A Professional Press Publication

HP Professional

AN INDEPENDENT PUBLICATION FOR USERS OF HP COMPUTERS ■ VOL. 2 ■ NO. 4 ■ $4.00

APRIL 1988

- Connectivity And Communication
- PC Compatibility Standards
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WORKSTATIONS

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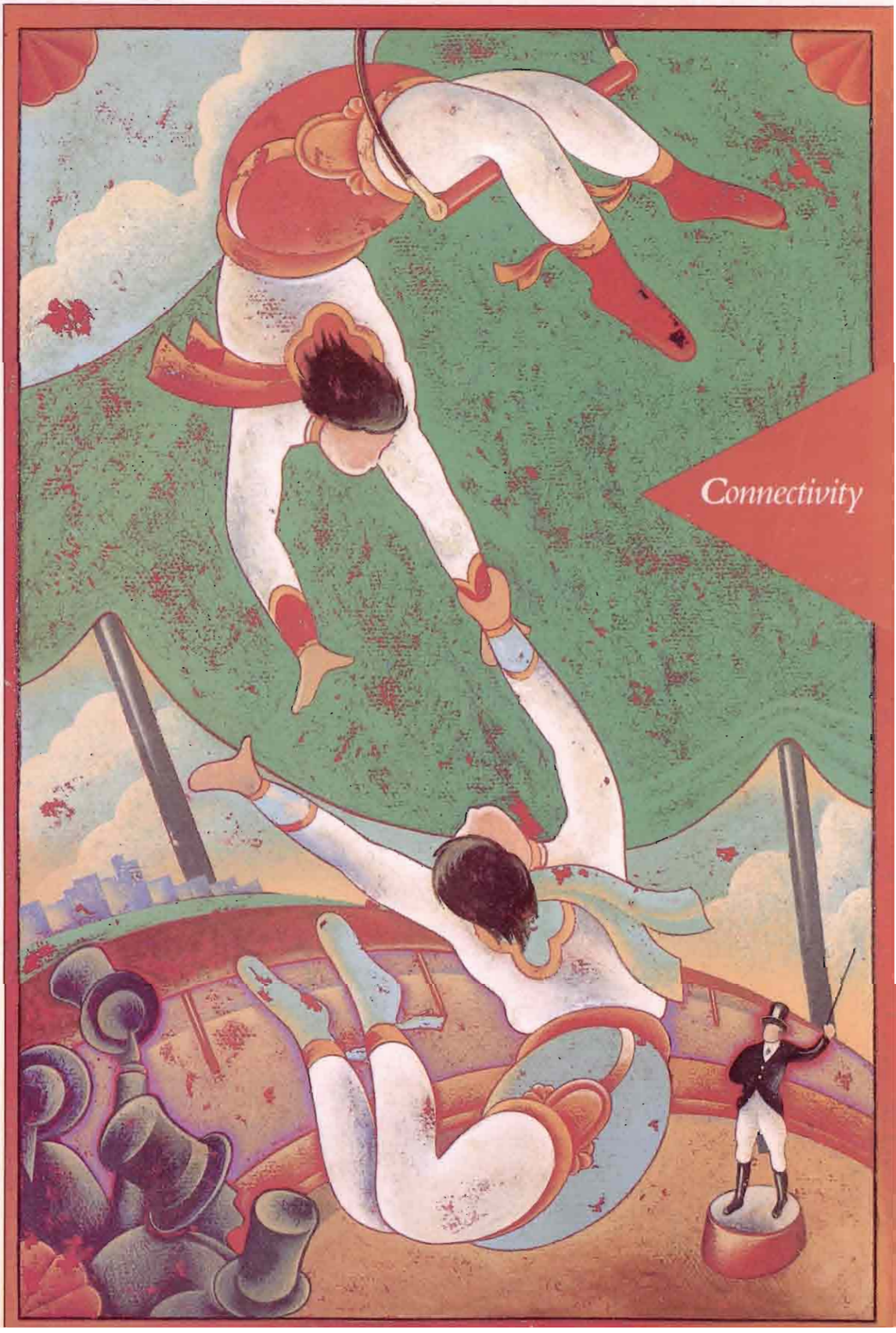

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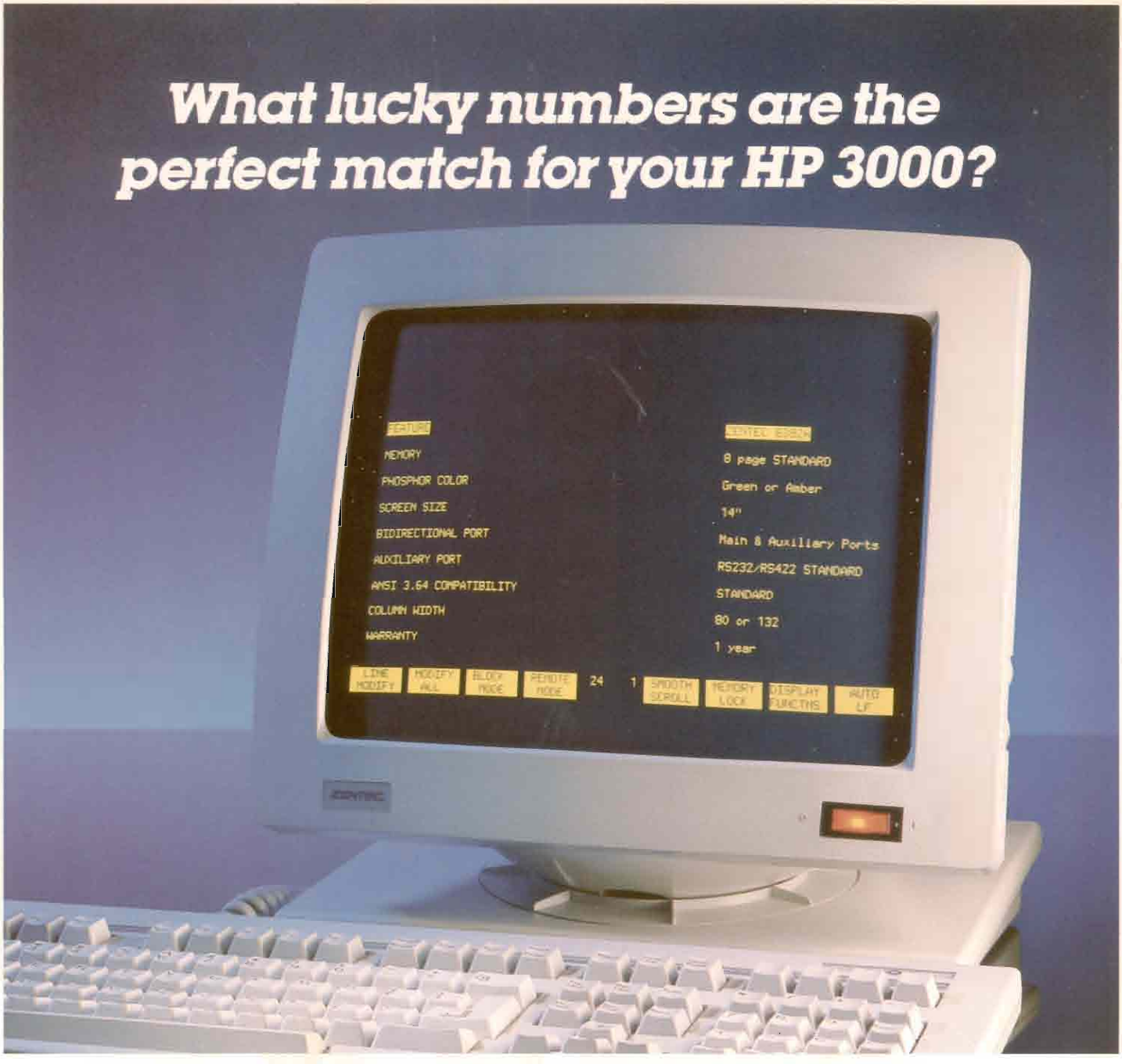

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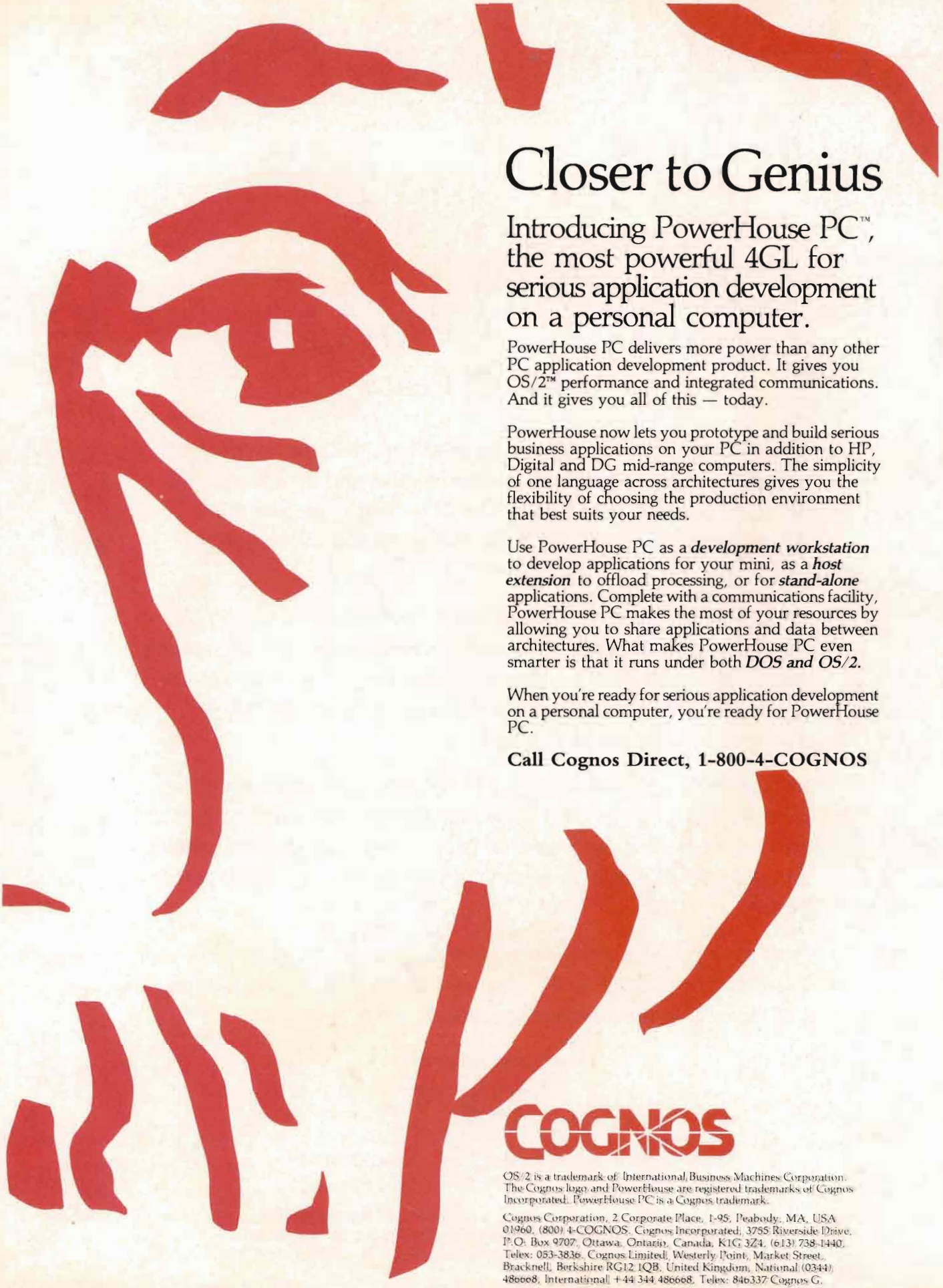

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This month's cover illustration is the work of Michael Schroeder, Reading, PA.

