command is parsed to:

```
SET,G,=,WD,/SYSTEM/GENERATION
```

which results in G being set to:

```
WD,/SYSTEM/GENERATION
```

Quoting comes in two forms and allows this preprocessing to be controlled or overridden. It also provides a means to include special characters (like dollar signs, \$ or blanks) in parameters. To quote a single character, precede it with

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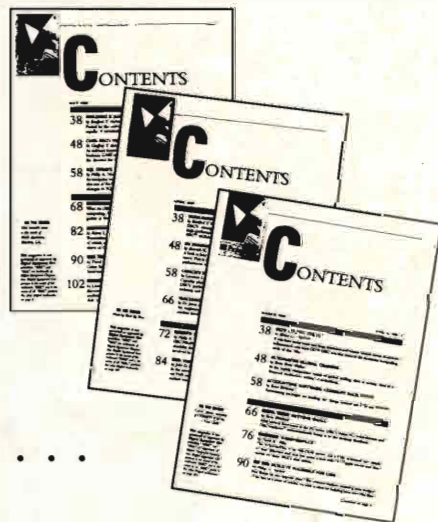
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a backslash (\). For example:

```
ECHO Hello, Joe User
```

produces:

```
HELLO,JOE,USER
```

To suppress the replacement of the blanks with commas, use backslashes:

```
ECHO Hello,\ Joe\ User
```

To quote longer strings, surround them with backquotes (''). For example:

```
ECHO 'Hello, Joe User'
```

produces:

```
'Hello, Joe User'
```

The substitution of commas for

blanks and the shifting of all text to uppercase have been suppressed.

CI Constructs

CI provides two structured programming constructs that allow conditional and iterative execution of commands. The IF/THEN/ELSE/FI construct can be combined with commands and utilities to test various conditions and take appropriate actions. For example, a command file might check to see if a required parameter was specified:

```
SET NULL =
IF IS $1 = $NULL; THEN
    ECHO 'Parameter must be
    specified.'
ELSE
    SET Parm = $1
FI
```

Note the semicolon command sepa-

The semicolon allows the more natural syntax...

rator before the THEN. CI considers THEN a separate command from IF. The semicolon allows the more natural syntax of putting THEN on the same line as the condition.

The WHILE/DO/DONE construct allows looping to execute the same commands on multiple arguments or on the same arguments until some condition is met. For example, a command file might be used to perform an EDIT/COMPILE cycle:

```
SET Flag = 0
```

Programs 1-6

Program 1.

```
SET NULL =

IF IS $1 = $null; THEN
    SET mask = $wd
ELSE
    SET mask = $1
FI

IF IS $2 = $null; THEN
    SET dlfile = dlopt.txt
ELSE
    SET dlfile = $2
FI
IF dl,$dlfile,,0; THEN
    ECHO 'Sorry, can't create directory list file '$dlfile
RETURN -1
ELSE
    IF dl,$mask,,0; THEN
        dl,$mask,u,$dlfile
        edit -b $dlfile,'se as of|1 3 k|$k|se re on|1 $ x/
[*$*//|er'
    ELSE
        ECHO 'No files match mask '$mask'.
        RETURN -2
    FI
FI
IF IS $3 = '-X'; THEN
    edit -b $dlfile,'se as of|se re on|1 $ x/'\'.[*$*//|er
FI
```

Program 2.

```
SET NULL =

IF IS $1 <> $NULL; THEN
    SET FTN_PROG = $1
FI
FTN7X,$FTN_PROG,-,-,$2
```

Program 3.

```
FTN7X,$1,-,-
IF $Return1; THEN
    LINDX,$1.REL,$2$1.LIB +NL
    PU $1.REL
    PU $1.LST
ELSE
    ECHO 'Errors compiling '$1'. Not indexing.'
FI
```

Program 4.

```
IF $QUIET; THEN
    SET ECHO = '*'
ELSE
    SET ECHO = 'ECHO '
FI
```

Program 4...continued

```
$ECHO
$ECHO 'MAKE <890228.1016>'

SET NULL =
IF IS $1 <> $NULL; THEN
    SET Make_Name = $1
FI
FTN,$Make_Name

IF $Return1; THEN
    IF DL,$Make_Name.LOD,,0; THEN
        LINK $Make_Name.LOD
    ELSE
        LINK $Make_Name.REL
    FI
ELSE
    $ECHO 'Errors compiling '$Make_Name'. Not linking.'
    RETURN -1
FI
$ECHO
```

Program 5.

```
SET Hold_wd = $wd
WD $1
```

Program 6.

```
WD $Hold_wd
UNSET Hold_wd
```

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```

WHILE $Flag; DO
  EDIT $1.FTN
  FTN7X,$1,-
  SET Flag = $Return1
DONE

```

Note that in CI, 0 is TRUE and non-zero values are FALSE, because RTE-A programs return 0 in \$Return1 if they succeed and a non-zero error code otherwise. For example, DL can be used to test file existence:

```

IF DL,$1,,0; THEN
  ;* Manipulate file
ELSE
  ;* FMP error DLing file
FI

```

If the file doesn't exist, DL returns -6 (a FALSE value to CI) causing the ELSE clause to be executed.

Using The Editor

While it isn't *awk* (Aho, Weinberger, and Kernighan's file processor) or even *sed* (the UNIX Stream Editor), *Edit/1000* is a very capable editor and an indispensable tool for building powerful CI utilities. The recent addition of a batch option allows command-driven editing without a lot of noise echoed to the screen. Regular expression processing and executing utilities from within EDIT provide almost limitless flexibility.

Program 1 shows DLOPL (Directory List, One Per Line) a utility which uses *Edit/1000* to post-process a directory listing for input to MERGE or other list-driven utilities. A directory list with update times is directed to a file, then EDIT is used to remove the header, trailer and update times.

The first set of EDIT commands may be read as, Edit the DL file in batch mode. Do not ask for confirmation of deletes, etc. Kill the first three lines of the file. Go to the last line of the file and kill it. Set regular expressions on, and on all lines of the file, remove all text beginning with the first blank on a line and continuing to the end of line.

The second set of EDIT commands are used to remove extensions from file names if the -X (remove extensions) parameter was specified. A regular expression is used to match any string starting with a period (.) and ending at the end of the line.

Utilities

Programs that return values with PRtn or EXEC 14 can be used to extend the CI command language for general or application-specific functions. One of the most useful CI utilities is provided with RTE-A: IS can be used to compare environment variables to one another or to constants.

Examples

To paraphrase a cliché, an example is worth 2 KB. With that in mind, consider *Programs 2* through *4*. *Program 2* shows FTN.CMD, which abbreviates repetitive compiles. The first line makes sure that the environment variable NULL exists with a null value. The second checks to see if parameter 1, the name of the source file to compile, has been specified. If a name is specified, it's stored in FTN_PROG for future use. In either event, the FORTRAN compiler is scheduled with options passed in the second command file parameter. By storing the first parameter away, the second invocation doesn't need to include the file name.

Program 3 shows LIB.CMD which facilitates compiling and indexing relocatable libraries. The first line compiles the source file specified in the first command file parameter. The second line checks to see if the compile succeeded. FTN7X will set \$Return1 to a non-zero value if any errors or warnings were detected. If the compile succeeded, LINDX is scheduled to index the relocatable file. (The directory for the library is specified in the second command file parameter.) When the indexing is done, the relocatable and list files, which are no longer needed, are purged. If the compile fails, a message is displayed, no relocatable is produced, and the listing file is left for debugging.

Program 4 shows a simple make utility. The first few lines use a user-defined environment variable, QUIET (defined interactively or in a LOGON command

*CI programs
save lots of
programming
time...*

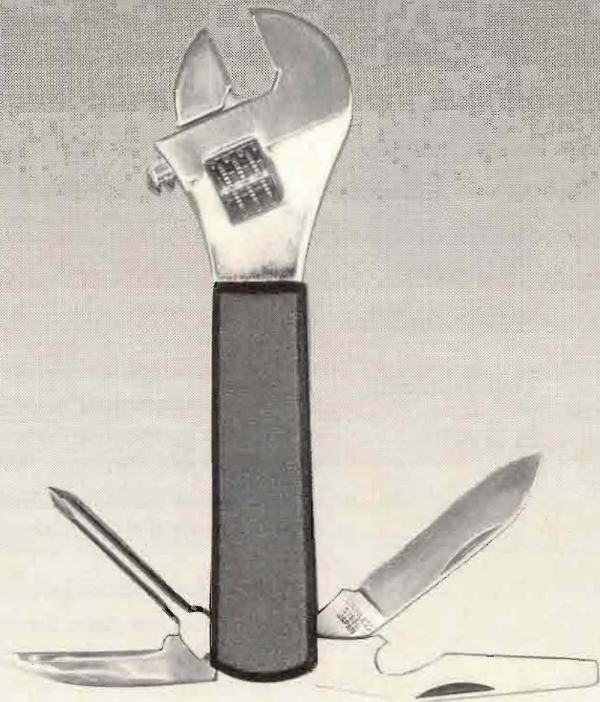
file), to initialize \$ECHO. If QUIET is TRUE, \$ECHO will evaluate to a CI comment character. If QUIET is FALSE, \$ECHO will evaluate to the ECHO command providing the user with some status information on the screen. MAKE remembers its first argument for later invocations then uses FTN to compile the program. If the compile succeeds, MAKE checks to see if a linker command file (.LOD) exists. If so, its name is passed to LINK. If not, LINK is passed the name of the relocatable file and uses defaults for its other parameters.

Programs 5 and *6* show a pair of command files that work together to make moving between directories easier. VISIT saves the current working directory in Hold_WD then moves to the directory specified in the first parameter. LEAVE uses to the saved value to reset the working directory.

THESE EXAMPLE COMMAND files illustrate building simple, reusable tools and building larger, more capable tools with them, a philosophy usually associated with the UNIX system but obviously not excluded from RTE-A. While CI "programs" may not be CPU efficient, they can save lots of programming time during development and, in that way, pay for themselves after a few invocations. Until there is a CI compiler, this is certainly good enough. —*Christopher Nelson is a systems analyst, programmer and freelance technical writer based in Stamford, CT.*

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S QL: THE DBMS STANDARD

**The Waiting
Is Over**

SQL, in its various implementations, is the relational database standard as specified by the ANSI committee. It's the first standard for database management systems to be recognized as an accepted de facto standard and as a formal ANSI standard. Because SQL is a standard, nearly every commercial computing institution should consider it as the next step forward.

Standards in software aren't new, but today you might not recognize their worth. The first major standard was the specification of programming languages. Today, COBOL is nearly the same across all computer systems. The current benefit is that personnel are relatively interchangeable, at least compared to the computing world prior to the advent of a standard language. And, to an extent, programs are transportable across hardware platforms.

The concept of a standard is that parts can become interchangeable. In the ultimate sense, programs written using standard facilities can be moved unmodified between hardware and operating system platforms. For the customer, that represents flexibility to adapt to new technologies and business relationships, as well as the ability to transfer people between environments. In today's world of packaged software, this also would open the market for both buyers and sellers of software. Programs no longer would be restricted to a specific hardware and operating system combination. The net customer results would be lower cost and lower risk exposure.

Before the mid-1970s, programs written in standard languages like COBOL or FORTRAN

were transportable. The tools available to an application were the compilers and a simplified file system. The big events of the 1970s were interactive computing and database management systems. The benefits of these new technologies have been so far reaching that we take them for granted: higher user satisfaction, faster application turn-around time, lower operational costs and more. But the requisite tools also took away much of the benefits of standard languages; applications of the 1980s hardly can be called transportable. Database management systems essentially undid the transportability of applications that was established with the language standards.

TODAY, A COMMERCIAL APPLICATION program is wrapped around the database management system. Its function is to direct the DBMS, so most application program logic is devoted to database access. Unfortunately, nearly all database management systems have different capabilities, and all have much different interfacing techniques. In spite of the language standard, the conversion task involving a database management system is more appropriately called a rewrite.

It's difficult to estimate the number of different database management systems on the market today, although there are probably fewer than there were five years ago. This means that some customers have code written to use a certain database management system that has no future. A similar, but perhaps worse, situation exists for customers who elect to switch hardware or operating systems. A conversion is painful and costly.

ANSI recognized the problem early and attempted to create a standard with CO-



STANDARDS

Larry Kemp

DASYL. While a few vendors implemented CODASYL databases, it's clear today that the standard wasn't successful. People simply didn't like it; it was awkward to use, restrictive in capability and, ultimately, people recognized that there were non-CODASYL database management systems available that didn't suffer from the CODASYL weak-

SQL allows an administrator to modify the database structure...

nesses. As a consequence, the CODASYL standard became a paper standard. In retrospect, it failed because the standard was formed too early.

The SQL standard is perhaps just another attempt. But it looks like this standard can and will be successful. At least this standard isn't too early. The basics of SQL relational databases have been around for over a decade, and commercially available versions have been around for almost a decade.

SQL databases excel in the areas of flexibility and simplicity. SQL database management systems offer flexibility by allowing a database administrator to modify the physical database structure without having to modify application programs. And SQL offers simplicity because a database can be constructed in a piece-wise fashion, using English-like commands. You can demonstrate this yourself by comparing the commands necessary to create or modify a database structure. Simplicity is apparent in the easy-to-read English-like queries embedded into the application source code.

Some people would argue that commercially available and commercially viable aren't the same. It's been only recently that SQL relational databases have gained the performance and flexibility that are required for use in transaction-processing applications. And many of the transaction processing require-

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ments aren't in the current specification, but the cooperation and communication between the current vendors is having remarkable success; revising standards

an issue. SQL databases are in a performance class different from that of early implementations. They're practical in transaction-processing applications.

use, ordering of access, and least impacting concurrency enforcement are the areas where the most improvement has been made. The end result is a high-volume database management system that can be used in the same market as traditional database management systems.

The obstacle of relational database implementations is that the entire structure is dynamic, requiring decisions to be made on the fly.

and agreement on features is happening.

Whether or not a written standard can become a reality ultimately is based upon usefulness. The pioneering versions of SQL offered less than exemplary performance. The early vendors sold SQL as a decision support database — an area where the feature set would be useful, but performance supposedly wasn't

Faster hardware and larger memory sizes have helped SQL databases, but most of the improvements have come in the optimization of the software product itself. The obstacle of relational database implementations is that the entire structure is dynamic, requiring decisions to be made on the fly. Optimal decision-making such as which physical path to

THE PUBLIC MISCONCEPTION of relational database performance has prompted vendors to confront the issue directly, by using what is now an industry standard benchmark. TP1, which also is known as ET1, is a benchmark that was originally developed by Tandem for the banking environment. Today, every major relational database vendor expresses their product's performance relative to that benchmark. This is a significant departure from the attitude of traditional database vendors, who all but avoid the subject of performance.

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There are both hardware vendors and independents in the SQL marketplace. Today, the independents probably lead the way in name recognition, with Oracle, Relational Technology (with Ingres) and Informix representing the big names. In the hardware vendor arena, IBM, DEC, Tandem and HP all have their own SQL products, and all of them refer to SQL as the preferred DBMS on their hardware. These vendors all have performance results to show that their products are commercially viable.

All of the vendors have their own competitive advantages. Tandem, for example, has full distributed database capability; Oracle has intervendore connectivity. But all vendors ascribe to a standard SQL for their core product. It's less important which vendor you choose, and more important that you do choose a database management system that corresponds to the SQL standard. If your choice happens to be wrong, your

application development costs are protected because you can switch to another product that corresponds to the standard.

All technical aspects aside, SQL offers its implementation by multiple hardware and software vendors. None of the successful non-relational database vendors can make that claim. The conclusion: SQL is the database management standard. To the many users who postponed the database management decision until the market sorted out, the waiting is over. To all users, its time to stop investing in old technology and to start investing in the new technology. —Larry Kemp is a systems consultant for Hewlett-Packard in Bellevue, WA. He specializes in data management and performance for HP commercial computer systems.

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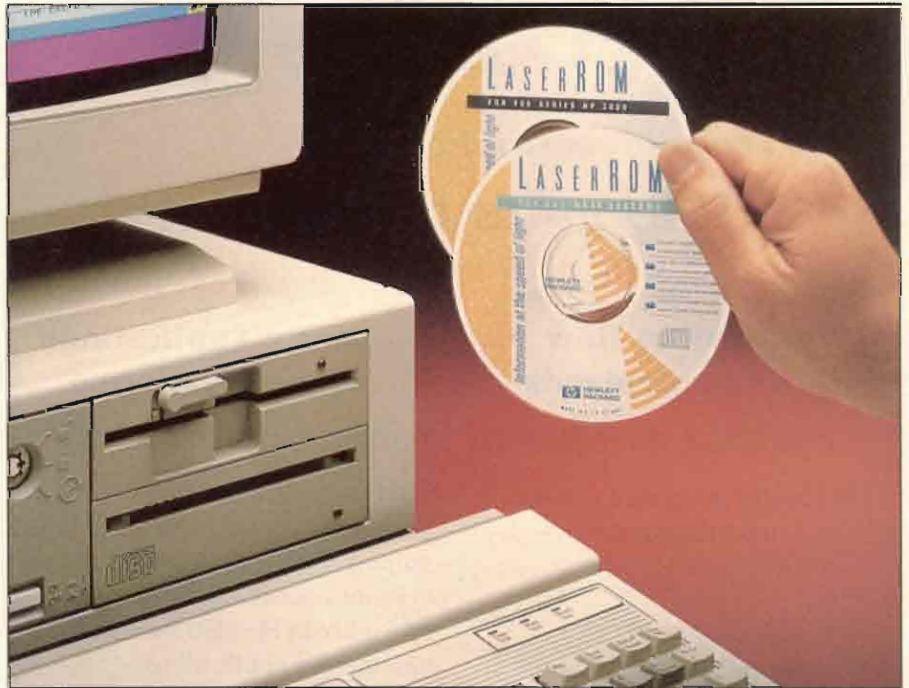
I'm always encouraged when a company like Hewlett-Packard promotes the use of new technology. HP introduced LaserROM about two years ago as an alternative to paper-based documentation and at the time, I thought it was overkill. But once again, time has proven me wrong. No longer will you have to plow through 96 user manuals to install a Series 950, or spend more time finding the correct manual than finding the solution. LaserROM can help find the answers — quickly.

Requirements And Installation

To run the LaserROM package you need a PC XT or compatible clone. However, for better performance you really should have an AT class PC. The retrieval software runs under the Microsoft Windows environment and given the graphics involved with Windows, you readily can see the difference in performance on the 80286-based machine. An 80287 math coprocessor chip also will help boost the performance.

Installing LaserROM is a three-step process:

- Physically installing the CD drive.
- Installing the Windows software.
- Loading the LaserROM software.



If you've never taken the cover off your PC, you should find someone to help you for the first time. It isn't very difficult, no harder than installing a second floppy or a hard disc. Nonetheless, beginners should get some help. The HP Vectra has slide rails built in for its drives. Just remove the cover plate and slide the WORM drive on the rails in slot

B, connect the cables and replace the top cover.

HP sends the run-time version of the Windows software. This simplifies installation, but also limits you to using it only for LaserROM. The installation

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process is straightforward and well documented. Before installing Windows and the LaserROM drivers, make sure you have an equipment list handy so you can answer the questions regarding your PC. LaserROM supports most HP printers and most popular PC printers. If you don't have a mouse, now is the time to get one. It's possible to run Windows and LaserROM exclusively from the key-

board, but the Windows interface is designed for a mouse.

Data Retrieval

LaserROM is basically a compact disc (WORM technology) with data recorded on it instead of music. Each disc holds more than 650 MB. HP sends an updated disc each month. They continually have increased the number of documents on

the disc since its beginning, and now have nearly every manual they print on disc. HP also includes its product catalog, communicators, application notes, bug reports and a computer-based training program for the LaserROM product itself.

With so much information on the disc, high-speed retrieval is an absolute must. I tested the keyword search to find all occurrences of the word SYSGEN. It took 15 seconds and located 360 documents. Finding the documents is quite fast, but paging through them is a bit time consuming. I've also noticed the package slow as the hard disc becomes fragmented. LaserROM uses temporary files and needs large chunks of space. For optimum results you should keep your hard disc as empty as possible.

There are two methods for retrieving information. The keyword search already mentioned searches for words and phrases. Boolean operators can be used to narrow the search to a specific combination of words. There are sensitivity settings that let you determine how close the words should be together in the document before selecting the document for you. You also can limit the document databases so that you do not search every document ever published by HP. This is helpful if you have an idea of where the information is located.

Another approach for limiting the search is through the use of a date search. This will find only those documents that were printed either before or after your selected date. If you're not interested in limiting your search, but rather expanding the selection criteria, you can use a wild card character to find all occurrences of a portion of the keyword. To do this you specify the leading characters and add an asterisk. For example, if you want all occurrences of words starting with "la", you simply enter "la*". LaserROM will return "laser", "label" . . . etc. There's a thesaurus facility that you can enable, which will find not only your keyword, but also categories of other forms of your keyword. For example plurals, abbrevia-

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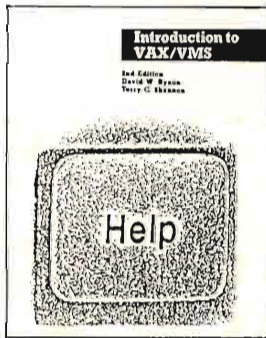


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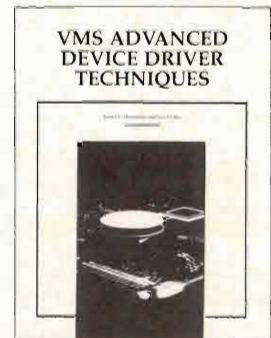


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it found. You then browse through each document, in any order you choose. The keywords are highlighted on the screen to help see them in context. Printing the documents is easy, but time consuming. There's no quick way to print the search results. LaserROM really isn't intended to be used for printing documents. You must open each document to read it and then select the print option, which starts another process for printing. Then you wait for the document to be printed to the spooler before control is returned to you. One nice touch is the ability to "print" to a disc file. If you generate internal documentation of any kind, this option will let you merge HP's documentation with your own. The disc file is a straight ASCII text file and can be included in any word processor.

The other retrieval method is a Browse. To use this you select the document you wish to browse and then page through it. The documents are divided

into chapters, with a brief description so you can skip to a relevant area of the document without reading through the entire thing. Printing to disc files and printers is available while browsing the same as during keyword retrieval.

Using Windows for the first time is a little confusing, but once you get used to using the mouse and your eye-hand coordination gets better, it becomes second nature. LaserROM can be a valuable time saver when looking for documentation and problem solving.

HP has continued to support this product well, and is worth the subscription price. I'd like to see HP offer a discount to its customers who purchase LaserROM and discontinue receiving printed documentation. This can work in small shops and save HP some money in distribution costs. Improvements could be made in the printing of documents, but this is only a very minor flaw in an interesting, innovative product. ■

tions, keyboard functions (such as ESC and CTRL).

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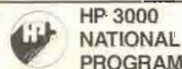


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Two resident LaserJet+ and 18 resident DEC LN03 fonts come standard and reside in 1 MB of ROM. Additional fonts are available on optional cartridges. The Smartwriter 150 has two cartridge slots for this purpose. In LaserJet+ emulation mode, fonts can be downloaded into RAM.

Configuration is done through front panel switches. Printer status, error and configuration messages are displayed in an LED display window. Configuration settings are divided into logical groups to make setup easier. For example, all commands related to page margin settings are in one group. Emulation, page size and page orientation commands are in another group. It's easy to change the configuration; you don't need to turn off the printer to effect the changes. Printer

configuration can be altered with software commands.