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- Separate mouse/graphics tablet port included
- 80387 and Weitek 1167 co-processor support

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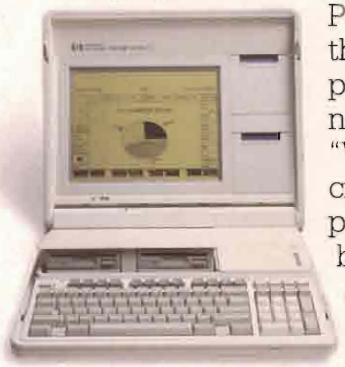

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8086 compatible

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It's How You Make It

You're a giant company by many a measure. Your sales are right up there on the *Fortune* list. But you have an identity crisis. You're fragmented: instruments, peripherals, computers, calculators . . . Even the individual product lines are fragmented: commercial vs. technical. Worse, the customers are fragmented. Just ask a commercial user if he's ever heard of a workstation, or what he might do with one. There are many instrument customers who don't even know HP makes computers!

Nothing in the preceding paragraph is news to anyone. The news is that change is in the wind and the wind is blowing.

The challenge to be met is clear. Catch Digital while Digital catches IBM. That will never be done by selling to the installed base. Legions of new customers must be found while losing none of the existing ones.

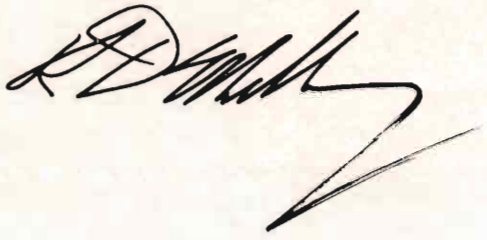
There are only three or four classes of new customers: truly new, those who never had a computer before (or only a PC); DEC customers; IBM customers; everyone else.

Truly new customers are best served by computer stores. The cost of sales to these is prohibitive. OEMs and VARs can pick these off as they graduate from their ATs. Wisely, HP is still promoting its relationship with the VAR community, unlike Digital. Winning customers away from IBM's midrange is easier than it seems. DEC has been doing it for years with awesome success. Just wait until the customer has more than one machine and needs to communicate!

Winning customers away from DEC is another matter. DEC has been charging hard at a single goal with a single plan for about 10 years now, spending dozens of billions on the way. Its VAXclusters are an ironclad lead. Until HP can field a response to clustering with real file sharing, it's gonna be tough indeed. Getting the rest of the world is just a matter of providing a good UNIX and HP's superior platforms and service, service, service.

Healing the rifts between commercial and technical, between instrument and computer, etc., is another big job. If you are one company, your employees have to see it when they look around. Only after you heal the rift in the minds of your employees can you begin to do the same in the minds of your customers. UNIX will help, but existing commercial customers must see a seamless networking between MPE and UNIX. They must find things to do with workstations that can benefit their MPE operations. Workstations are a natural for DEC users because they're just another VAX.

HP recently was hailed as the only company capable of catching DEC. We knew that when we started this magazine. It's nice to see the financial community agreeing with us as we approach our first anniversary.



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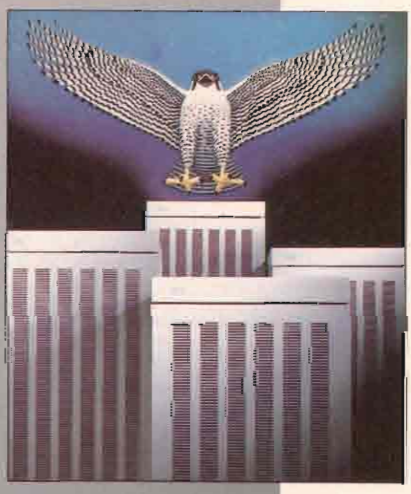

To further assure reliability, every Falcon is fully compatible with HP's sophisticated fault isolation diagnostics. EMC's network of Sales and Service locations worldwide provides on-the-spot service.

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INDUSTRY WATCH

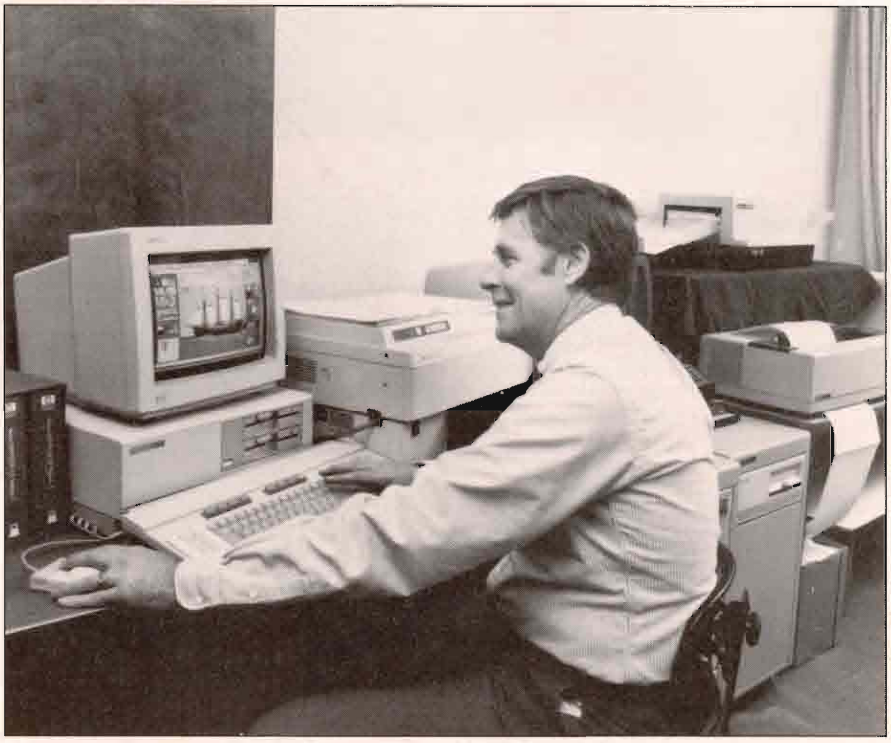
Larry McClain

Education's CMI Market

HP has long been an aggressive player in the multibillion-dollar education market. The company currently has more than 400 educational accounts — about 60 percent of which are in the college and university ranks, the rest in public school districts (kindergarten through 12th grades). In recent months, HP has shown heightened interest in the latter group. Significant growth in computer spending is projected for America's 80,000 public schools, especially for systems that provide Computer Managed Instruction (CMI). Hewlett-Packard already is the number one CMI vendor in California and it's vying with IBM and DEC for that distinction nationwide.

Minicomputer-based CMI lets teachers and administrators determine how students throughout the district are faring when their skills are measured against specific learning objectives. CMI often gets mistakenly lumped with another acronym popular among educators — Computer Assisted Instruction (CAI). With CAI, a computer or terminal is used to present instructional material directly to the student. While this has proven beneficial in some respects, it hasn't done much to reduce teachers' paperwork or help them shape curriculum to district objectives. CMI, on the other hand, is an information management system designed to assist the educator in the ongoing process of *managing* instruction.

"Comparing CMI to CAI is a bit like comparing today's physicians to turn-of-the-century doctors," says Tim Hughes of Abacus Educational Systems (Denver, CO), which offers a CMI package for the HP 3000 family. "Doctors back then could take your temperature and do a few basic things, but they didn't have a CAT scan."



Dr. Larry Lawrence uses a Vectra PC and HP LaserJet printer with an HP 3000 minicomputer. He's working to integrate computer-managed instruction at the laboratory elementary school of the UCLA Graduate School of Education.

CMI's bread-and-butter applications include organization of curriculum, test generation, exam scoring and diagnostic data on student achievement.

Curriculum objectives usually are set at the district level, often by a committee.

For example, students in third-grade math should know how to add, subtract, multiply and divide competently. To ascertain whether they've mastered those skills, administrators first enter test items into the district's HP 3000. Terminals (or Vectra PCs) then are installed at the various school sites. At each terminal, there's also an optical mark reader. Teachers access the 3000, generate the test they want and print it on a LaserJet. Students record their multiple-choice answers on a form the mark reader will accept. Teachers then take the answer sheets back to the terminal and feed them to the card reader. The CMI test databases enable both teachers and administrators to generate a variety of sophisticated reports to see whether district goals are being met.

SEVERAL RECENT TRENDS have made school administrative computing — and especially CMI — a very hot market.

Continued.

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Foremost is the near panic over the quality of the nation's schools, a fever that began with the 1983 report, *A Nation At Risk*. After reading it, legislators in several states passed bills mandating greater accountability from public schools. This coincides with rising enrollments from the '80s "Baby Boomlet" that are already putting increasing pressure on public school resources.

According to Joseph Moriarty of the Kerry Consulting Group (Claremont, CA), a firm specializing in educational computing, "CMI is increasingly required just to stay even with the requirements for accountability."

Many lawmakers see computerization as crucial to achieving the necessary improvement in public schools. Several states have earmarked sizable sums for computer acquisition in the schools. There's even one Federal bill — the Computer Education Assistance Act of 1985 — that provides computer funding through 1990.

Another reason for the CMI surge is the decreasing cost of hardware capable of running sophisticated CMI applications. Although spending for computer equipment is only running between one percent and 1.5 percent of public education's total purse, that's still nearly three billion for the 1987-88 academic year — an amount that could rise even higher as more CMI solutions become available.

"Everybody seems to be wanting to get into the CMI market," says Moriarty. "The opportunity for dominance is attractive because of the large number of schools."

HEWLETT-PACKARD'S STRATEGY in CMI is to offer the most comprehensive systems on the market. "We offer complete solutions because of the relationships with our suppliers," says Lynn Gardner, HP's manager of education marketing for the K-12 segment. There are three software companies that figure prominently in HP's plans. Two of them — Carter-Schaefer & Co. (Houston, TX) and Pertaine Systems, Inc. (Redwood City, CA) — offer HP 3000 packages that address schools' general administrative needs including budgeting, payroll, scheduling, inventory and some student information functions. The third company is Abacus Educational Systems.

Abacus has huddled with both Pertaine and Carter-Schaefer to develop ready-made software interfaces, enabling Abacus' CMI package to work smoothly with the other companies' products. HP customers currently running either Pertaine or Carter-Schaefer software easily can add full-fledged CMI. New HP customers can order the total package right off the bat: general administrative functions wed to CMI.

The relationship between Hewlett-Packard and Abacus dates back to the product's development, which was funded by a quarter-million-dollar grant from HP. One of Abacus' distinctions — quickly becoming a must for CMI packages — is its ability to be customized to a district's own objectives. Some CMI products force schools to use the software publisher's objectives.

Abacus is being used in more than 50 school districts and community colleges in the U.S. and Canada. The program fully supports curriculum development, and users can link curricular areas, teaching objectives and test items. Abacus generates more than 20 instructional management reports, ranging from the performance of one student on one objective to the performance of all district students on all objectives.

EDUCATORS ARE NOTORIOUS tire-kickers when it comes to computer purchases. To get the sale, a vendor must offer more than a comprehensive software solution — that's why HP plays up its other assets when wooing CMI customers: discounts, special service agreements, expandability and reliability.

Because schools have come to expect deep discounts from computer vendors, notes HP's Gardner, "We've increased our discounts in order to be very aggressive in this market." Schools get a 25 percent discount on all HP 3000 hardware, a 38 percent discount on system peripherals and a 50 percent discount on software not bundled with the hardware. HP personal computers can be purchased for 38 percent off if there's a $400,000 minimum commitment per year.

Adds Gardner, "To distance us from the competition, we're offering one year of free servicing to CMI customers." Moreover, expandability never will be a problem because HP has a long history of providing timely upgrades.

Finally, HP offers its CMI customers something that's in short supply in the computer industry — GUTS. In this case, GUTS means "Guaranteed Up-Time Service," HP's guarantee of 90 percent up-time on all of its systems.

CMI innovation, deep discounts and GUTS — that's HP's answer to today's crisis in education. *—Larry McClain is a freelance writer based in Southern CA.*

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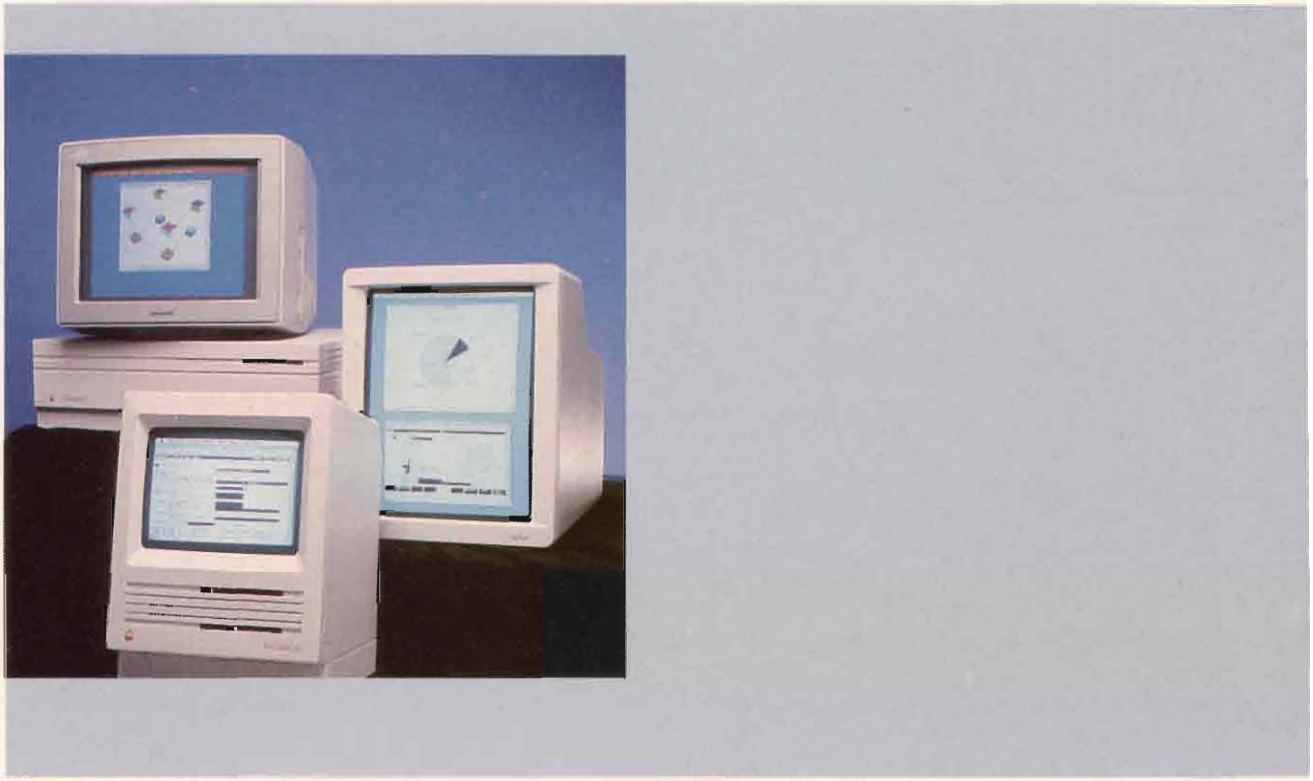
Welcome to the next generation of HP terminal emulation software for Macintosh.



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NEWS & TRENDS

HP, Cognos Sign Corporate Agreement

Canon OA System Uses PowerHouse

Cognos Incorporated and Hewlett-Packard signed a two-year agreement in mid-February granting HP a corporate license for Cognos' advanced application development software.

This agreement allows HP to distribute internally Cognos' PowerHouse application development language for use by any of its divisions. Other Cognos software products — Graphics, Architect, The Expert and PowerPlan — also are included in the agreement.

In addition, Cognos will provide technical services to HP, enabling HP staff to develop their own internal support and education programs. Cognos products already are used within HP.

According to Lloyd B. Taylor, HP corporate director of information systems, "PowerHouse now offers HP users the option of operating under MPE-V on the HP 3000 business computers, under MS-DOS or OS/2 on the Vectra microcomputers, and later this year it will be available running under HP-UX on the HP 9000 Series 800 technical workstations."

Earlier in the month, Cognos announced that its advanced fourth-generation software is at the heart of a new office automation system launched in Japan by Canon Sales Co. Inc. of Tokyo.

Canon's System 3000 is the result of a unique cooperative project involving Cognos, Canon Sales Co. Inc. and Yokogawa Hewlett-Packard (YHP), also of Tokyo. The system includes hardware components from both Canon and YHP, and incorporates a specially modified version of PowerHouse as a key software component. YHP is a principal distributor of PowerHouse in Japan.

William G. Breen, Cognos senior vice president, operations, said, "This agreement opens a very important door for Cognos. A joint venture with one of Japan's leading manufacturers of office automation equipment provides an unparalleled opportunity for Cognos to gain recognition in the business applications software market in Japan."

McDonnell Douglas Chooses HP

Represents Entry Into UNIX Marketplace

McDonnell Douglas Manufacturing and Engineering Systems Company recently chose HP as a UNIX-system workstation vendor, representing its entrance into the UNIX-system marketplace.

McDonnell Douglas will combine its Unigraphics software with HP 9000 workstations and servers as an HP value-added reseller (VAR) to provide a complete mechanical engineering CAD/CAM offering. The corporate agreement, which includes the workstations, has a first-year estimated sales value of up to $20 million.

Thirty HP 9000/Unigraphics systems have been installed at the McDonnell Douglas Helicopter Division, though the focus of the expected sales will be to customers external to McDonnell Douglas and HP.

The agreement will include workstations and servers from the HP 9000 Series 300 and 800 product lines, as well as associated peripherals. Series 300 is based on the Motorola 68000 processor. Series 800 is based on HP Precision Architecture.

IEM Offers Lifetime Warranty

1-, 2-, 4-MB Boards Purchased After 1/1/88

IEM Inc. (Ft. Collins, CO) has announced its new lifetime warranty on 1-, 2-, and 4-MB memory boards for HP's Series 200/300 computers. Any IEM memory board purchased after January 1, 1988, that is used on a single machine (identified by serial number) is eligible for lifetime warranty coverage.

To begin lifetime coverage, the customer simply needs to fill out and return a Lifetime Warranty Registration form, which is shipped with the product. Boards that aren't registered within 30 days will be covered by a two-year warranty.

While under warranty, any board that malfunctions will be replaced free of charge, provided the malfunction wasn't due to improper care or unauthorized servicing.

Ford Aerospace Orders 767 UNIX-Based Engineering Workstations

Totals $16 Million

Hewlett-Packard recently received a $16 million order for 767 HP-UX engineering workstations from Ford Aerospace and Communications Corporation. This is part of a larger contract awarded Ford Aerospace by the U.S. Army.

HP will ship the HP 9000 Model 330 workstations for the Ford Aerospace maneuver control system-nondevelopment item (MCS-NDI) under this contract, one of HP's largest workstation contracts in the past year.

The HP Model 330 workstations are based on the Motorola MC68000 microprocessor and run on the HP-UX operating system.

Ford Aerospace holds a $50 million, one-year contract with options to provide the U.S. Army with components for MCS-NDI.

The MCS-NDI system comprises off-the-shelf equipment supplied by HP and other vendors, and software developed by Ford Aerospace. The MCS-NDI is a new automated control and communications system that can be used by the U.S. Army in the field.

Ford Aerospace is evaluating its third generation of HP processors, and compatibility among the models of a product line is critical to Ford's corporate strategy.

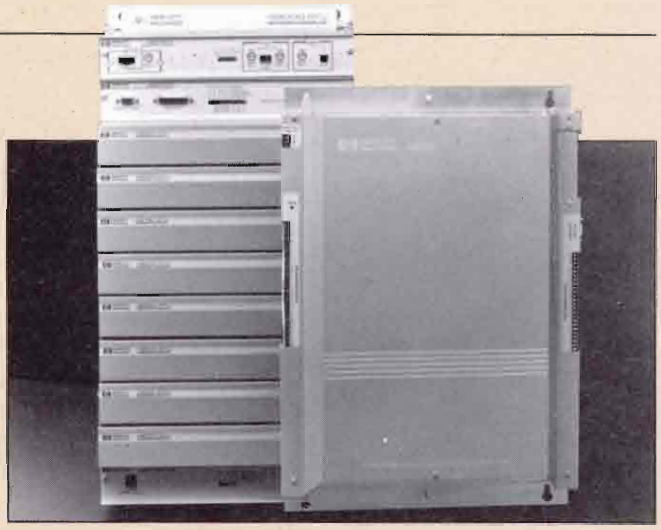
Intermetrics Develops Software Tools For HP 64700 Series

Signs Agreement With HP

The Software Products Division of Intermetrics, Inc., has entered into a joint marketing agreement with Hewlett-Packard to provide software for the new HP 64700 emulator series. The software to be provided includes C cross compilers, cross assemblers, XDB source level cross debuggers and utilities specifically designed for programming embedded microprocessors.

The initial software offering is targeted to program the 68000 and 8086 microprocessor families, and the Z80. It is available on the following host platforms with special user interfaces: HP Vectra PC, IBM PC and compatibles, Sun, Apollo and VAX workstations.

The HP 64700 emulator series is an entry-level emulator designed for small design teams using the PC workstation with a migration path to a high-performance development environment. This will allow users to continue using the same emulator and development software as they grow to larger development host environments.



The HP 48050A measurement and control unit.

HP Offers Measurement, Control Unit For Industrial Environments

48050A Extends 48000 RTU Family

Hewlett-Packard recently introduced its new HP 48050A measurement and control unit designed specifically for harsh industrial environments.