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feed, and changing emulation mode, without interrupting the printer.

The Tektronix emulation supports most of the commands available on Tektronix 4014 graphics terminals with the exception of the interactive commands used for cursor movement and graphics input. In Tektronix Alpha Mode, four character cell sizes are used to simulate the sizes available on a Tektronix 4014 graphics terminal. Five vector patterns in two pen widths are available.

For those who need to know, the DEC LN03 Plus emulation mode supports all the LN03 Plus commands except for the commands to load/delete font files and the command to select graphic size. In addition to the text modes, the Smartwriter supports DEC Sixel graphics.

Documentation

Documentation is excellent. There are individual chapters devoted to printer setup, configuration, maintenance and troubleshooting and an appendix for each of the emulations. In addition, a separate manual provides information on setting up the Smartwriter for a variety of software packages.

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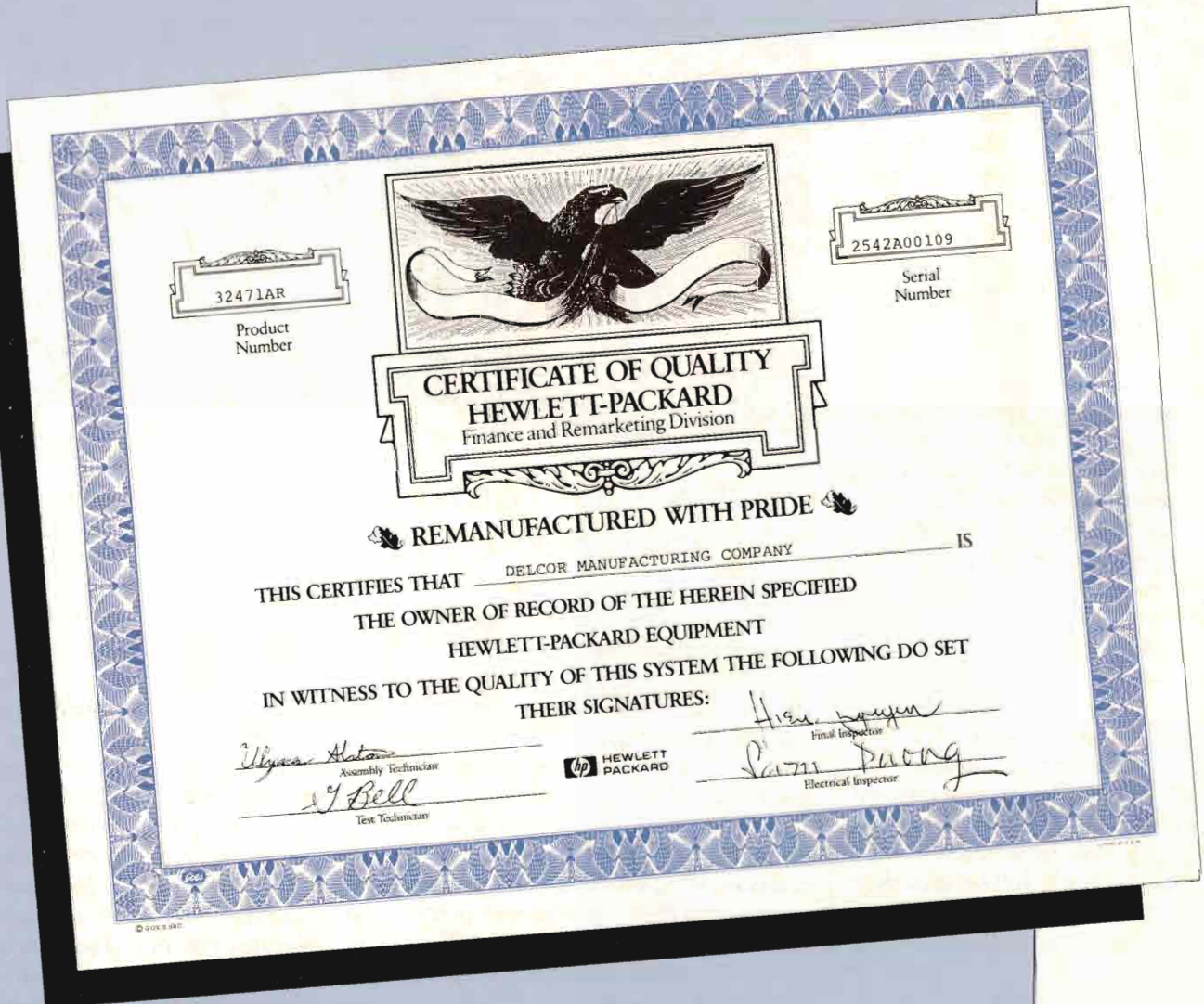
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SECURITY

Jeffrey Caldwell

The next time you log on to your system, whether you're

a programmer, data entry person, or the president of the company, ask yourself, "What's on this computer that's so important that I need a security system?" The answer is that the very life of the company itself is being protected by the security environment.

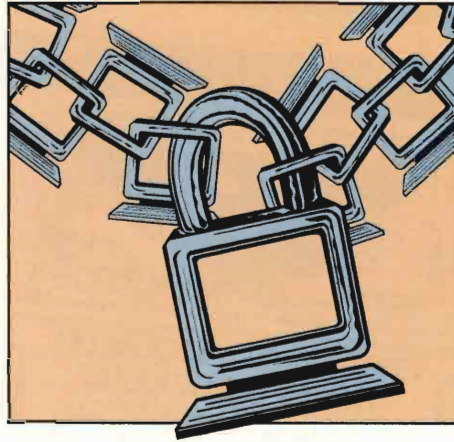
One of the basic functions of any computer is storing and presenting information — information that tells everything about the past accomplishments, achievements or failures of the company. Computers are becoming so valuable to some companies that it would be hard to produce or ship inventory items if the computer isn't functioning for even one day!

This dependency raises the question, What is so important? The answer can be broken down into three parts. The first part is the information or data itself. Another element is the programs and the last ingredient is the operation system and other system utilities. As each one is reviewed, you will see how they unite to form the foundation of any automated company.

Electronic Information

At the heart of every company is information. Stop reading this article for a minute and look at your office surroundings, or picture an office with reports, shipping forms, computer printouts, or a terminal where all those items could be instantly reproduced. We live in a world where accurate and timely information is needed to operate competitive companies.

Such information might include re-



to depend on other systems to assure the usefulness of the data.

ceipts or trade secrets, sales amounts for products or costs associated with manufacturing, inventory information, or summary sales history that would be reviewed by management to determine whether a product will continue to be made and sold.

Data lost, destroyed, manipulated or given to competitors could be fatal to a company. What would happen to a sales organization if all the sales history for the last quarter or year were lost? How could commissions be calculated or paid in a timely manner? How would the company know what was and was not ordered and where the merchandise should be shipped? How would the manufacturing section of the company know what to produce, and what materials to order for the production cycle?

These examples of broad information categories typify the importance of good and timely information. But it's important to remember that each and every one of the records within a subsystem must be accurate and be protected by a security system. If the system and

With a weak security system protecting the accuracy and completeness of the information, users will start

security environment allows even a few pieces of information to be recorded incorrectly or be modified in any way, then a shadow of doubt is placed upon the accuracy of each report.

With a weak security system protecting the accuracy and completeness of the information, users will start to depend on other systems to assure the usefulness of the data. Manual logs, duplicate controls or reports created outside the automated system will begin to appear. Users will take the control and balancing points away from the automated world and duplicate or replace them with unneeded manual controls.

Application Programs

You might take application programs for granted, but they're a valuable and costly asset for any corporation. More and more manual procedures, calculations, checks and controls are being delegated to the computer in the form of program procedures. Allowing these programs to be changed by anyone in the organiza-

tion at any point in time causes a breakdown in the control environment that can cost a company millions of dollars.

Think about the types of program procedures that probably are being executed on your computer at the present time. If it's a fixed asset application, depreciation is being calculated on a monthly and/or yearly basis. These depreciation amounts are also calculated for bookkeeping purposes and state and federal tax records. In an accounts payable system the 1099 tax information, discount amounts and payment terms are being kept.

A company can't survive without collecting the money that it is owed. Picture an accounts receivable system that doesn't accurately maintain customer balances, apply cash receipts, check credit limits, calculate the age of the balances and automatically sends out payment notices.

Add to these simple calculations more complex procedures such as inventory reorder points that automatically will create purchase orders; purchase orders that are electronically sent to the supplier's computer; order confirmation and, at a later time, receive the invoice and send an electronic fund transfer to complete the transaction.

You can see how these program procedures are becoming a bigger and bigger part of any competitive company. I hardly need to mention that it's important to safeguard these automated processing points. Gone are the days where a control was simply reviewing a manually created daily sales log, or keeping ordering information on index cards. Because many of these daily decisions and control points have been imbedded in program code, it's of utmost importance to keep them accurate and in tune with managements wishes

Proper control over program procedures includes limiting access to the source code by using security software; monitoring and controlling access to the programs when a change needs to be made; and appropriate documentation outlining and authorizing needed changes, testing the completed changes

and controlling the implementation of the change. This all adds up to maintaining the accuracy of the program procedures.

System Software And Utilities

Last is the system software and utilities that provide a processing environment for the data and the programs. Although some of these items are programs and might belong in the previous category, think of them as a blanket over all of the data and application software.

Included in this category are utilities to edit and manipulate data, print routines, security software, telecommunication systems, balancing utilities, job scheduling systems and backup and recovery jobs. The one common characteristic for many of these utilities is that they usually can access, display, print and even change the data with little or no audit trail.

In order to keep a good level of accu-

racy over the automated information, it's very important that proper procedures be placed over the use of these utilities. Preventive controls should be in place to limit the use of utilities that can update information to only the system people who need to use them. In addition, detective controls should track the usage of the tools in order to monitor exactly how the utilities are being used and on which pieces of data.

Management, whether or not they are aware of it, depends on these three system elements. Put all three areas together and you have an accurate and complete environment upon which timely and informative decisions can be made. — *Jeffrey Caldwell is an information technology manager specializing in computer security and control for Coopers and Lybrand, Los Angeles, CA.*

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Field Service

Ron Levine

Take Good Care Of Your Desktop

The desktop computer (DC) is among the most useful and

versatile office machines available today. Whether you're using it for word processing, financial calculations, information management, science or engineering projects, or laboratory applications, you'll soon wonder how you got along without it.

Your individual desktop productivity tool can take over many tedious jobs for you, perform tasks much faster and even do things that you wouldn't believe possible. The opportunities are only restricted by your imagination and by your machine being up and running at the time you need it. When it's down, it's like temporarily being without your telephone or automobile.

By taking care of your DC on a daily basis, you can avoid most minor problems and headaches and greatly reduce maintenance service calls. And, you don't have to be knowledgeable in either computer operations or repair.

As networking becomes a corporate mainstay, many of you are being introduced to the DC for the first time. While it takes very little time or effort to operate a DC properly, there are concerns that must be addressed that aren't usually associated with the larger systems (e.g., minis and mainframes).

Selecting The Right Environment

Your DC system should be set up where it's both convenient for you and environmentally friendly for the machine. It's easier to install the system in the right place the first time than to move the system later. Before setting up or relocating, ask yourself the following

questions:

- Is there enough light?
- Is there ample space?
- Is it quiet?
- Will my chair be comfortable for extended operation of the keyboard?
- Are system units being placed for ease of use and accessibility?
- Has system setup (height, reach, etc.) been designed for me?
- Is a phone nearby?

That takes care of your needs, but what about your buddy, the desktop? To be comfortable, it needs a yes answer to these questions:

- Are there ample electrical outlets?
- Can an outlet be dedicated to the DC and its accessories?
- Is normal room temperature maintained throughout the day?
- Is the area free from electrical interference and magnetic force fields?
- Is the work area free from static electricity? (When there is static electricity in the room, just touching any part of the computer can disrupt operation.)
- Is the environment free from excessive dust and dirt?
- Does the workbench, desk or table provide for unobstructed air flow through the system units (i.e., are the air vents in the DC, printer, CRT, etc. clear)?

If you aren't sure if there's static electricity in the room, a good precaution is to buy antistatic spray and spray the room. This is especially important if you have thick rugs: Thick, nylon rugs are the worst. The antistatic spray won't hurt carpeting or furniture if you spray it around the room and not on any particular item. You can also solve the static electricity problem by using an antistatic mat. These come in two types: tufted and grounded. To avoid creating shocks caused by touching a metal object, use a computer desk or stand with

metal rather than rubber legs, no rubber casters, and avoid wearing rubber-soled shoes when using your computer.

More Considerations

Because your computer is sensitive to heat, place it in a spot close to an air-conditioning vent. This enables you to regulate the computer temperature and remedy the situation quickly if the system does get too warm. If you have a high-speed printer, it's the component that creates the most heat; set it closest to the air conditioning vent. Also, the less space you have in the room, the warmer the temperature will be. The same goes for more people or more equipment in the same vicinity.

When choosing a printer table, desk or stand, make sure it's sturdy. The printer vibrates as it works and, because jolts and shaking are actually bad for the equipment, try to keep the vibrations down to a minimum by supplying very sturdy furniture. Also, protect the rest of your equipment from printer vibrations, which can loosen screws, connections and PCBs, by putting your printer on a stand by itself.

Interconnecting cables (those that run from one component to another) should be kept short and away from power cables (those that run to the outlet in your computer room wall) and from any sources of electromagnetic radiation (such as your phone or the side of the computer that contains the power supply).

Plug your DC power cables into a reliable and if possible, dedicated outlet. A dedicated outlet has the only computer system plugged into it. Sudden power surges or other electrical interference can damage internal circuits. A dedicated outlet helps keep interference

from other appliances to a minimum.

Keep a hydrocarbon bromide fire extinguisher nearby, because while water won't harm you, it does harm the equipment. Carbon dioxide extinguishers are better for the equipment, but can harm (even kill) you if used in a very closed room or in close quarters. Hydrocarbon bromide leaves no residue and is usable at normal temperatures.

When setting up your system, it's wise to check out your electrical system in terms of what it does and doesn't do to your computer system. Turn the computer on, put something on the screen (you'll need to check back to see if the screen display has changed, so make it simple), and take all discs out of the drives. Flip on and off all switches and equipment in the room, checking back each time to see if the screen shows what you originally typed. Now, flip on and off all large electrical appliances in the office or building (air conditioner, other electronic equipment, etc.). You're checking for electrical sags and surges in the line. When one occurs, you'll find that the screen display changes because the electrical interference causes the computer to think that it has been given a command. From now on, whenever the computer is on, don't turn on/off any switches or appliances that have affected the computer during this test.

It's best not to operate your system during electrical storms, or any storm that threatens to take out power lines. If you do have your computer on when a blackout occurs, unplug the system from the wall outlet to prevent a power surge.

Check with the electric company to find out if brown-outs are common in your area. A brown-out is when the line voltage deliberately is reduced by the electric company during times of heavy use — such as during the afternoon on the hottest days when air conditioners use so much power. See your computer dealer about obtaining a power conditioner.

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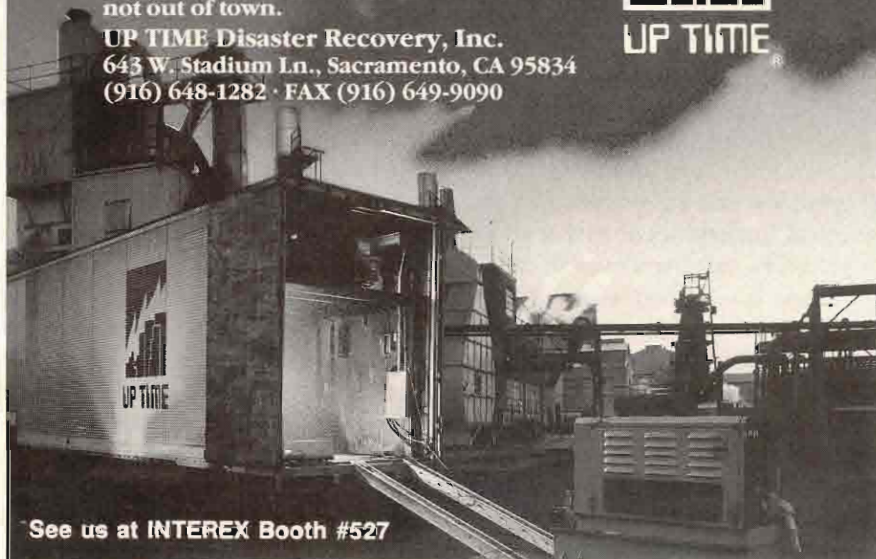
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PC TIPS

Miles B. Kehoe

When HP first shipped an MS-DOS based computer, MS-DOS

2.11 was new but lacked many of the command language features that allow programmers and power users to create easy-to-use batch programs for themselves and for less experienced users. Now that MS-DOS Version 3.3 is becoming more common on Vectras and other IBM AT compatible systems, knowing some of the improvements to MS-DOS and the batch command language might be beneficial.

A batch program is a file with one or more MS-DOS commands executed in a predefined sequence. It's an ASCII text file and must have the extension .BAT to identify it as a batch file. Create your own batch files with Executive Memo-maker, Microsoft Word, and virtually any word processor or text editor as long as you are sure to save the file as ASCII.

Any command or sequence of commands performed at your keyboard can be performed inside a batch file. However, there are many batch file features that aren't available to you when you enter commands at the keyboard. You can execute internal commands to the MS-DOS command processor, or execute one or more external commands. In MS-DOS 3.3, there's an easy way to execute another batch file.

Preliminaries

If your system starts up in PAM, you should either start the MS-DOS command program shown in PAM, or if function key f8 is labeled "Exit to MS-DOS", press it to remove PAM from memory. You always can get back into PAM by typing EXIT at the command prompt (if you started the MS-DOS command pro-

gram) or by typing PAMCODE if you got to the command processor by exiting PAM with key f8.

Once you see the MS-DOS command prompt, you actually are using a program called the MS-DOS command processor, COMMAND.COM. This program normally is loaded into memory when you first start up your system and gives you a variety of built in commands such as DIR, TYPE or ERASE. It also provides the ability to start other executable programs with file names ending in .COM or .EXE. COMMAND.COM interprets the commands you provide in batch files. In a sense, batch files are programmed in the COMMAND.COM command language.

The Environment

The command processor maintains a number of variables used to maintain information in COMMAND.COM while other programs are running, or to pass information to other programs start from the command program. These variables are known as environment variables, and you can use them to store the type of prompt you want to see every time COMMAND.COM restarts after you exit another.

The command processor maintains a certain amount of memory to store information passed to other programs

The command processor maintains a certain amount of memory to store information passed to other programs ...

when you start them. It also will store information for COMMAND.COM to use when it resumes control after executing another program. These locations are called environment variables and you can use them to store the prompt you want to see from MS-DOS; the path the command processor should use to search for programs; and any other information the programs you use may need each time the program is run.

When starting the command processor, you can type set to see the value of all currently defined environment variables. Depending on what programs and peripherals you use, your environment may be very simple or very complex.

TABLE 1	
COMSPEC=C:\COMMAND.COM	
PROMPT=\$p\$g\$g	
PATH=C:\BAT;C:\BIN;	

Typical MS-DOS Environment.

TABLE 2	
FILES=99	
BUFFERS=16	
DEVICE=C:\ANSI.SYS	
SHELL=C:\DOS\	
COMMAND.COM /E:2048 /P	

Specifying a path to COMMAND.COM.

You can see a simple environment definition in *Table 1*.

By the way, in MS-DOS Version 3.2 and later, you don't have to keep `COMMAND.COM` in the root directory. By using the `SHELL` statement in `CONFIG.SYS`, you can direct MS-DOS to load the command processor from any valid disc location. My `CONFIG.SYS` file is listed in *Table 2*.

Making More Space

All of the information shown by the `set` command is stored as ASCII characters in the environment space of your command processor. In MS-DOS 2.11, you're limited to 160 bytes of environment space. You can see how a complex `PATH`, prompt and one or two other variables could easily fill the available space.

Fortunately, in MS-DOS 3.0 and after there's an easy way to increase the num-

ber of bytes available for environment variable storage. Remember that you can specify the `SHELL` statement in `CONFIG.SYS` to identify the program to be loaded initially after start-up. In many HP Vectra and HP 150 systems, this is set to `PAM`, although I personally prefer letting MS-DOS boot normally before loading `PAM`.

In *Table 2*, you may notice some extra characters at the end of the `SHELL` statement: the `/E:` and `/P` parameters allow you to specify additional environment space as well as to control what will happen on start-up.

In MS-DOS 3.0 and 3.1, the `/E:` option allowed you to specify up to 62 "paragraphs" of 16 bytes each for a maximum of 992 bytes of expanded environment space.

In MS-DOS 3.2 and after, the `/E:` parameter specifies the actual number of

bytes. In the example in *Table 2*, I have requested 2,048 bytes of memory be allocated for my environment. Remember that this expanded environment space reduces the amount of memory my applications will have, so be sure to take this into consideration!

The `/P` parameter is important because it directs `COMMAND.COM` to execute the `AUTOEXEC.BAT` file after starting up. This is true even if `AUTOEXEC.BAT` is in the root directory.

If you don't include a `SHELL` statement in your `CONFIG.SYS`, MS-DOS 3.2 and later default to:

```
SHELL=COMMAND.COM/E:160/P
```

This loads `COMMAND.COM` with 160 bytes of environment space and causes it to execute `AUTOEXEC.BAT` right away. If you haven't run into prob-

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lems with “out of environment space” errors, you probably don't need to change — yet.

Taking Advantage Of COMSPEC

As you saw in *Table 1*, the location and name of the current command processor is maintained in the environment vari-

COMMAND.COM:

- When you boot MS-DOS, have your AUTOEXEC.BAT file copy the COMMAND.COM program to the RAM disc.

- Set COMSPEC to point to the copy of COMMAND.COM in the RAM disc, not on the disc drive or floppy.

When you exit 1-2-3, the command processor takes charge and attempts to reload itself using the program and path specified in the COMSPEC variable.

able called COMSPEC. You can take advantage of this feature to speed up your computer when you exit your applications, especially if you're on a floppy disc based system.

When COMMAND.COM loads as the command processor, it allows you to execute other programs. While those other programs, such as Lotus 1-2-3, are running, the command processor doesn't really need all of its memory because it isn't interacting with you while Lotus has control.

When you do start a program like 1-2-3, COMMAND.COM sets aside a small portion of low memory to hold your environment variables and enough of itself to get reloaded once your 1-2-3 session is over. Just before passing control to 1-2-3, COMMAND.COM frees most of its high memory, which makes more of your 640K available to Lotus. PAM works the same way on the Vectra PC.

When you exit 1-2-3, (or any application) the command processor takes charge and attempts to reload itself using the program and path specified in the COMSPEC variable. Depending on the speed of your disc, this reloading can take up to four seconds every time you exit an application.

If you have a RAM disc, you probably can reduce this time by using your new knowledge about COMSPEC and

- Use MS-DOS as you normally would.

When you exit an application such as 1-2-3, the command processor attempts to load a new copy of itself from the location specified in COMSPEC: here, from the RAM disc. Because RAM disc access is much faster than any physical disc, it will take much less time to reload COMMAND.COM, and you'll get the MS-DOS prompt much faster than before.

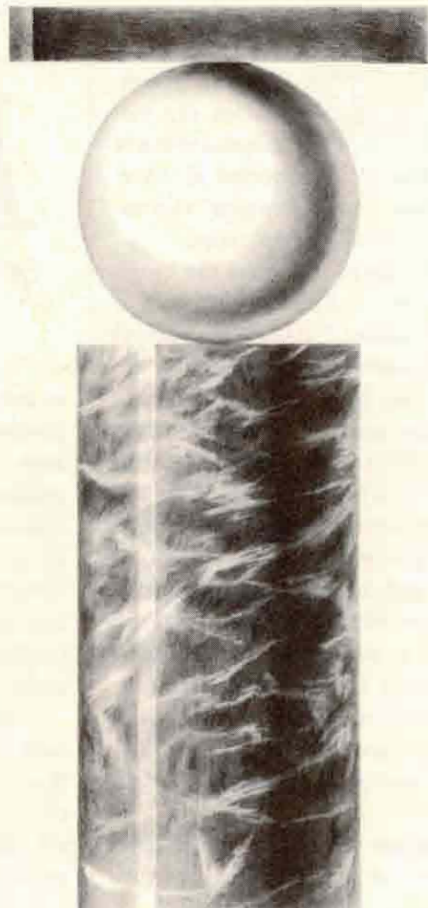
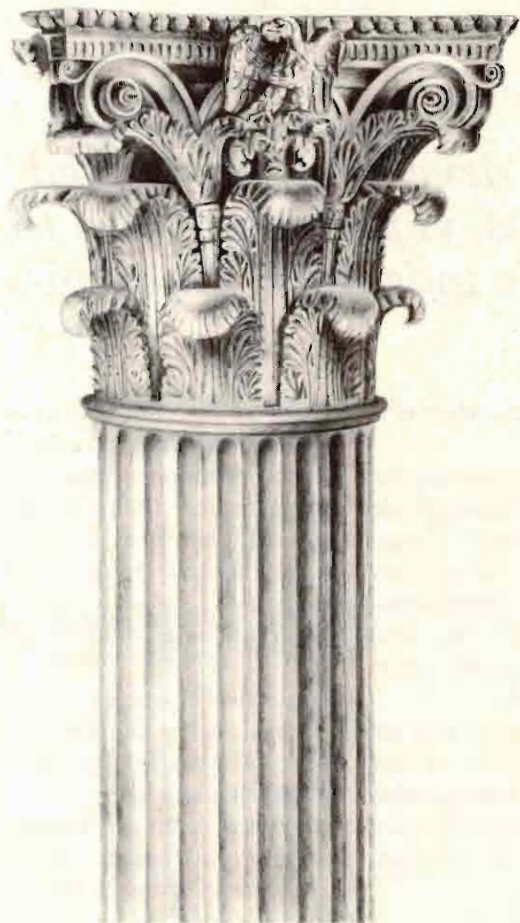
A number of older programs, especially those written in compiled Microsoft BASIC, require COMMAND.COM be in the same directory as the EXE file. COMSPEC solves some of those problems by making COMMAND.COM always available. It also gives you something to do with the 384K of RAM you often have freewhich is useful for “RAM disc only” because of MS-DOS memory organization. It's nice to know you can use some otherwise wasted resources to speed up your system.

Next month, I'll move on to using the environment variables to make batch files that can help save you keyboard effort and time. —Miles B. Kehoe is an online support manager for Verity Inc., Mountain View CA.

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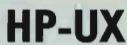
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Vi Editing Techniques



Andy Feibus

This month's column concludes the discussion of the vi

text editor with information about vi configuration, some "complex" vi commands and editing multiple files.

When vi starts, it checks the user's environmental variable EXINIT for a vi configuration file. If EXINIT isn't set, vi checks the user's HOME directory for the file .exrc. Vi automatically executes these configuration commands before reading the file to edit. This file is called the *global configuration file*. An example global configuration file provided with HP-UX is /etc/d.exrc.

Configuration commands may be entered manually within vi by preceding the command with a colon (while not in insert mode). If the commands are placed into a configuration file, the colon doesn't precede the command.

Some useful configuration commands:

■ **set ignorecase (set ic)** — Ignore case distinctions for searches. To turn this feature off, use **set noic**.

■ **set nomsg** — Prevents other users from sending messages to your terminal via the HP-UX write command.

■ **set magic** — Permits the user to use all special characters (e.g., *, . and &) when doing a substitution or search. If this option isn't set (e.g., **set nomagic**), only the characters ^ (beginning of line) and \$ (end of line) have special meaning.

■ **set number (set nu)** — Turns on line numbering when displaying a file. To turn this feature off, use **set nonumber (set nonu)**. The line numbers aren't stored as part of the file.

■ **set showmode** — Causes the automatic display of the words INPUT MODE

If you're developing structured programs, vi provides a way to control code indentation: set autoindent.

at the bottom of the screen when vi is placed into insert mode.

■ **set exrc** — Causes vi to process the configuration commands in the .exrc file located in the local directory. If this setting is active, vi processes the local configuration file immediately after processing the global configuration file. This configuration command is useful only in the global configuration file.

Some configuration commands are useful depending on the type of files you're creating. These configuration commands usually are placed in the local .exrc file. For example, the command:

```
set wrapmargin=##
```

(or **set wm=##**) causes vi to automatically wrap any words that end within the last ## characters of the right margin (e.g., **set wm=10** moves any words that extend over column 70 to the next line). This command provides a way to do input that's similar to most word processors (i.e., not pressing [Return] until the end of the paragraph).

However, if you're developing structured programs, vi provides a way to control code indentation. The configuration command:

```
set autoindent
```

(or **set ai**) causes vi (when in insert mode) to use the indentation for the current line as the indentation for all subsequent lines (until the indentation is changed). Indentation also is related to the shift width, which is established by the command:

```
set shiftwidth=##
```

(or **set sw=##**), where ## is the number of spaces to shift a line of the file when the << (shift lines left) and >> (shift lines right) vi commands are used. To increase the indent on the current line, space over to the desired column. To decrease the **autoindent** by the current shift width, press ^D as the first character on the line. All subsequent lines retain this indent until the indent is changed again.

Autoindent automatically adds tabs and spaces to the line when any text is entered on the line; vi doesn't add tabs or spaces to a blank line.

One other configuration setting should be used to improve **autoindent**'s operation:

```
set tabstop=##
```

(or **set ts=##**), where ## is the number of spaces a tab represents when displaying a file. The tabstop size, if **autoindent** is

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enabled, should be set to a multiple of the shift width (e.g., set shiftwidth to three and **tabstop** to six).

To view the current **vi** settings, use the command **:set all** (the **:** is shown here, because this command isn't normally included in a configuration file).

Another configuration command you may use is the **map** command. It permits you to define **vi** actions for certain key sequences. For example, to define **PREV PAGE** key on HP terminals to scroll the file one page upward, place this command in the configuration file:

```
map ^[V ^B
```

(**^[** is the same as the **ESC** key and **^B** is the **vi** command for scrolling backward one page). As many as 32 definitions may be defined at one time with the **map** command. The file **/etc/d.exrc** contains many example mappings. To map a function key, use:

```
map #n <string>
```

where **n** is the function key number and **<string>** is the **vi** action produced when the function key is pressed.

To cancel a mapping from the **vi** session, use the **unmap** command (e.g., **:unmap #1** cancels the mapping for function key 1).

Vi also permits you to perform "complex" operations involving the file you're editing and HP-UX commands.

For example, to route the contents of the file you're editing to the printer without saving the file, use the **vi** command:

```
:w !pr | lp
```

Notice that **:w !<command>** has results very different from **:w !<filename>**. The **:w !<command>** command routes the entire file as standard input to **<command>**. You also may route only part of the file to **<command>** by specifying a range of lines to the **:w** command (e.g., **:200,250w !pr | lp**).

To read the results from an HP-UX command into the file at the current cursor location, use the command:

```
:r !<command>
```

where **<command>** is any HP-UX command. For example, to place the names

of all C files in the current directory into the file you're editing, you can use:

```
:r !ls *.c
```

However, this formats the list of files with one file on each line. To reformat this list into four columns, mark the beginning of the list with a marker (e.g., use marker **n**) and move the cursor to the end of the list. Then, execute the following command:

```
!'npr -4t
```

This command replaces the text between the current cursor location and the marker **n** with the output resulting from passing this text through the command **pr -4t**. This type of command is known as a *shell text replacement command*.

The **pr -4t** command places tabs between the entries in each column. To create this columnar output with spaces instead of tabs, use the command:

```
!'npr -4t | expand
```

To add line numbers to each line in the

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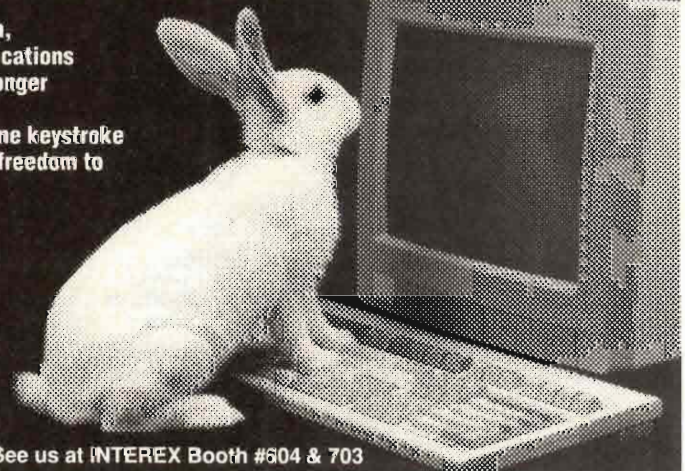
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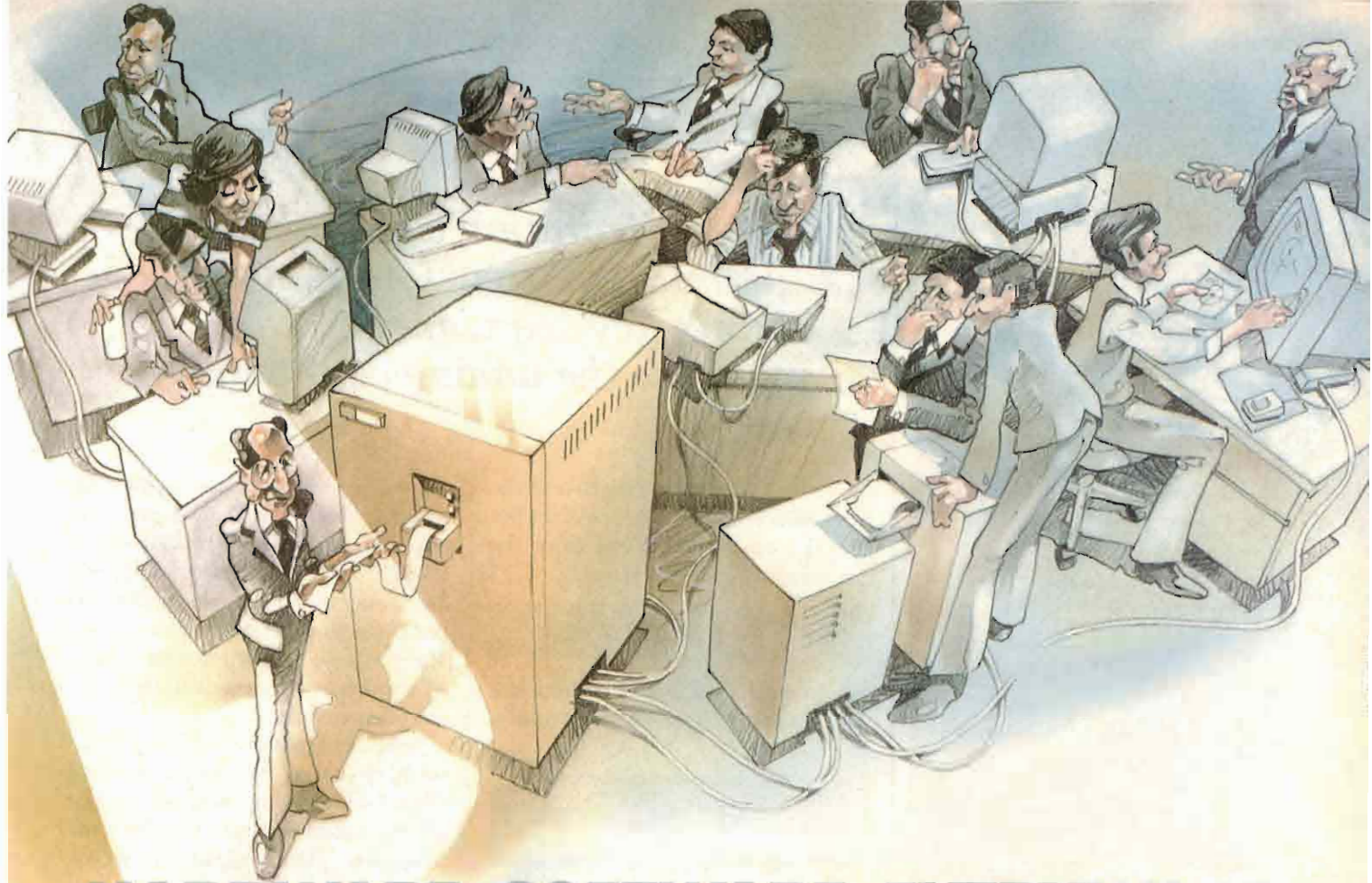
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The configuration command **map** permits you to define **vi** actions for certain key sequences. To cancel a map use the **unmap** command.

file you're editing, you can move to the first character in the first line of the file (i.e., the command **:1**) and enter the command:

```
!Gpr -n5
```

The general format for performing a text replacement with an HP-UX command is:

```
!<object><command>
```

where **<object>** is the text *object*, which is bounded by the current cursor location and location specified by a **vi** location specifier (e.g., **\$** indicates the text between the current cursor location and the end of the text line; **n** indicates the text between the current cursor location and the beginning of the line containing the marker **n**). The **<object>** may be preceded by an integer count to specify a larger text object (e.g., **w** indicates a single word of text starting at the present cursor position and **4w** indicates the four words starting at the present cursor position). The **<command>** may be an HP-UX command, or a series of HP-UX commands separated by pipes or the **tee** command (the **tee** command is documented in Section 1 of the *HP-UX Reference Manual*).

If you're dissatisfied with the results from a shell replacement command, immediately use the **undo** command.

You aren't required to exit **vi** each time you wish to edit a different file. If you start **vi** with the command:

```
$ vi file
```

you may edit **file2** by entering the command **:e file2** (or **:e! file2**, if you don't wish to save the changes made to **file1**). If you're in **file2**, and you want to re-edit **file1**, enter the command **:e file1** and **vi** places the cursor at the beginning of the line you were editing last within **file1**. **Vi** only saves the location of the previous file you edited.

When you move from one file to another, all marker locations are lost and the buffer history stack (where the last 10 text buffers from yanks, deletes and changes are placed) is erased. However, all **vi** configuration settings and all named buffers (those referenced with the command **"**) are retained. Use named buffers to pass text between any files you're editing.

You also may start **vi** with a list of files to edit. For example:

```
$ vi file1 file2 file3
```

starts **vi** and displays the contents of **file1** for editing. When you're finished editing **file1** (and have saved the file using the **:w** command), use the command **:n** to begin editing **file2**. If you change **file2** but don't want to save these changes, use the command **:n!** to ignore the changes and begin editing. To re-edit the files from the beginning of the list, use the command **:rewind** (or **:rewind!** if you don't want to save the changes you made to the current file). —*Andy Feibus is a freelance software consultant in Atlanta, GA.*

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RDBMS

Fabian Pascal

Referential Integrity Is Also Critical

There are five types of data integrity: Entity, Domain, Column, User Defined and Referential.

The first four were discussed in last month's column. Referential Integrity, (RI) which involves data consistency, is also critical.

Because it's easier to convey the concept of RI with examples, let's go back to the PROJECT database, shown in Figure 1.

The DEPT# column in the DEPARTMENTS table is a primary key (PK). But note that there's also a DEPT# column in the EMPLOYEES table, which designates the department to which an employee is assigned. You must recognize EMPLOYEES.DEPT# as a foreign key (FK) referencing DEPARTMENTS.

One aspect of database integrity is data consistency. You want all FK values to be consistent with the PK values they reference. The PROJECT database has several FK's:

FK:	References
EMPLOYEES.DEPT#	DEPARTMENTS
DEPARTMENTS.MGR#	EMPLOYEES
PROJECTS.ERESP	EMPLOYEES
ACTIVITIES.PROJ#	PROJECTS
ACTIVITIES.ACT#	ACTYPES
ASSIGNMENTS.EMP#	EMPLOYEES
ASSIGNMENTS (.PROJ#, ACT#)	ACTIVITIES

One example of a RI rule was given last month (as b): "Employee should be assigned to valid departments." This rule is trying to prevent employees from being incorrectly assigned to non-existent departments.

Now consider the ASSIGNMENTS

Referential Integrity is a FK value that must match some existing PK value and can't be partially missing.

table where each row represents the assignment of an employee to a project activity. The (PROJ#, ACT#) combination is actually a compound (or composite) FK, referencing PK values in the ACTIVITIES table. Suppose the following rows existed in ASSIGNMENTS:

PROJ#	ACT#	EMP#	START	TIME
AD3113	???	260	4/15/82	1.00
??????	70	260	4/15/82	1.00

where ?s represent missing data.

Can you tell that one employee is assigned to two project activities from a sheer duplication error? Such ambiguities introduce integrity problems in databases and can result in misleading or erroneous information. To avoid them, RI prohibits composite FKs from being partially missing.

The set of rules that enforce consistency for all FKs throughout the database is called referential integrity. RI is generically expressed as:

A FK value that must match some existing PK value and can't be partially missing.

RI Violations

Any attempt to add, change or delete a FK value, or a PK value already referenced by FK values could violate RI, corrupting the database.

Let's consider the FK case first, ex-

amples of which would be:

- A. Inserting a new employee row with, or updating an existing one to an invalid DEPT#.
- B. Adding a new assignment row with, or updating an existing one to either an unknown PROJ#, or an unknown ACT#.

Such attempts always should be rejected.

Examples of the PK case would be:

- C. Updating a department row referenced by DEPT# in employee rows.
- D. Deleting a department row referenced by DEPT# in employee rows.

Should such actions be rejected too? Not necessarily. It depends on what the operation represents. What if D reflected a cancellation of a department with lay-off of its employees? In this case, the deletion of the department could be CASCADED (or propagated) through its referencing employee rows, deleting them, too. On the other hand, what if, following the cancellation of a department, its employees are temporarily waiting for reassignment? Here, the FK values of the pertinent DEPT#s could be SET MISSING (i.e. no current assignment). Only if the company happened to have a policy prohibiting C & D actions would a rejection be necessary.

So, in more specific terms, RI rules for the A and B cases implicitly are set for

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D01	DEV. CENTER		A00
D11	MFG. SYSTEMS	60	D01
D21	ADM. SYSTEMS	70	D01
E01	SUPPORT SVCS	50	A00
E11	OPERATIONS	90	E01
E21	SOFTWARE SUPPORT	100	E01

DEPARTMENTS Table

PROJ#	PNAME	ERESP	STAFF
MA2110	PROGRAMMING	60	9.00
MA2111	PROGRAM DESIGN	220	2.00
MA2112	ROBOT DESIGN	150	3.00
MA2113	PROD CONT PROGS	160	3.00
OP1010	OPERATION	90	5.00
OP2010	SYSTEMS SUPPORT	100	1.00
AD3112	PERSONNEL PROG	250	1.00
AD3113	ACCOUNT PROG	270	2.00

PROJECTS Table

PROJ#	ACT#	STAFF	BEGIN	END
MA2112	70	2.00	1/01/82	7/01/82
MA2112	180	1.00	7/01/82	2/01/83
MA2113	60	1.00	2/15/82	9/01/82
AD3112	60	0.75	1/01/82	3/15/82
AD3112	70	0.75	1/01/82	10/15/82
AD3112	80	0.35	8/15/82	12/01/82
AD3112	180	0.50	8/15/82	1/01/83
AD3113	70	1.25	6/01/82	12/15/82
AD3113	80	1.75	1/01/82	4/15/82
AD3113	180	0.75	3/01/82	7/01/82
OP1010	130	4.00	1/01/82	2/01/83

ACTIVITIES Table

EMP#	ENAME	DEPT#	HIRED	SALARY
100	Spenser	E21	6/19/80	26150
150	Adamson	D11	2/12/72	25280
160	Pianka	D11	10/11/77	22250
310	Setright	E11	9/12/64	15900
250	Smith	D21	10/30/69	19180
260	Johnson	D21	9/11/75	17250

EMPLOYEES Table

ACT#	ACTCODE	ACTNAME
10	MANAGE	Manage/Advise
30	DEFINE	Define Specs
40	LEADPR	Lead Program/Design
60	LOGIC	Describe Logic
70	CODE	Code Programs
80	TEST	Test Programs
130	OPERAT	Oper Computer Sys
140	MAINT	Maint Software Sys
160	ADMDB	Adm Databases
170	ADMDC	Adm Data Comm
180	DOC	Document

ACTYPES Table

PROJ#	ACT#	EMP#	START	TME
MA2112	60	150	1/1/82	1.00
MA2112	180	150	7/15/82	1.00
MA2113	60	160	7/15/82	1.00
OP1010	130	310	1/1/82	1.00
AD3112	70	250	8/15/82	0.25
AD3112	180	250	8/15/82	0.50
AD3112	80	250	10/15/82	0.50
AD3112	60	250	1/1/83	1.00
AD3113	80	260	3/1/82	0.50
AD3113	180	260	4/15/82	1.00
AD3113	70	260	6/15/82	0.50

ASSIGNMENTS Table

The PROJECT Database.

rejection, while RI rules for the C and D cases require the user to specify, at database creation time, which of the three options (CASCADE, SET MISSING or, by default, REJECT) is desired for each update or delete operation on FKs.

Whose Responsibility?

The most critical point about integrity is that it should be enforced centrally by the DBMS and not, as in traditional systems, by users in applications. Because there are so many users and applications affecting the content of the database in so many ways, leaving enforcement to applications causes serious problems. First, the procedural code, which must be written to cover all possibilities for all keys is complex and extensive. This not

only makes it an expensive and time demanding burden, but also makes the process prone to errors and omissions that are hard to detect and correct.

Second, there's a considerable amount of unnecessary duplication involved because some integrity rules must be enforced in many applications. When conditions change, the ramifications of the changes for the various rules must be identified throughout the system and revised in many places. It's also difficult to validate the correctness, completeness and consistency of all the rules because they're buried in applications and aren't even visible in a central place.

Keep in mind that PROJECT is a simple database. In real world situations, the number of keys and business rules involved and their intricate relation-

ships can quickly overwhelm users. In fact, it's estimated that at least 70 percent of the effort invested in data-based applications is spent in identifying, developing, validating and maintaining integrity code.

For these reasons, the relational approach shifts the responsibility for enforcing integrity from users to the DBMS. With a relational DBMS, users should declare to the system:

- the primary keys
- foreign keys and referential actions desired
- any other (domain, column and arbitrary) rules.

The DBMS should store this information in its catalog and use built-in intelligence to enforce all five types of rules for any and all updating operations per-

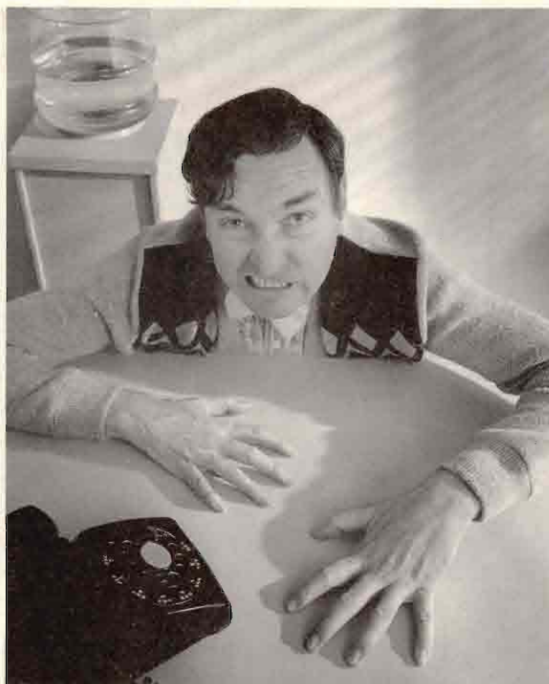
formed on the database. This way, users are no longer burdened. They can be more productive and the system is much more effective (it makes no errors) in preventing data corruption.

Note that RI enforcement implicitly requires entity integrity (EI) enforcement, and both are dependent on the support of primary and foreign keys. If the system doesn't have direct knowledge of keys, it can't properly and systematically enforce row uniqueness (EI), and it can't understand and enforce the consistency implied by the FK values pointing to unique PK values. That the various features of the relational model are closely interdependent is a sign of how fundamental *all* of them are, and explains why vendors can't properly support some but not others.

Up until recently most DBMSs, including those based on SQL, have ignored integrity. Increasing attention is being paid to it because IBM has introduced some EI and RI features in the last versions of DB2 and SQL/DS, and because the ANSI standard committee has a proposal that also incorporates some such features. There are various attempts by vendors to add integrity features to their products. But, as is always the case with relational features, such attempts are incomplete, poorly implemented or just advertising hype, with no substance behind it.

So, armed with the integrity principles described here, carefully evaluate claims of relational integrity, and remember: Unless a DBMS supports integrity in the back-end — it won't deliver the needed practical benefits, and any relational claims would be unwarranted. To date, there's no DBMS that *fully* supports relational integrity, but there are systems that do at least a partial job. — *Fabian Pascal is a Washington DC microcomputer analyst and consultant specializing in relational data base management and SQL, and is affiliated with Codd & Date Inc.*

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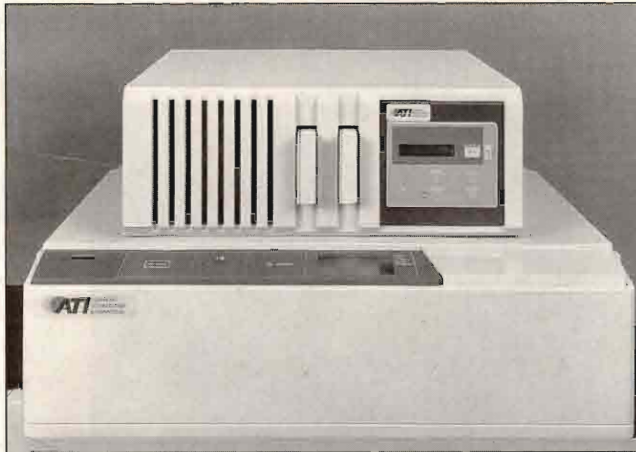
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**ATI introduced
the LC-6000 printer
controller**



Continued from page 28

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For further information, contact Link Electronics Inc., 885 Oak Grove Ave., Menlo Park, CA 94025; (415) 325-1500.

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**ATI Unveils 60ppm
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Advanced Technologies International (ATI) introduced the LC-6000, a high-speed printer controller that allows laser printers to output 60 or more pages-per-minute of text and graphics.

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Contact Advanced Technologies International, 355 Sinclair-Frontage Rd., Milpitas, CA 95035; (408) 942-1780.