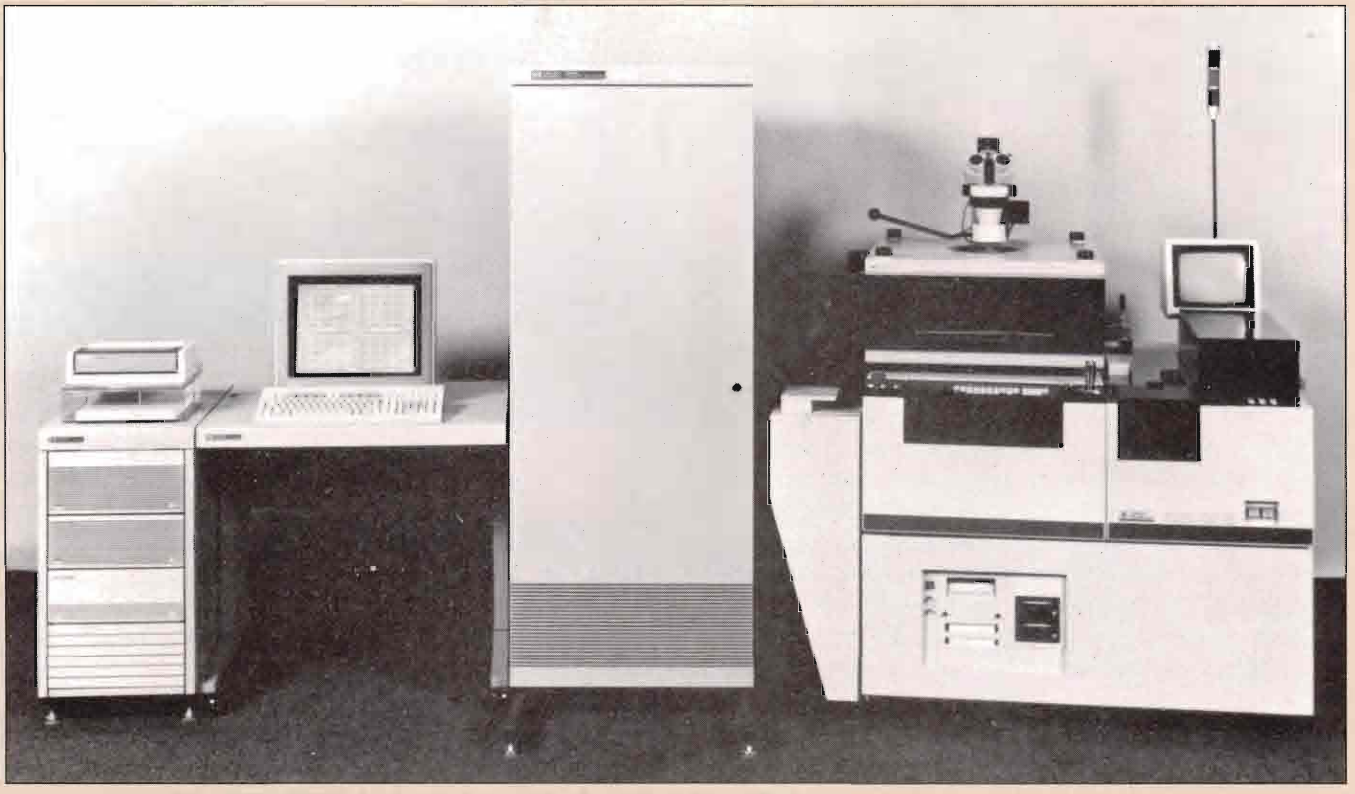
The unit extends the scalability of the HP 48000 remote-terminal unit (RTU) product family by addressing applications that require small point counts, providing end users, systems integrators and OEMs with more tools to build their data-acquisition and control solutions. The HP 48050A has 23 I/O points, which can be increased to 45 I/O points with an expansion board.

Target markets for the data-acquisition and control unit include petrochemical, telecommunications, transportation, rubber and plastics, food and beverage, and electrical utilities.

Applications range from supervisory control and data-acquisition (SCADA) systems and energy management to the measurement, monitoring and control of remote facilities and equipment.

Customers will refer to the HP 48050A as an RTU, a distributed-control unit, a front-end processor, or an industrial data-acquisition and control unit depending on the particular application. It has a user-configurable database library incorporating more than 50 signal-processing functions ranging from simple scaling for engineering-unit conversions to more complex algorithms such as PID loop control or AGA flow calculations.

The HP 48050A contains a multitasking BASIC programming language. User-defined tasks easily can be written in BASIC. Using a PC running MS-DOS, custom tasks and functions also can be written in Microsoft C or 8086 assembler and then downloaded to the HP 48050A.



The HP 4062C is shown here with the HP 4089A 96-pin test head installed on a commercial wafer prober.

HP Introduces High-Pin-Count Switching Matrix

Extends Semiconductor Parametric Test

HP recently introduced the HP 4089A, a new high-pin-count switching matrix.

Designed primarily for use with the HP 4062C high-performance semiconductor parametric test system, the 96-pin switching matrix doubles the number of test pins, while still maintaining high-resolution measurement capabilities.

The HP 4089A allows the HP 4062C to test the complex structures of advanced semiconductor processes. Customer parametric-test requirements are rapidly changing, as new process technologies such as Bi-CMOS, GaAs and power MOS grow more important.

The HP 4089A's high pin count makes the HP 4062C suited to high-volume process-monitoring applications.

Extending HP's line of low-leakage switching matrices, the HP 4089A offers a full range of test-pin configuration options. HP's semiconductor parametric test system thus can be configured with 12 to 96 pins, depending on test needs.

The HP 4089A is fully compatible with existing HP systems. Owners of HP systems can upgrade their systems to the larger switching matrix without rewriting the test code. Test programs written for R&D or process-development needs on a low-pin-count system quickly can be transferred to a high-pin-count system for process-control applications.

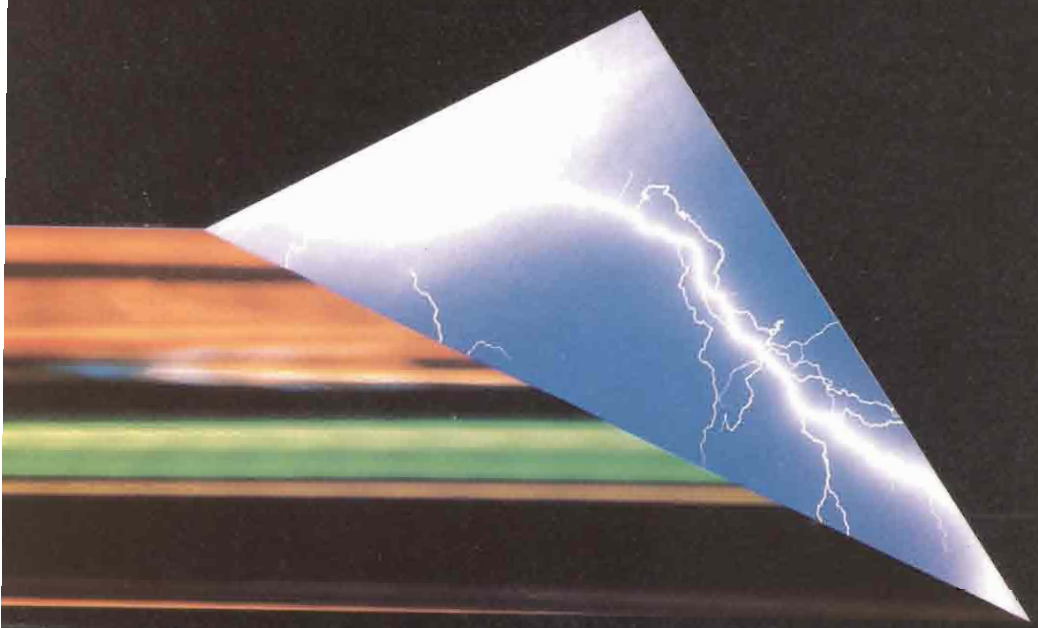
Microsoft, HP Port MS OS/2 LAN Technology

For UNIX System V Environment

Microsoft Corporation and Hewlett-Packard have announced a new networking product, Microsoft LAN Manager/X (LM/X), which brings the functionality of the MS OS/2 LAN Manager to the UNIX System V operating environment. The new product, being jointly developed by Microsoft and Hewlett-Packard, will allow a UNIX System V-based server running LM/X to service requests from workstations running Microsoft Networks, Microsoft Networks for XENIX and MS OS/2 LAN Manager ("LAN Manager") networking software.

LM/X initially will be developed to run on Intel 80386-based systems under the new merged XENIX/UNIX System V product,

Introducing, the 4GL Environment



The fourth generation language (4GL) was a revolution. It allowed programmers to code 10-20 times faster than COBOL! That's a benefit that is difficult to live without. However, when developing and running application systems, there is more to life than coding. Much more.

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Microsoft UNIX System V/386, Release 3.2. It can be ported to servers running other implementations of the UNIX operating system. LM/X will be licensed to OEMs by Microsoft and is scheduled to be released in early 1989. A software developer's kit will be available from Microsoft by the end of 1988.

HP is working closely with Microsoft to develop LM/X technology, applying its expertise in the UNIX System V environment to the port of Microsoft OS/2 LAN Manager technology. HP also is the first major OEM to announce support for LM/X and will be using the new product on the HP 9000 systems running under the HP-UX operating system.

An LM/X-based server will be able to service requests from workstations running any of Microsoft's other networking products, as well as related IBM products such as PC-LAN and OS/2 Extended Edition. All of these products, like LM/X, are based on the Server Message Block (SMB) communications protocol, a standard jointly defined by IBM, Microsoft and Intel.

In addition, because LM/X is a port of the OS/2 LAN Manager, DOS, OS/2 and XENIX systems running their corresponding LAN workstation software can communicate with both OS/2 LAN Manager servers and LM/X servers without requiring any new or different LAN workstation software.

Further communications breadth is achieved through LM/X's ability to coexist on the same server with other networking subsystems, such as Sun's NFS or AT&T's RFS. This capability allows workstations running other networking products to exist in the same network as those running SMB-based software.

LM/X will be able to run on various networking hardware, including Token-Ring, IEEE 802.3/Ethernet and 5BASE1 StarLAN. The product also will be ported to different low-level transports (communication protocols), including Netbui (PC-LAN), TCP/IP and ISO. In addition, it will be ported to various transport-level interfaces, including Berkeley Sockets and AT&T System V Transport-Level Interface (TLI).

HP 9000 Provides CADAM/CATIA Access With IBM 5080 Emulation

Combined Systems Solve Complex Tasks

HP has announced that now its engineering workstations can access IBM mainframe-based applications with the HP 98855A, a new IBM 5080 emulation product.

Users of HP workstations and IBM mainframes can work together using the computational and graphics strengths of their respective systems to solve complex tasks. Engineers in a variety of industries, and designers who use HP 9000 workstations primarily for design and analysis, now can access designs and data stored in IBM mainframe-based applications such as CADAM and CATIA.

The 5080 emulator is the result of a team effort between HP and Spectragraphics Corporation (San Diego, CA).

The HP 9000 Model 350SRX or 350CH workstations, which run the emulation, can communicate with an IBM mainframe in single-user or multiuser configurations.

The HP/Spectragraphics design-set channel controller can support a maximum of 64 simultaneous users and up to eight LAN gateways. Alternatively, communications adapters and modems may be inserted on each end of the coax path to convert the communications to T1, V35 and fiber-optic modes. This allows workstations to be remotely located from the host mainframe, while communicating via leased lines, microwave or fiber-optic links.

HP workstations with 5080 emulators can be added to existing IBM mainframes using Spectragraphics channel controllers and Spectragraphics IBM-compatible 5080 terminals.

The HP 98855A can be enhanced with an IBM 3278 emulator and a high-speed, file-transfer product. The 3278 emulator allows users of HP 9000 workstations to emulate an IBM 3278 terminal to perform data entry-inquiry applications.

HP Joins X Consortium

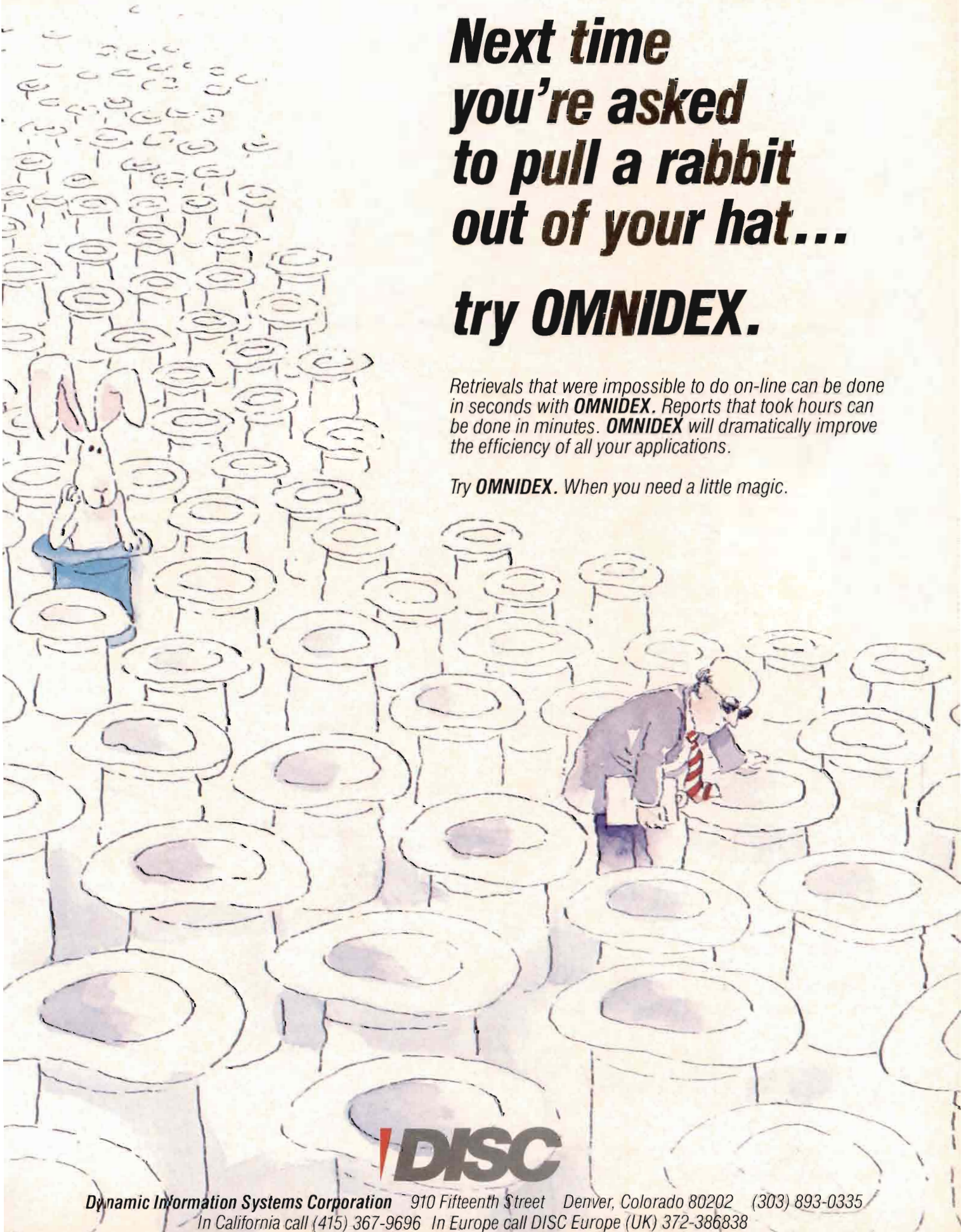
Continues To Support X Window System

Hewlett-Packard is among the first companies to join the X Consortium, a multivendor group chaired by the Massachusetts Institute of Technology. HP is committed to the X Window System to provide the foundation for distributed computing in a multivendor environment.

Through membership in the consortium, HP will continue to contribute to the future development and direction of the X Window System. Future releases of the X Window System from HP will be based on X version 11, release 2.

Other X news: At the X Conference held at MIT in January, HP announced its plans to develop for public use a set of "widgets" based on the X user interface toolkit.

"Widgets" are interactive graphical components of an applications user interface, such as menus, forms and scroll bars. The HP widget set will enhance software developers' productivity in writing portable, easy-to-use applications for the X Window System. These widgets will be available from HP this summer and will be contributed to MIT for public distribution on the MIT X11 tape.



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Inference Ports ART to HP

Connects To HP 9000 Workstations

Inference Corporation recently announced it will port ART (the Automated Reasoning Tool) to the HP 9000 Series 300 and 800 workstations. The porting agreement is significant, since it will provide engineers with the capabilities of the industry's powerful expert system development tool on a high-performance engineering workstation.

Chuck Williams, Inference Corporation's executive vice president, views this business agreement as an important opportunity to bring the benefits of ART to the large installed base of HP 9000 workstations.

William G. Parzybok, Jr., vice president and general manager of HP's Engineering and Manufacturing Systems Group, said, "The agreement brings a significant new ability to workstation users. Expert system development is assuming even greater importance as it becomes more broadly commercialized."

The Series 300 family of technical computers provides users with a variety of workstations, instrument controllers and modular components. The high-end Series 800 workstations are based on an enhanced version of RISC architecture and offer 32-bit addressability as well as 48-bit and 64-bit virtual addressing.

ART is a primarily rule-based development and deployment environment used for building commercial expert systems. It has been used to develop and deploy wide-ranging expert system applications such as credit analysis, factory and office automation, medical claims monitoring, software emulation and process control.

Standard And Poor's Trading Systems Licensed For HP Systems

StockMate Runs On HP 9000s

A new licensing agreement recently announced makes Hewlett-Packard the first major computer vendor to support Standard and Poor's Trading Systems' real-time broker application on the UNIX operating system.

The Standard and Poor's computer software, S&P StockMate, is a quotation and information system designed for the securities-brokerage industry. It operates on HP 9000 individual workstations and multiuser computers, including those systems based on Precision Architecture.

S&P StockMate is built around Standard and Poor's Ticker III, a professional, real-time, consolidated market-data broadcast of all North American securities including stocks, bonds, futures, indices and options.

HP And TSSI Sign Agreement

Links HP 16500A, CAE Simulators

Hewlett-Packard has reached an agreement with Test Systems Strategies Inc. (TSSI, Beaverton, OR) under which TSSI will develop software links between the HP 16500A logic-analysis system and CAE simulation workstations.

With these links, users of CAE simulators are able to transfer test vectors to an HP 16500A logic-analysis system to permit real-world, stimulus-response analysis of simulated designs. The links represent an expansion of TSSI's current family of products for linking design to test systems.

Known as the Test Development Series (TDS), TSSI software products will link the HP 16500A to all CAE simulators presently supported by the TDS product family. The software runs on Apollo Aegis, Sun UNIX or DEC VAX/VMS operating systems.

HP will continue to provide support for the HP 74240A and 74240B CAE link between the HP Electronic Design System and the HP logic-analysis system.

HP Provides Upgrade For Model 825S, SRX Workstations

2.0 MFLOPS Performance

Hewlett-Packard has announced a CPU upgrade for the HP 9000 Model 825S and 825SRX workstations.

Previous workstations have had floating-point performance rated at around 1.0 MFLOPS. This is the first time that a workstation has performed at more than 2.0 MFLOPS.

The upgrade is a field-installable CPU board set upgrade for Model 825S multiuser/servers and 825SRX superworkstations that don't require an I/O expander. A new board set can be installed in minutes to replace the current CPU-board set. Model 825 systems with the new CPU upgrade are object-code compatible with all Series 800 systems, and no software changes are required.

With 2.02 double-precision MFLOPS, the upgrade ($10,000) boosts the floating-point performance to more than three times that of its predecessor. The upgraded Model 825 now is more than 75 percent faster than the Sun 4/260 and Silicon Graphics 4D/70, and four times faster than the DEC MicroVAX 3600 in floating-point performance. The integer performance of Model 825 is increased from eight to 14 times that of a VAX 11/780.

The Model 825SRX ($69,500), a superworkstation, and the Model 825S ($42,500), a multiuser computer and server, both are based on HP Precision Architecture. ■

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SAS System Runs Under UNIX

SAS Institute Inc. announced the SAS System under UNIX to more than 3,000 SAS software users attending the 13th annual SAS Users Group International (SUGI) conference in Orlando, FL. The first UNIX implementation of the software will support Hewlett-Packard's HP 9000 Series 300 under HP-UX, with support for the 800 Series later this year.

In addition to opening a new market for the Institute, the SAS System for UNIX is an important step forward for the Institute's multivendor architecture. The multivendor architecture allows SAS to develop a software system that will run across most future hardware platforms that it might encounter. As SAS implements the system in each new environment, the host layer, which comprises about 10 percent of the code, is written specifically for that host platform. The remaining code, comprising the core and applications layer of the SAS System, is written in C and can be moved across hardware platforms.

The UNIX implementation is a validation of the multivendor architecture concept, which the Institute adopted in 1984. The core and applications layers are the same for both the HP release and the Institute's recent release for the SAS System for PCs (release 6.03).

The SAS System is an integrated software system providing complete control over data management, analysis and presentation. It includes modular components for data entry, retrieval and management; report writing and graphics; statistical and mathematical analysis; decision support; and applications development. To use any module in the SAS System, sites first need base SAS software for data management, analysis and report writing.

Available immediately, the SAS System under HP/UX is licensed annually, with fees based on machine size.

Contact the Software Sales Department, SAS Institute, Inc., SAS Circle, Box 8000, Cary, NC 27512-8000; (919) 467-8000.

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HP Expands 700 Series Terminals

HP has added two new terminals to the HP 700 terminal family — the HP 700/44, HP's first terminal for PC-based multiuser environments, and the HP 700/43, a general-purpose ASCII terminal.

When connected to a PC running Santa Cruz Operation's XENIX operating system, the HP 700/44 can use the same programs as the PC, including MS-DOS applications.

Like the recently introduced line of HP Vectra PCs, the HP 700/44 ($575) has the IBM PC character set and enhanced PC keyboard layout, giving the terminal the look and feel of a PC. The 14-inch display screen, which has both 80- and 132-column modes, is available in amber, green or soft-white phosphor. The latter shows black letters on a white screen similar to a printed page.

Up to 32 terminals can be connected to the HP Vectra RS/20, which is based on the Intel 80386 microprocessor, and up to 16 terminals can be connected to the HP Vectra ES/12 PC. These multiuser PC systems provide a cost-effective solution for small businesses, medical practices, financial institutions and companies with offices in many locations.

Designed for business, technical and manufacturing applications, the HP 700/43 display terminal ($475) is an enhanced version of the HP 700/41 introduced in August 1987.

HP also enhanced its HP 700/71 IBM 3191-compatible terminal ($695) by increasing the refresh rate from 64Hz to 72Hz and by adding the soft-white screen option at no additional cost.

Contact Hewlett-Packard, 3000 Hanover St., Palo Alto, CA 94304.

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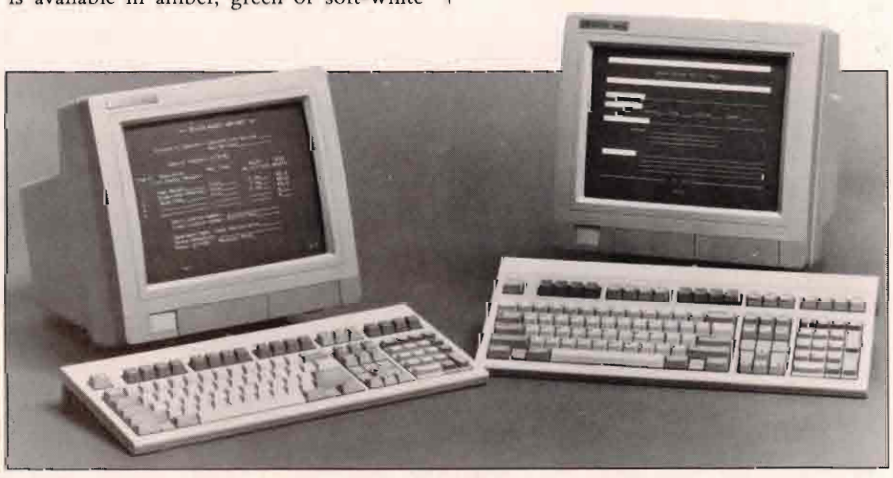

The HP 700/43 (left) is HP's newest general-purpose ASCII terminal. The 700/44 (right) is HP's first terminal for PC-based multiuser environments.

IOtech Enhances IEEE-488 Interface

IOtech, Inc. has updated its IEEE interface for PC compatibles to provide added hardware compatibility and easier-to-use software features.

Personal488 ($395) is a unique device driver-based interface that's easier and simpler to operate than standard subroutine-based interface products. Product enhancements include wider compatibility with other NEC 7210-based interfaces currently available; hardware improvements that allow multiple boards to share the same DMA and interrupt channel and built-in selectable wait-state generator so it can operate with the new high-speed PCs; and enhancements to the device driver software that make software code more readable and shorter by allowing the user to predefine an instrument's parameters such as its device name, IEEE address and terminators once.