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For more information, contact JYACC Inc., 116 John St., New York, NY 10038; (212) 267-7722.

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**Amnet's Software Interface
Helps Network Operators**

Amnet has announced a graphics software package for its Nucleus 7000 Series family of PC/AT-based packet switching systems. The N7900 color graphic user interface shows operating conditions on a multinode packet switching network from the global level down to the RS-232 connector pins on individual ports.

The software interface is designed to minimize demands on network operators. Network conditions, such as line outages and equipment failures, can be seen across a room or flagged by an au-

dible alarm. The package also provides help screens at each successive level to assist operators in network configuration, analysis and troubleshooting. An event alert window keeps operators continuously aware of changes in network conditions, regardless of what screen display is in use.

For further information, contact Amnet Inc., 1881 Worcester Rd., Framingham, MA 01701; (508) 879-6306.

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**OCS Unveils
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OCS has announced EXPRESS 6.0, its batch job scheduling software system that has been enhanced to include windowing capabilities and networking functions for multiple system users.

EXPRESS provides users with the ability to view, control and modify their entire production workload simultaneously on a single screen. These windows link users with up-to-the-second information on system processing.

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IEM Inc. has expanded its line of memory products with the model EX-2300 series of memory boards, which offer 4 and 12 MB add-on memory daughterboards with parity check for HP 350/370 computers. These cards are fully compatible with comparable HP memory boards and can be installed on the HP98258A parity memory controller.

IEM also offers the model EX-210 series of memory boards for HP 1000 A-series computers. These memory boards for Z400, A600+ and A700 computers are available in capacities of 4, 8 and 16 MB. Contact IEM Inc., P.O. Box 8915, Fort Collins, CO 80525; (303) 223-6071 or (800) 321-4671.

Circle 365 on reader card

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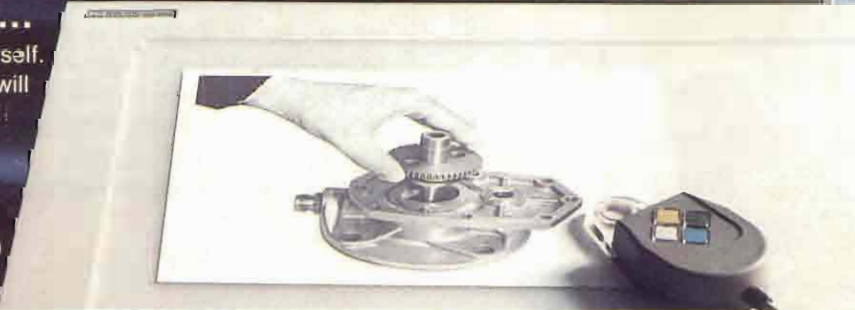
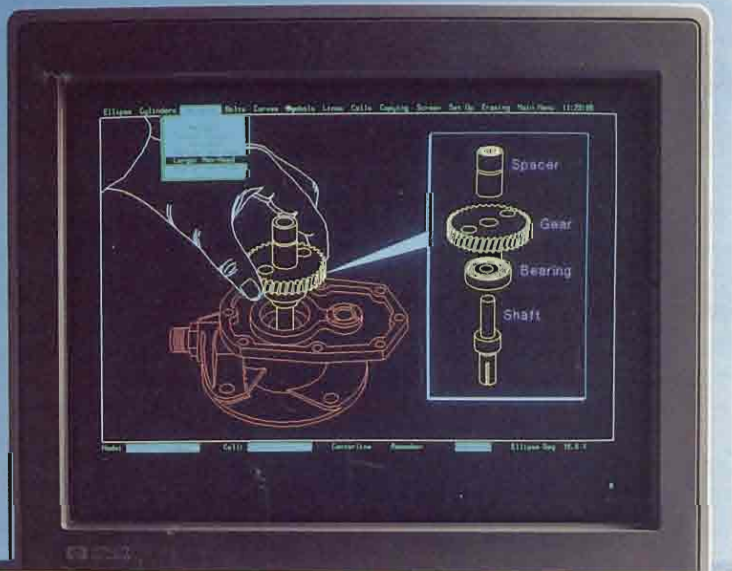
Import-export options make TC10 compatible with many desktop publishing, CAD and other HP software. TC10 is available in HP BASIC Version 5.1 for \$1295.00 and in HP BASIC/UX for \$1495.00.

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CIRCLE 152 ON READER CARD

HIBACK/XL And DBTUNE/XL Offered In Native Mode

HI-COMP Hinrichs GmbH, a European software manufacturer, has released its native mode versions of HIBACK/XL and DBTUNE/XL, featuring speed improvements of about 60 percent over current C-mode versions.

All functions of DBTUNE and HIBACK remain including data integrity check, network capabilities and unattended operation.

In addition, the company has released a new module within DBTUNE/XL and DBTUNE/3000 named Root File Maintenance. The new functions include add/delete path, add/delete set, file debuggers and more.

Contact in Europe, HI-COMP Hinrichs GmbH, Eichenlohweg 24, D-2000 Hamburg 60; 49-40-630 4011 or in the U.S., HI-COMP America Inc., 305 Broadway 4th Fl., New York, NY 10007; (212) 732-1946 or (800) DBE-TUNE.

Circle 366 on reader card

HP Offers EDA Software For Apollo's Series 10000

HP and its Apollo Division announced the availability of electronic-design-automation (EDA) software packages for the Apollo Series 10000 personal supercomputer. Seven Series 10000 Solution suppliers are Cadence Design Systems Inc., EDA Systems Inc., EESof Inc., Meta-Software Inc., Microtel Pacific Research Ltd, Sancad and Synopsys Inc.

The new solutions suppliers for Series 10000 join more than 50 software vendors who previously announced support for the RISC-based (reduced-instruction-set-computing) personal supercomputer.

Framemaker 2.0 Available for HP Workstations

HP and Frame Technology Corp. announced that FrameMaker 2.0 workstation publishing software will be available this fall on HP 9000 Series 300 and 800 (RISC-based) workstations.

This release supports the X Window

System industry standard from MIT and OSF/Motif, the OSF user environment. It also includes a floating-license server allowing users in workgroups to economically share FrameMaker licenses across a network instead of requiring one license per workstation.

Techcom Releases TC10 Technical Illustrator

Techcom Inc. has introduced TC10 Technical Illustrator, a high-end illustration system that runs on the HP 9000 computer. TC10 is a complete computer graphics system for producing high-quality line illustrations on the computer. It differs from the many DAC systems on the market in its ability to accurately transform images (photos, drawings, sketches, engineering drawing, printed piece, etc.) into precision line illustrations. TC10's advantage over other object oriented drawing programs is its mechanical drawing routines. Complex mechanical objects can be drawn using powerful specific mechanical routines. Although directed towards the mechanical illustration market, TC10 is also capable of producing beautiful free form illustrations.

TC10 sells for \$1,295 Basic 5.11 version and \$1,495 Basic/UX version. Basic/UX requires the HIL security module. Contact Techcom Inc., P.O. 39206, Indianapolis, IN 46239; (317) 359-4400.

Circle 361 on reader card

CST Unveils DataProbe II Protocol Analyzer/Emulator

Control Systems Technology has introduced the CST DataProbe II protocol analyzer and emulator. The device is designed for installing and maintaining data communications networks.

It can capture and/or generate data at up to 19,200 bps. The 30 KB capture buffer is battery backed-up and can be dumped to a computer or printer. Protocols available include Async, BSC, SDLC, SNA, HDLC, IPARS, MIL-188, Burroughs and X.25.

The unit features dual-line auto-

configuration. Protocol, data rate, clocking and other link parameters are determined and displayed for both the DTE device and the DCE device simultaneously, thus mis-matches are immediately apparent.

Data analysis features include SDLC/HDLC frame display, character/HEX/binary data display, RS-232 signal display and parity/CRC error analysis.

The DataProbe II can emulate both DTE and DCE devices. It performs BERT/BLERT tests and can generate Fox messages, user-defined messages and user-defined test sequences.

The internal "breakout" facility features dual LEDs, switches and jumper points on all signal lines. Up to six signals can be captured for redisplay and/or used for triggering.

DataProbe II models range from \$1,695 to \$1,895 depending on protocols

included. Warranty is one year.

Contact Control Systems Technology, 19751 Frederick Rd., Suite 350, Germantown, MD 20874; (301) 540-8614.

Circle 362 on reader card

Data Physics Introduces DP420 FFT Analyzer

Data Physics Corp. a supplier of signal processing solutions, released the DP420 FFT Analyzer, a precision FFT workstation for high-quality dual channel FFT measurements at a 20 KHz realtime rate. Incorporating components for Data Physics' SPI Collection platform for PC-AT compatible computers, the availability of the DP420 makes it easy for PC-AT users to acquire an instrumentation grade FFT analyzer at about one-half the cost of comparable instruments.

The DP420 offers a wide range of measurement functions including lin-

ear spectrum, power spectrum, transfer function and coherence in the frequency domain; transient capture, impulse response, and correlation in the time domain; and histogram, probability, and statistics in the amplitude domain.

The DP 420 features a menu driven EGA color display that turns the user's PC-AT into the DP420's control panel. Measurement function and parameter selection is accomplished by soft keys and arrow keys. Signals are displayed graphically in either a window or spreadsheet format taking full advantage of the size, resolution and color palette available on the EGA display. Measurement results are easily output to a printer of HP-GL graphics plotter.

Contact Data Physics Corp., 1219 S. Bascom Ave., Suite 224, San Jose, CA 95128; (408) 977-0800.

Circle 363 on reader card

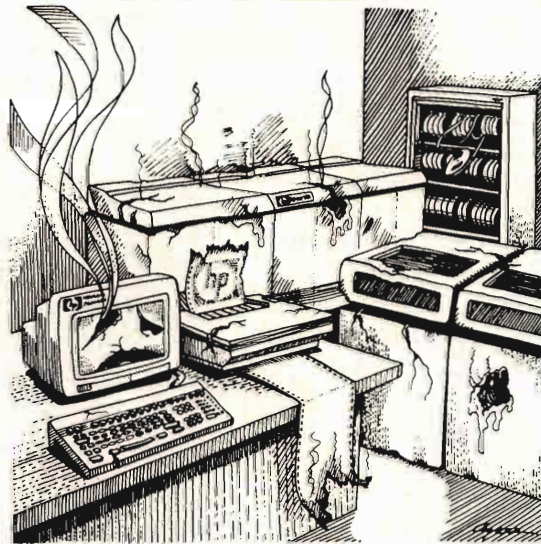
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CIRCLE 158 ON READER CARD

Precision Image Adds Two Models To Plotter Line

Precision Image has added two D-sized models to its line of large-format electrostatic plotters, the C2526 color and M2536 monochrome plotter.

Precision Image's plotters use proprietary drum-based technology to eliminate the media shrinkage, stretching and poor color registration normally associated with roll-fed web plotters. They also feature Helical Scan technology, a copier-like paper feed cassette, 400 dpi resolution, raster capability, and an automatic configuration file that allows a single plotter to accommodate 32 different types of graphics processing formats.

Contact Precision Image, 501 Chesapeake Dr., Redwood City, CA 94063; (415) 366-8900 or (800) 338-3377.

Circle 382 on reader card

PrintAPlot Allows Printer To Become A Pen Plotter

Insight Development Corp. has introduced a software translation package that provides any printer with the capabilities of a pen plotter.

PrintAPlot allows software applications using the HP-GL language to work directly with most dot matrix, inkjet and laser printers.

PrintAPlot runs on all HP models and compatible laser printers.

For further information, contact Insight Development Corp., 1024 Country Club Dr., Suite 140, Moraga, CA 94556; (415) 376-9451.

Circle 381 on reader card

Kroy Offers Typeset Letters On Adhesive Strip

Kroy has introduced a printer and software that allows PC users to create typeset quality letters and symbols on repositionable adhesive-backed tape.

The printer is designed for graphics applications requiring high-quality lettering such as advertising mockups, technical drawings, maps, newsletters and business presentations.

The Kroy LetterCrafter software interfaces with IBM-PC or compatible computers and the new Kroy 460PC printer. The software can import word processing or database ASCII text files.

The Kroy 460 printer has a resident font that corresponds to Helvetica, with 14 other typestyles available, as well as bar codes, international symbols and decorative borders.

For further information, contact Kroy Inc., P.O. Box C-12279, Scottsdale, AZ 85267-2279; (602) 948-2222.

Circle 384 on reader card

Gerber Brings 3D Options To HP ME Series 10 Users