Also included are several additional utilities that redirect IEEE data to the serial or parallel port so the user can command an IEEE plotter or printer from application-specific software such as Lotus 1-2-3 or AutoCAD.

The Personal488 is compatible with all popular DOS-based languages with no drivers or extra add-ons needed.

Contact IOtech Inc., 23400 Aurora Rd., Cleveland, OH 44146; (216) 439-4091.

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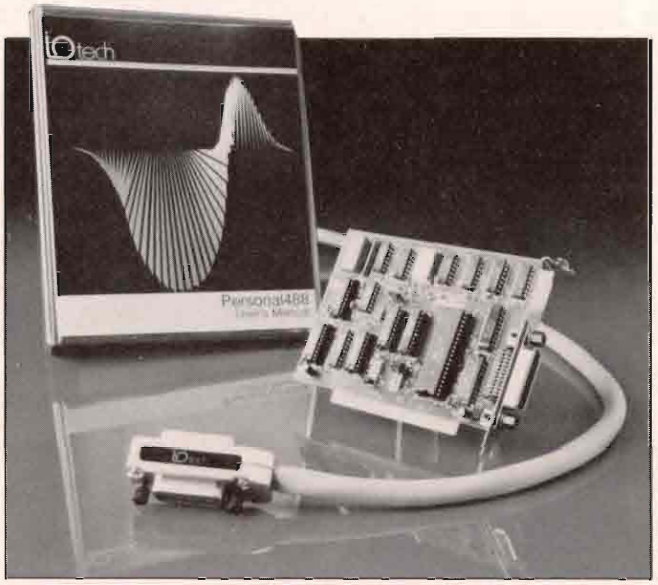

Personal488 is IOtech's updated IEEE interface for PC compatibles.

VOCOM Provides Integrated Software

VOCOM, a division of Dean-Michaels Corporation, recently announced the VOCOM Application Software solutions system that can be independently run or integrated in any fashion.

A global database is used and can be structured around user-defined accounts, units, projects or any combination thereof. This user-defined structure provides for reporting flexibility normally not found in standard accounting systems. The user can view the profitability of any entity such as company, division, department, profit/cost center, project, product line and more. The user can easily define whatever units and projects are appropriate for his business and report any combination of the units and projects desired. Reporting can be made for any date range and can be consolidated to any level.

The VOCOM system features modular structure to adapt to organization needs, complete integration and online editing for maximum accuracy, comprehensive security to limit access to vital information, online documentation for ease of operation, organizational structure by account, unit or project and extensive report writing capabilities.

The VOCOM system consists of nine modules:

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■ *Accounts Payable* ■ *Fixed Assets/Depreciation*
■ *Accounts Receivable* ■ *Payroll/Personnel*
■ *Purchasing/Receiving* ■ *Prospect Tracking*
■ *Inventory Management*

Contact VOCOM, The Dewitt Bldg., P.O. Box 847, Ithaca, NY 14851; (607) 272-8464.

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Cognos Launches PowerHouse PC

Cognos Incorporated recently entered the PC workstation market with the release of PowerHouse PC, a full-function version of Cognos' fourth-generation application development language that runs under DOS or OS/2 on 80286- and 80386-based PCs.

PowerHouse PC turns an AT-class PC into a workstation for serious application development. The product has built-in communications facilities that enable PowerHouse programmers to develop applications on a PC to run on a minicomputer, or vice versa.

PowerHouse PC will let you use the PC to run time-consuming jobs like large data entry and verification operations so that companies can free up the more expensive CPU cycles on mid-range machines and increase their staff productivity simultaneously.

PowerHouse PC includes all standard PowerHouse modules — a data dictionary, dictionary reporter, screen-design and data-input program, volume transaction processor and a report writer. In addition, there's a microcomputer file-format utility and a host connection program to provide terminal emulation and to transfer data files or complete applications. An import/export utility allows users to transfer data between PowerHouse PC applications and PC-based programs.

The product runs on IBM PC ATs or compatible 286/386 machines, including HP Vectras, DEC VAXmates and DG Dasher/286s, as well as IBM PS/2 Model 50 and up.

The minimum configuration DOS version requires 640 KB of RAM, and its OS/2 counterpart requires 2.5 MB of RAM.

Contact Cognos Inc., P.O. Box 9707, 3755 Riverside Dr., Ottawa, Ontario K1G 3Z4; (613) 738-1440.

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Continued on page 24.

CDMS Expands Typesetting Options

Syntactics Corporation has expanded the capabilities of the Crystal Document Management System (CDMS) (starting at $595), a software package that fully integrates word processing with a powerful document-format database and optional integrated typesetting.

With the introduction of LaserPak, an add-on product for CDMS, users can generate typeset-quality documents on HP's LaserJet printer family and on laser printers supporting PostScript.

LaserPak takes advantage of CDMS's automatic typesetting features such as defining parameters for fonts, point sizes and vertical spacing so that typesetting becomes a one-button operation. A document is laid out, fully typeset and directed to the printer with the press of a single function key.

With LaserPak, graphic images also can be incorporated into CDMS documents. Bit-mapped images from sources such as MacPaint can be integrated with text files with a simple command.

LaserPak is available in two versions — LaserPak/HP and LaserPak/PS. LaserPak/HP supports typesetting on the HP LaserJet printer family. It's available for PCs and Altos systems running XENIX, and for AT&T, NCR and Unisys UNIX-based systems.

LaserPak/PS supports typesetting on Apple, QMS and other PostScript laser printers. It currently is available for AT&T UNIX-based computers.

LaserPak is based on the technology of Syntactics' CrystalTypeset, introduced in November 1986 to provide HP LaserJet Plus support for CrystalWriter, a Syntactics word processing package.

Contact Syntactics Corp., 4655 Old Ironsides Dr., Suite 400, Santa Clara, CA 95054; (408) 727-6400.

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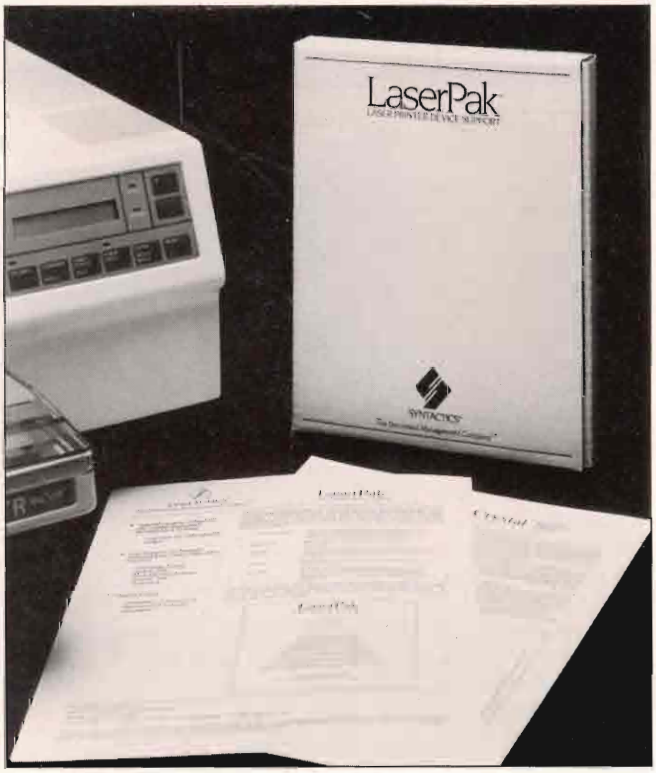

LaserPak allows CDMS users to generate typeset-quality documents on the HP LaserJet printer family and PostScript laser printers.

AMS Automates Porting From Series 80

Advanced MicroSolutions has announced a new release of its *HP Series 80 to Rocky Mountain BASIC Translator and Porting Guide* that automates moving from the obsoleted HP Series 80 computers. By using the AMS package, Series 80 programs and data can be moved to the HP 9000, Vectra PC or the IBM PC/AT running RMB with little or no programming required.

With the AMS Translator, the porting to the newer desktop computers can be accomplished in hours or days rather than the weeks, months or years required to manually translate the code.

This package automatically translates over 90 percent of all Series 80 keywords including ROMs and binaries. Documentation includes complete keyword cross-reference, porting instructions and an in-depth language comparison. While using the AMS Translator, users also will be learning the new language and system.

Contact Advanced MicroSolutions, 2510 Middlefield Rd., Redwood City, CA 94063; (415) 365-9880.

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CIA Exposes HP 3000 Secrets

FACER INFORMATION DESIGN has released its Australian product, CIA, into the North American and European markets.

CIA (CPU I/O Analyser) allows the performance of the HP 3000 to be monitored both online and in batch mode.

The online monitor has simple-to-use screen structures that allow the display of total or "filtered" process, CPU, memory and disc activity. It allows the queues of processes to be dynamically altered as well as give file equations, files being accessed and segmentation for each process.

The batch mode function allows CIA ($3,000) to collect performance statistics in background over a user-defined period and at user-defined intervals. At the end of the statistics collection period, a set of reports is produced that show the global, disc and process activity of the system over the statistics collection period. Both CPU and disc activity is also shown in graph form.

Contact FACER INFORMATION DESIGN, P.O. Box 270, Epping NSW 2121, Australia; FAX +61 2 484 5709.

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BACKCHAT Runs On HP PA 3000s

Proactive Systems recently announced the availability of its BACKCHAT distributed database software on HP Precision Architecture. BACKCHAT replicates databases in real time and provides distributed database solutions for users of multiple HP 3000s.

Following work under HP's FAST START program, BACKCHAT now is available for MPE/XL systems using NS as a communication link. In addition, it supports

Continued on page 84.

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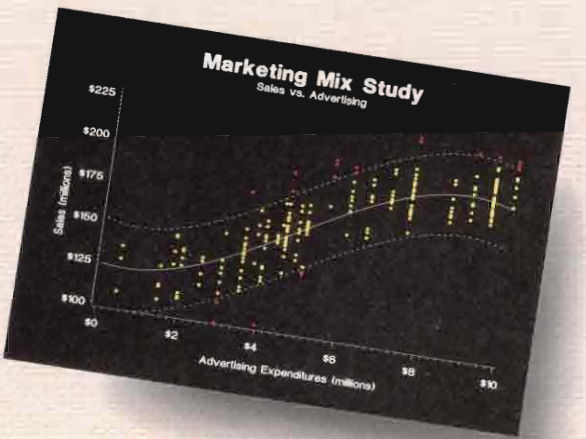

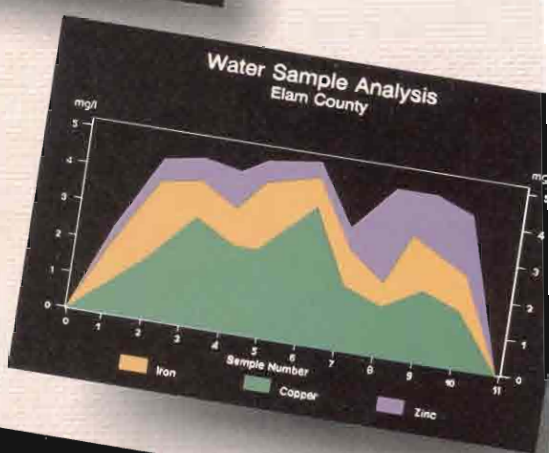

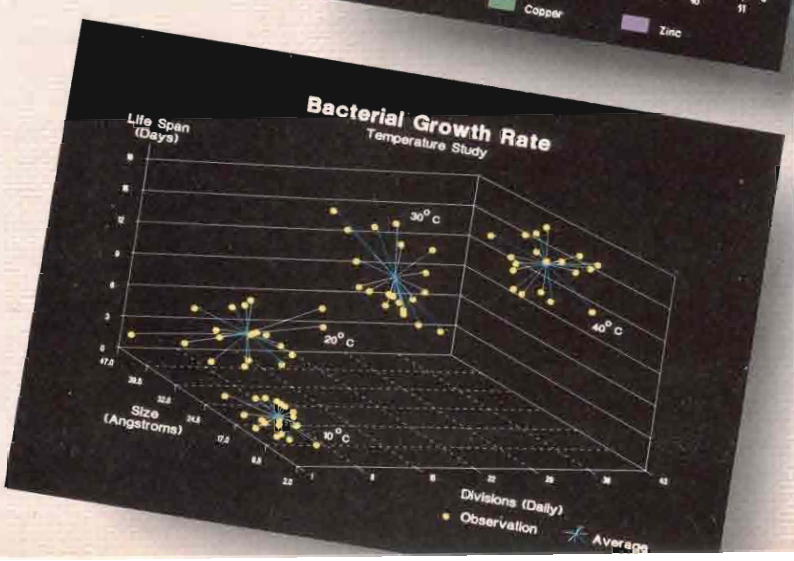

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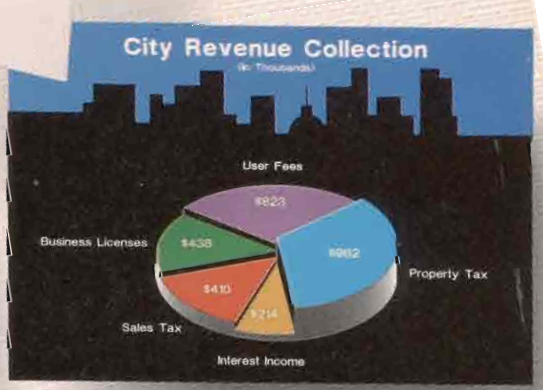
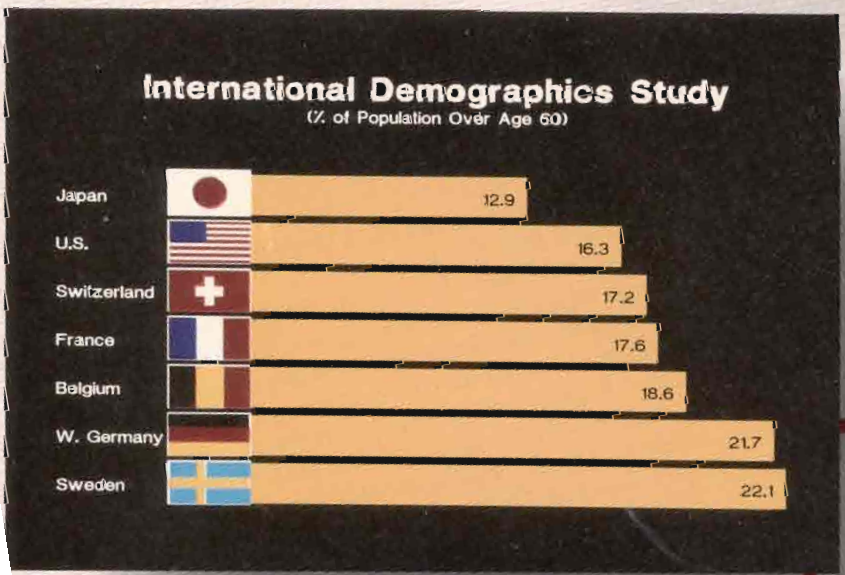
Interest Income	$207	7%	$214	7%
Sales Tax	$397	14%	$410	14%
Total	$2,763	100%	$2,867	100%





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Learning LAN Bridges

The Key To True LAN Connectivity

A LAN Bridge is an intelligent packet switch that spans two or more local area networks providing the path for internetwork data traffic as shown in *Figure 1*. The Bridge monitors data packet activity on each connected LAN and decides which data packets should be transferred from one LAN to the other. As a result, the Bridge functions as a data packet filter allowing only specific packets to travel from one LAN to the other: Packets that match a certain destination criteria (those destinations determined not to be located on the sending LAN) are transferred while others (those located on the sending LAN) are blocked.

With a LAN Bridge in place, any device connected to LAN-A in *Figure 1* can send data packets to any device located on LAN-B, just as if the sending device were directly connected to LAN-A. In a properly designed bridge, the LAN user doesn't even realize that the destination device is on another LAN.

A LAN Bridge takes advantage of the LAN packet format shown in *Figure 2*. Local area networks that obey one of the IEEE LAN standards such as IEEE-802.3 (Ethernet, STARLAN), IEEE-802.4 (MAP) or IEEE-02.5 (Token Ring) implement data packets having the format shown in *Figure 2*. Each packet contains a Destination Address followed by a Source Address and Data Field.

[By Tad Witkowicz]

The Destination Address identifies the address of the device to which the packet is being sent, while the Source Address identifies the address of the sending device. All data information, including the LAN protocol, are contained inside the Data Field of each packet. Each of the popular LAN protocols such as TCP/IP, XNS, DECNET, MAP, TOP, LAT, as well as numerous vendor modifications of these, utilize the packet format shown in *Figure 2*.

Because it is connected as a node on each of the two interconnected networks, the LAN Bridge receives all data packets on each connected LAN and compares packet Destination Addresses with an Address Directory it maintains for each LAN. Using this Address Directory, the Bridge determines which packets should be forwarded (bridged) to attached LANs.

Since the LAN Bridge examines only the Address Fields and not the Data Fields contained in each packet, the bridging process is protocol-independent (*Figure 3*).

A well-designed LAN Bridge has

the ability to build its own Address Directory by listening to data traffic and memorizing the different Source Addresses it encounters on each of the connected LANs. It stores all Source Addresses in local memory which is used as a directory. This type of Bridge is known as a Learning Bridge. Its key advantage is ease of use since it is a "plug and play" device requiring no user programming or setup.

Important Bridge features include:

Protocol Independence. LAN software protocols exist in many standards such as DECNET, TCP/IP, XNS, TOP, MAP, OSI and LAT. Many LAN vendors have taken pieces of LAN protocol standards and adapted them to their own products resulting in incompatible standards. For example, a well-known personal computer LAN offers Novell and 3Com protocols, each using XNS, yet the LANs are incompatible because the protocols have been modified.

It's essential that a LAN Bridge be insensitive to the LAN protocol or its usefulness becomes extremely limited. An XNS-dependent bridge can pass only XNS packets from one LAN to another. This becomes a problem if a user wants to install TCP/IP or DECNET devices on each LAN. Those devices would be unable to communicate with their peers located on the other LAN because the XNS-dependent Bridge can pass only XNS packets.

FIGURE 1

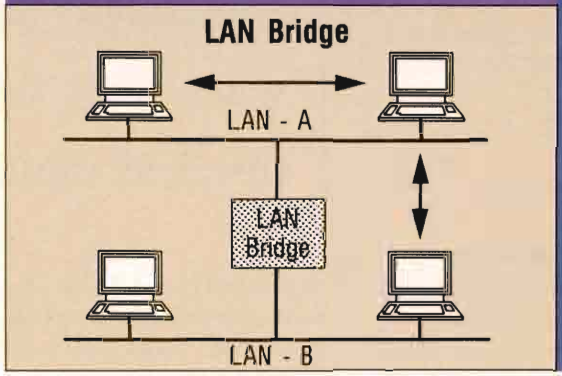


FIGURE 2

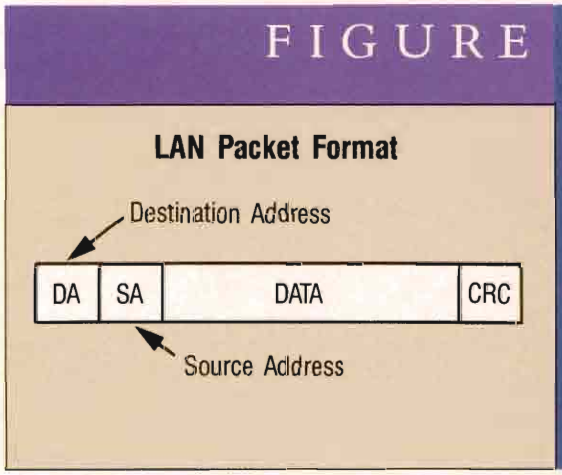
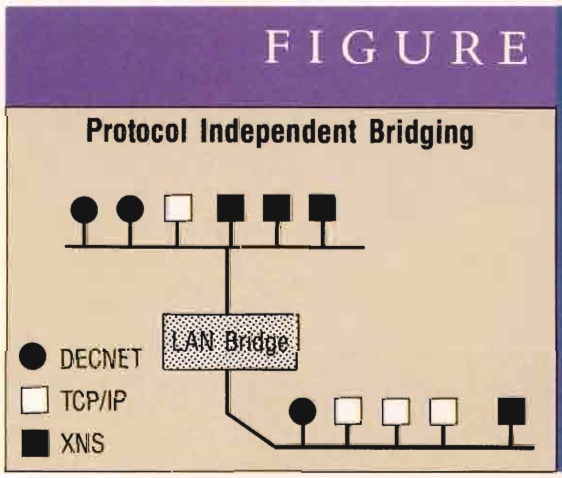


FIGURE 3



Fast Filter/Transfer Rate. A key performance parameter for a LAN Bridge is its ability to filter (examine) a large number of packets in a short period of time. A LAN Bridge must be able to examine all the packets that appear on each LAN. This requirement exists because the Bridge has no way of knowing whether or not a given packet needs to be transferred until it receives the packet and compares its Destination Address with its Address Directory.

Consequently, if the Bridge is unable to keep up with the traffic on the connected LANs, it will miss data packets that may have been destined for the other LAN. When this occurs, the sending device must retransmit the packet, thereby incurring a delay in its ability to communicate with its peer on the other LAN and unnecessarily increasing local traffic.

Once the Bridge determines that a packet must be transferred to the other LAN, it must perform the actual transfer from its memory. This transfer must be done quickly so that additional packets can follow.

If the Bridge is unable to keep up with the traffic-generating capability of the two connected LANs, packets will be lost, causing a communications bottleneck as well as creating unnecessary and excessive LAN traffic.

Connecting Dissimilar LANs. The ability to bridge dissimilar LANs such as Ethernet and Token Ring or Ethernet and STARLAN is becoming an important requirement in the implementation of LANs. Because different LAN standards operate at different data transmission speeds with different cables using different priority schemes, a Bridge that connects dissimilar LANs must be able to perform the bridging function described earlier and convert the standards (speeds, topology

consideration, etc.) as well (see *Figure 4*).

This important capability allows a LAN user to select the type of wiring scheme, transmission speed and LAN standard that's most effective for his specific situation. As LAN protocols (LAN software) become available for the different standards, the user will be able to maintain full functionality regardless of the LAN standard employed.

Key To Internetworking

INTERNETWORKED LANs or ILANs represent an important development in the ability to implement local area networks. The ILAN concept solves the connectivity problem created when large LAN users have installed multiple LANs, using multiple LAN standards, purchased from different vendors and located at multiple sites within a corporation. Here are several examples of ILAN in use:

Backbone LANs. An example of a Backbone LAN is shown in *Figure 5*. In the figure, a coaxial cable Ethernet is used, although the Backbone also could be Fiber Optics, Broadband, Token Ring or any other convenient networking standard. LAN Bridges are used to connect smaller departmental LANs or subnetworks to the Backbone.

The Backbone is the data highway for internetworked packets. Each of the LAN Bridges monitors data traffic on its

> The ILAN concept solves the connectivity problem created when large LAN users have installed multiple LANs . . .

[WHAT IS A LAN BRIDGE?]

With the growth of the LAN market, several new devices have been created that make implementation of LANs more straightforward. Here I'll describe LAN bridge devices from the nontechnical perspective. It explains what they are, what they do and how they're used.