Gerber Systems Technology (GST) has announced a direct data translator for the HP ME Series 10 2D CAD product from HP. The translator gives HP ME 10 users an upgrade path to numerical control (NC) surface machining capability, and shortens the design-to-manufacturing cycle by saving HP ME 10 drawings as SABRE-5000 drawings. Users then can build on the translated drawing with SABRE-5000 software to create 3D surface models and NC output for multi-axis machining.

The direct data translator benefits customers with mechanical application such as complex surface machining and tool-and-die stamping.

For further information, contact Gerber Systems Technology Inc., 425 Sullivan Ave., South Windsor, CT 06074; (203) 282-1478.

Circle 380 on reader card

Galileo Scientific Announces E-Z FFT

Galileo Scientific has announced E-Z FFT, a fast fourier transforms for HP 9000 Series 200/300/500 and HP Vectra (w/Viper card).

This menu-driven, stand-alone program allows time to frequency and frequency to time transformations, giving real, imaginary, magnitude and power spectra of the frequency domain data in graphic and tabular form; various filtering operations; removal of dc component; windowing; network analysis calculating the response of any circuit to any waveform.

For further information, contact Galileo Scientific, 2731 Blairstone Rd., #175, Tallahassee, FL 32301; (904) 878-7450.

Circle 375 on reader card

FOR YOUR INFORMATION

- Keithley Instruments (Cleveland, OH) has published a 25-page brochure that describes 32 switching matrix, multiplexing and scanner modules.
- HP's 1989-90 power supplies and electronic loads now is available. The 144-page catalog contains full descriptions of HP's manual and computer-controlled dc power supplies and electronic loads. The information helps readers choose the correct product for a given system or laboratory application.
- The latest edition of Hewlett-Packard's RF microwave and MM-wave measurement accessories catalog (literature 5953-2346) now is available. More than 500 products from dc to 110 GHz are described and specified in this free 86-page document.
- A 10-page product guide from ICS Electronic Corp. (San Jose, CA) presents a comprehensive line of IEEE 488 bus controllers, extenders, expanders and auxiliary products. The publication include photos and product descriptions of over 40 hardware, software and accessory items — all designed for the reliability and economic enhancement of 488 bus installations.

INTEROP 89

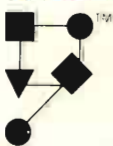
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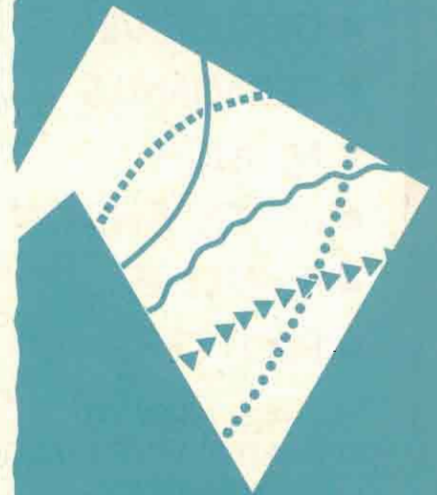
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NEW PRODUCTS

HP Laser Incorporates LAN CD ROM Products On LAN

HP announced HP LaserLAN, a product that enables the user to place any CD ROM product from HP on a LAN.

HP LaserLAN, which consists of standard CD ROM drive and Microsoft extensions software, operates on a MS NET or NetBIOS (HP office share).

Targeted for MIS professionals such as system managers, administrators and software engineers, these services distribute more than 300,000 pages of customer support information on CD ROM.

Presently, HP's CD ROM-based services support HP 3000 business computers, including the commercial RISC-based precision architecture computers, and HP 9000 Series 800 HP-UX computers.

Cimlinc Software Available To HP Users

Cimlinc Inc. now is porting all of its CIM and mechanical CAD/CAM software to HP 9000 Series 300 engineering workstations. Users of these UNIX system workstations can enhance their productivity with Cimlinc's easy-to-learn, easy-to-use wireframe and surfaces design and 2D and 3D drafting software.

All Cimlinc software runs on the entire range HP 9000 Series 300 workstation in the X window environment (ANSI X.11) under HP-UX.

For more information, contact Cimlinc Inc., 700 Nicholas Blvd., Elk Grove Village, IL 60007; (312) 228-7300.

Circle 378 on reader card

Statistical Software Available For HP 9000

Minitab Inc. has supplemented Minitab Statistical Software with release 5.1. It's available for HP 9000 Series 300, 500 and 800 systems running HP-UX.

Minitab is an interactive software package for organizing, analyzing and reporting statistical data. Features include: descriptive statistics, regression analysis, analysis of variance, nonparametric tests, tabulation, time series

analysis, exploratory data analysis, distributions, plots, histograms and more.

Minitab is supplied on nine-track tape or tape cartridge. Prices range from \$1,700 to \$3,300 depending on series type. Academic and multiple machine discounts are available.

For more information, contact Minitab Inc., 3081 Enterprise Dr., State College, PA 16801; (814) 238-3280.

Circle 377 on reader card

CalComp Plotter Creates D-Size Drawings In Color

CalComp Inc. has unveiled a plotter that uses direct imaging technology to produce superior-quality one- or two-color ANSII-/ISO A1-size drawings for a variety of CAD/CAE applications.

The DrawingMaster (Model 52224), replaces the Model 5723 monochrome electrostatic plotter.

The DrawingMaster outputs check plots or finish-quality plots on roll-feed media 24 inches (610 millimeters) wide, generated primarily from random vector plot data off-loaded from the host computer. The self-contained plotting system sorts the vectors, generates the lines and area fill and rasterizes. Disc capacity is 25 MB.

The DrawingMaster accommodates a variety of roll-feed paper and film—each type engineered for different hardcopy needs, such as checkplots, reports or two-color plots.

It comes standard with four multiplexed ports and an automatic media cutter; a plot collection basket; indicators that warn the user when the media supply is low or empty; a four-switch control panel; a user's guide and a quick-reference guide.

Contact CalComp, 2411 W. La Palma Ave., Anaheim, CA 92801; (714) 821-2000 or (800) CALCOMP.

Circle 383 on reader card

Powerhouse 5.06 Available For HP MPE V

Cognos Inc. has announced the availability of Powerhouse architecture 5.06

for HP MPE V systems. This latest version incorporates new features including a menu-driven interface to the quiz report-writer, which allows users to construct or modify the layout of a report, without having to initiate changes in quiz.

Enhancements to the product's push-button prototyping capabilities now make it possible for users to select individual files from a dictionary to develop prototypes, as well as to define relationships between files.

Contact Cognos Inc., 3755 Riverside Dr., Ottawa, Ontario K1G 3Z4; (613) 738-1440.

Circle 374 on reader card

PM-Focus Tools Portable To HP Graphics Environment

Information Builders has reported that the new object oriented tools provided by PM/Focus will be fully portable to all HP supported graphic environments; NewWave, X/Windows and OSF/Motif under HP-UX and future windowing interface standards.

Focus for HP currently supports cooperative processing under HP-UX between the Series 800 and 300, and under MPE XL with a cross-machine interface to the Classic 3000 environment. The new client/server component of workstations with all HP host systems. PC users are able to access Focus and non-Focus data transparently from any file server on a Series 300, 800 or 900 system.

For more information, contact Information Builders, 1250 Broadway, New York, NY 10001; (212) 736-4433.

Circle 379 on reader card

Unison's Data Center Integrator Aids Operators

Unison Software has announced a software management system called Data Center Integrator. It's designed to provide greater coherence and reliability to data center operations, as well as reduce operator errors and make staff training easier.

Integrator consists of two programs Integrator/CONMAN for the system op-

erator and Integrator/ARRANGER for the system manager.

With Integrator/CONMAN operators execute all console functions normally available through each product's CONMAN programs or through the tapes program TAPESOP, without having to run the programs individually.

Even if the user doesn't have all of

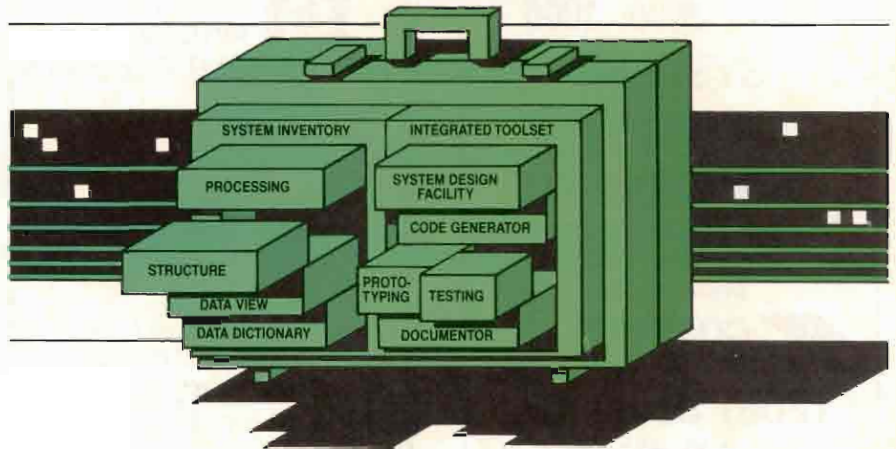
Unison's products installed, Integrator/CONMAN provides several features, such as user defined commands, REDO stack and Native Mode execution of MPE XL UDCs and command files.

For more information, contact Unison Software, 675 Almanor Ave., Sunnyvale, CA 94086; (408) 245-3000.

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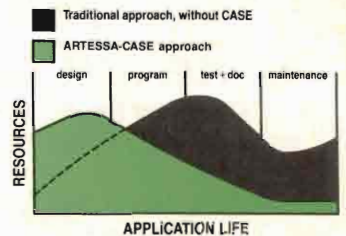
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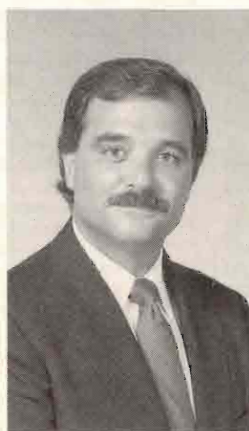
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ADVERTISERS INDEX

Reader Service Number	Page
248	Access Data86
101	Access Technology14-15
102	Adager6-7
137	Advanced Computing Environment119
252	Aldon Computer Group81
161	APPIC USA, Inc.69
192	APPIC USA, Inc.106
104	Bering Industries83
175	Bradford Business Systems64
106	Bradmark Computer Systems, Inc.5
180	Bradmark Computer Systems, Inc.I.B. Cover
236	Brant Technology113
107	Business Systems International97
108	Cardinal Data Corp.73
109	Cognos Corporation56-57
164	Collier-Jackson, Inc.93
167	CompuTech Systems Corp.120
158	Computer Solutions Inc.117
182	Cort Directions102
198	Cumulux Technology29
111	Data Based Systems Inc.101
153	Digital Products, Inc.84
178	DTACK Systems Inc.40
112	Dynamic Information Systems Corp.41
113	EMC Corporation9
244	Equinox Systems, Inc.59
245	Equinox Systems, Inc.61
246	Equinox Systems, Inc.63
154	Facer Information Design55
133	Forest Computer4
254	Forest Computer4
150	Gold Key Electronics44
115	Herstal Automation Ltd.74
	Hewlett Packard (Business Systems/Plus)supplement
190	Hewlett Packard (Network Systems Sector)70-71
143	Hewlett Packard (Remarketing Division)95
116	Hi-Comp International1
116	Hi-Comp InternationalI.F. Cover
168	Holland House25

Reader Service Number	Page
148	Hypoint Technology68
117	IEM, Inc.2
118	IMACS Systems Corp.11
119	Indigo Software28
172	Infocentre Corp.91
171	Information Builders, Inc.23
144	Infotek Systems Corp.35
188	Innovative Information Systems, Inc.88
120	Innovative Software Solutions108
170	Intelligent Interfaces, Inc.115
151	Invitational Computer Conference127
121	Invitational Computer Conference65
123	IOTECH108
173	Kelly Computer Systems Inc.19
126	Martinsound Technologies90
256	MB Foster Associates54
232	MCG Corp.79
197	Mitchell Humphrey & Co.21
149	National Instruments10
129	NSD, Inc.105
255	Operations Control Systems39
130	Orbit Software USA103
251	Orion Systems Technology, Inc.116
125	QMS113
134	Quality Consultants Inc.121
156	Running Mate45
174	SME111
194	Smith, Dennis & Gaylord, Inc.107
145	Software Systems Technology82
136	SOTAS International47
179	STR Software Company99
356	Techcom115
166	Teledyne Isotopes54
155	Telamon52-53
138	Tymlabs Corp.13
165	Tymlabs Corp.77
238	Tymlabs Corp.30-31
139	Unified Software Systems66
141	Unison Software17
181	Uptime Disaster Recovery, Inc.99
186	VitalSoft67
142	Walker Richer & Quinn, Inc.B. Cover
176	Windjammer Barefoot Cruises109

[CALENDAR]

[SEPTEMBER]

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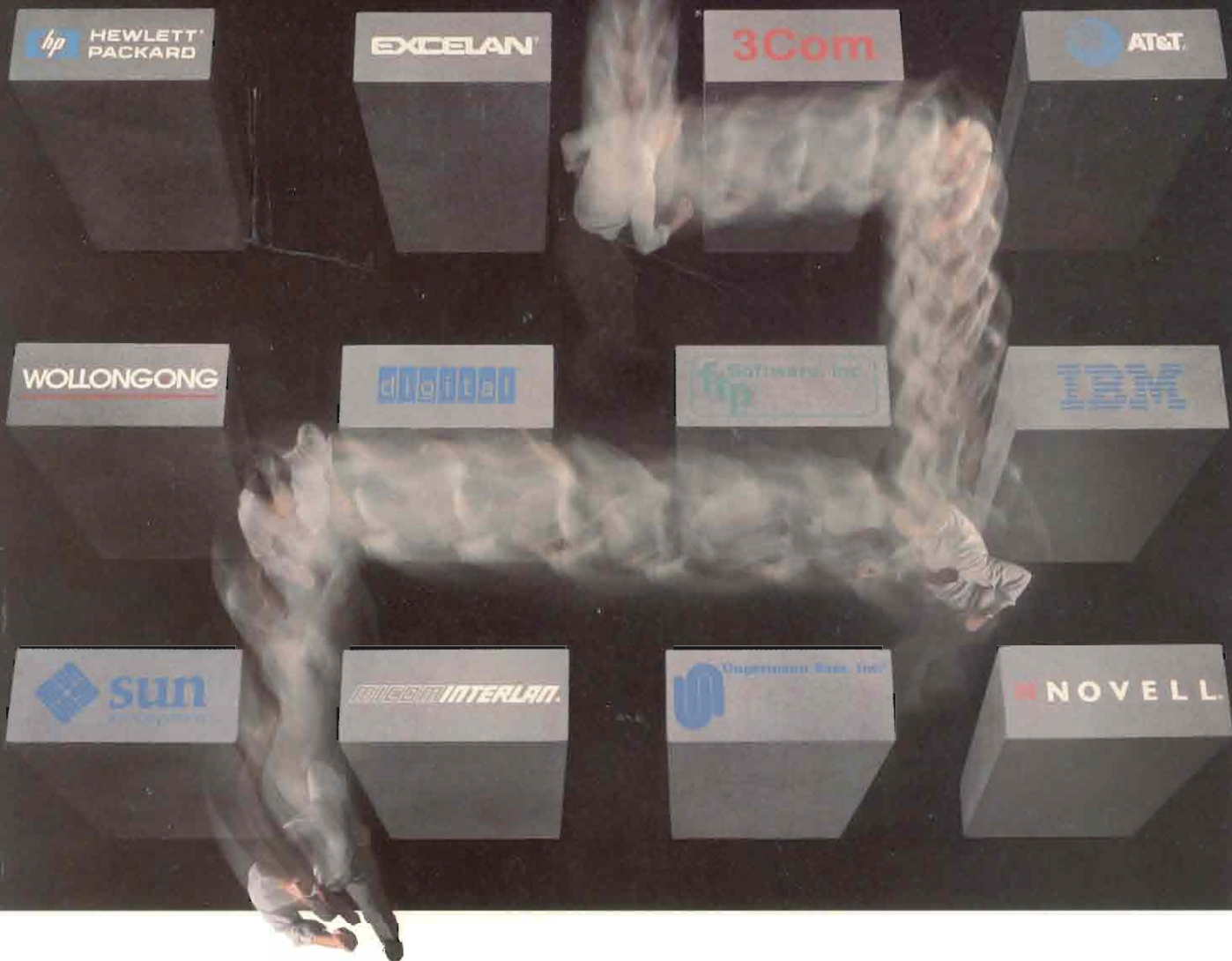
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