Before proceeding with the LAN bridge description, it may be useful to describe a LAN in nontechnical terms. Imagine a small country with cities, towns and villages that, in our simplistic model, represent different computers located throughout a corporate facility. The need to communicate between the different cities, towns and villages, and the benefits that are derived from such communication are clear.

Suppose that, in our model country, people communicate by sending messengers between the different cities, towns and villages. There are many messengers traveling around, each one carrying information from one specific location to another. In order to provide the messengers with a means of getting from one location to another, our model country has built a system of roads designed to accommodate the country's geographical size, number of traveling messengers and other factors that are specific to this particular country. The entire network of roads, messengers and methods by which they travel and traffic laws comprise this country's communication network.

In our analogy, the computers are connected by wires or fiber optics (roads) which they use for sending data (messengers) to each other. The way the data travels, its speed and transmission methods are the "traffic laws" that govern the network. The communications system just described is what's known as a local area network or a LAN. It gives computers and the people who operate them the ability to communicate and share data files, printers, modems and data storage devices. This capability enhances each computer's functionality and its usefulness.

Unlike many technological innovations, the LAN bridge does exactly what its name implies, that is, it bridges two networks. To continue our analogy, imagine that there are now two countries separated by a body of water. A bridge will be used to "interconnect" the two countries.

It's reasonable to assume that there are differences as one travels from one country to the other. For example, one country has cobblestone roadways while the other has six-lane divided highways. Using the same reasoning, the speed limit in one country is 35 MPH while it's 100 km per hour in the other. Other traffic laws, such as the side on which people drive, presence or absence of one-way streets, etc., also are likely to be different. The bridging device must take these differences into account when allowing messengers to pass from one country to another.

Technologically, the two countries actually are two different networks. One might be composed of fiber optics while the other uses coaxial cable. It's not important to understand the detail of the networks any more than it's necessary to understand why two countries have different traffic laws. What's important is that traffic going from one country to the other is able to adapt itself as it crosses the bridge in either direction.

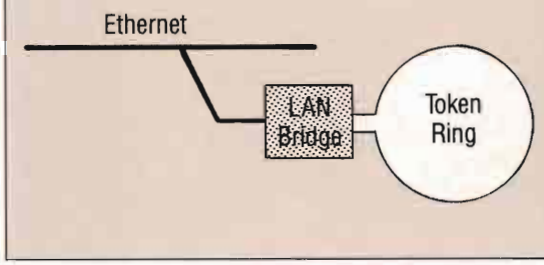
LAN bridges perform exactly this function. LANs operate at different bit rates (speed limits), over different media (road beds) and with differing topologies (beltways, thoroughfares, one-way streets, etc.). The LAN bridge must take data packets (messenger traffic) and change their orientation so they effectively can travel from one network to another without violating the "local laws." The LAN bridge, in essence, "retrains" the messengers so they safely can travel from one country to another.

The LAN bridge performs another important function. It controls which data packets (messengers) are allowed to cross the bridge. Clearly, if the messengers have no business to conduct in

respective subnetwork and forwards (bridges) packets to the Backbone if they are destined for addresses on other subnetworks. At the same time, each LAN Bridge monitors the Backbone for data packets destined for addresses located on its local subnetwork. After identifying such a packet, it forwards (bridges) it to the subnetwork.

FIGURE 4

Bridging Dissimilar LANs



This type of network replaces a single large network, but offers several important advantages. First, a much larger geographical area can be covered than with a single LAN. LAN traffic is localized to the individual subnetworks resulting in less traffic experienced on each subnetwork. At the same time, the LAN Backbone still provides full connectivity allowing any device on any subnetwork to establish a communication path with any other device on any other subnetwork.

LAN Bridges ensure that connectivity is protocol-transparent, giving users the convenience of mixing vendors and applications and allowing them to connect any device anywhere on the entire network. As a result, any user can access any corporate resource regardless of its location. Finally, the backbone allows the use of smaller subnetworks which can be implemented with lower cost

the other country, their passage over the bridge will only add to traffic congestion and impede the progress of those packets that do need to get over to the other side.

Control is accomplished by putting on the bridge an immigration officer who screens the approaching messengers and determines whether or not they should be allowed to cross. Technical implementations of this process vary. In some cases, the "immigration officer" talks to the messengers to determine where they want to go. In other cases, he simply looks at the destination and return address on each message carried by the messenger and automatically makes the decisions.

The performance of a LAN bridge is judged on the basis of how many messengers are processed by the "immigration officer" on each side of the bridge and by how many passengers can travel over the bridge in any given time.

A well-designed LAN bridge must be able to accept many data packets from attached LANs, examine their destination and source addresses, and transfer only those that need to cross the bridge. In a typical application where two Ethernet LANs are being bridged, the bridge device ("immigration officer") must be able to process as many as 30,000 data packets per second and transfer over 9,000 packets per second.

Another important characteristic of a LAN bridge is its ease of use. Clearly if the bridge is to decide which data packets are allowed to cross from one network to another, it must have *a priori* knowledge about the networks and the type of devices that are attached to it.

The best bridges are designed to automatically learn the locations of all devices on the two attached LANs. The bridge builds a directory of names that represent devices on the two networks, then uses the directory as the database for making transfer decisions.

Therefore, if the bridge sees a data packet on LAN "A," it consults its address directory and determines whether the destination address of that packet is for someone who resides on LAN "A" or "B." If the destination address is on LAN "B," it transfers the data packet from "A" to "B." If, on the other hand, the destination address is on LAN "A," then no transfer is necessary.

The self-learning process makes the operation of a LAN bridge easy. In fact, LAN bridges are much more difficult to explain than to use. A well-designed product requires absolutely no user involvement. It needs only to be attached to the two networks and powered up. The rest is done automatically.

The real world of LAN bridges is a complicated one because there are many LAN designs that are very different. There are at least five recognized industry standards that are used to design LANs and several proprietary designs as well. It's very common to find that a customer may have installed two or more different LAN standards to satisfy his particular computer communications requirements.

This multinetwork and multistandard LAN environment requires that many different LAN bridges be available to the customer so he can interconnect all of his LANs together into a company-wide network. For example, if there were only three LAN standards (such as the ones offered by IBM, DEC and AT&T), this would create the need for six different LAN bridges: DEC-to-DEC, DEC-to-IBM, DEC-to-AT&T, IBM-to-IBM, IBM-to-AT&T and AT&T-to-AT&T.

Because there are actually five LAN standards and several other communications networks that may require bridging, there are requirements for over 30 different LAN bridge designs.

Going back to our analogy for one more point, it should be obvious that it makes little sense to use a single style of road (freeway, two-lane, one-way street) throughout a country. By the same reasoning, it makes little sense for a corporation to design with a single type of network when interconnecting computers.

Fortunately, LAN bridges are appearing on the market that allow the interconnection of fiber optics, coaxial cable, twisted pair wiring and the like. These bridges assure the LAN user the ability to interconnect his networks together to achieve the maximum potential of his computer installations. ■

technologies such as Cheapernet or STARLAN.

LAN Traffic Reduction. The packet filtering feature of a LAN Bridge is commonly used to solve LAN congestion problems. A busy network such as the Ethernet shown in *Figure 6* can be subdivided into two or more smaller segments which are connected with LAN Bridges. Devices on one segment still communicate with their peers on that same segment.

The important difference here is that this intersegment traffic is local: Bridge filtering prevents this intersegment traffic from appearing on the second segment since only packets that are addressed to devices on the second segment will be allowed to pass.

Thus the local packets don't unnecessarily congest other segments. The result is a substantial load reduction on each of the two LAN segments with no sacrifice in connectivity or performance.

Remote LAN Connections. Connecting LANs in remote offices or divisions can best be accomplished using protocol-transparent LAN Bridges. Remote LAN Bridges provide bridging and data communication interfaces in a single unit. Each remote LAN Bridge monitors packet traffic on its LAN, capturing those packets destined for remote locations. It converts these packets into serial data format for transmission over telecommunication lines like 9.6 KB/sec., 56 KB/sec. or T1 *(see Figure 7)*.

At the other end of the serial link, the serial data is converted to the appropriate LAN standard and transmitted to the attached network. Bridge filtering assures that only those packets destined for remote locations are transmitted over the serial links. This allows internetworking to take place on relatively low-speed leased lines saving recurring line costs.

Protocol-independent remote Bridges further reduce cost by allowing many LAN users to send data to their remote peers without having any protocol restrictions or limitations.

This is in sharp contrast to remote Bridge capabilities provided by the suppliers of LAN File Servers. The latter requires that a telecommunication line be used for connecting LAN devices that use only that vendor's protocols.

FIGURE 5

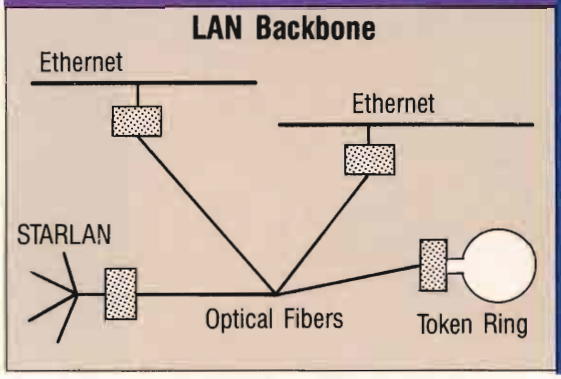


FIGURE 6

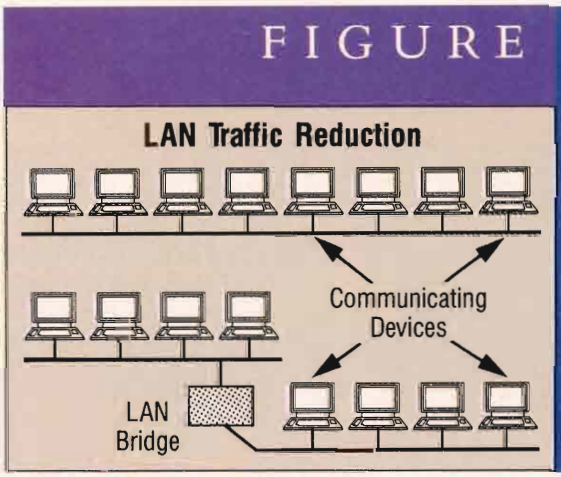
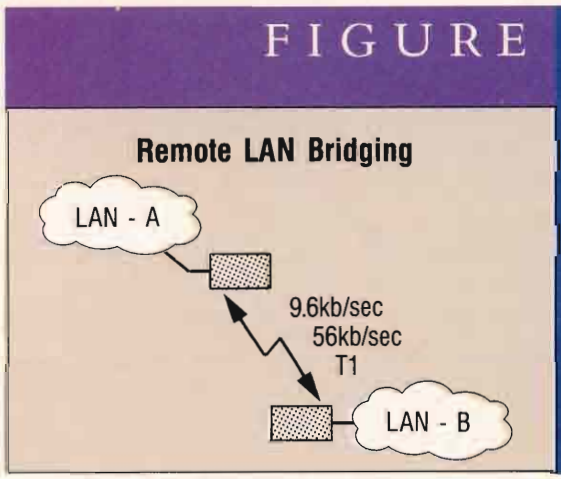


FIGURE 7



THE ABILITY TO transfer data packets between different LANs independently of LAN standards or proocols is a feature that no other LAN product offers. LAN Bridges often are 10 to 100 times faster and significantly less expensive than other internetworking products such as routers or gateways. The nonintrusive nature of the Bridge and the resulting simplicity of application and maintenance also are major advantages.

As the need for internetworking of LANs continues to increase, the only device that maintains network performance and economy is the ILAN Learning LAN Bridge. *—Tad Witkowicz is president and founder of CrossComm Corporation, based in Marlboro, Massachusetts.*

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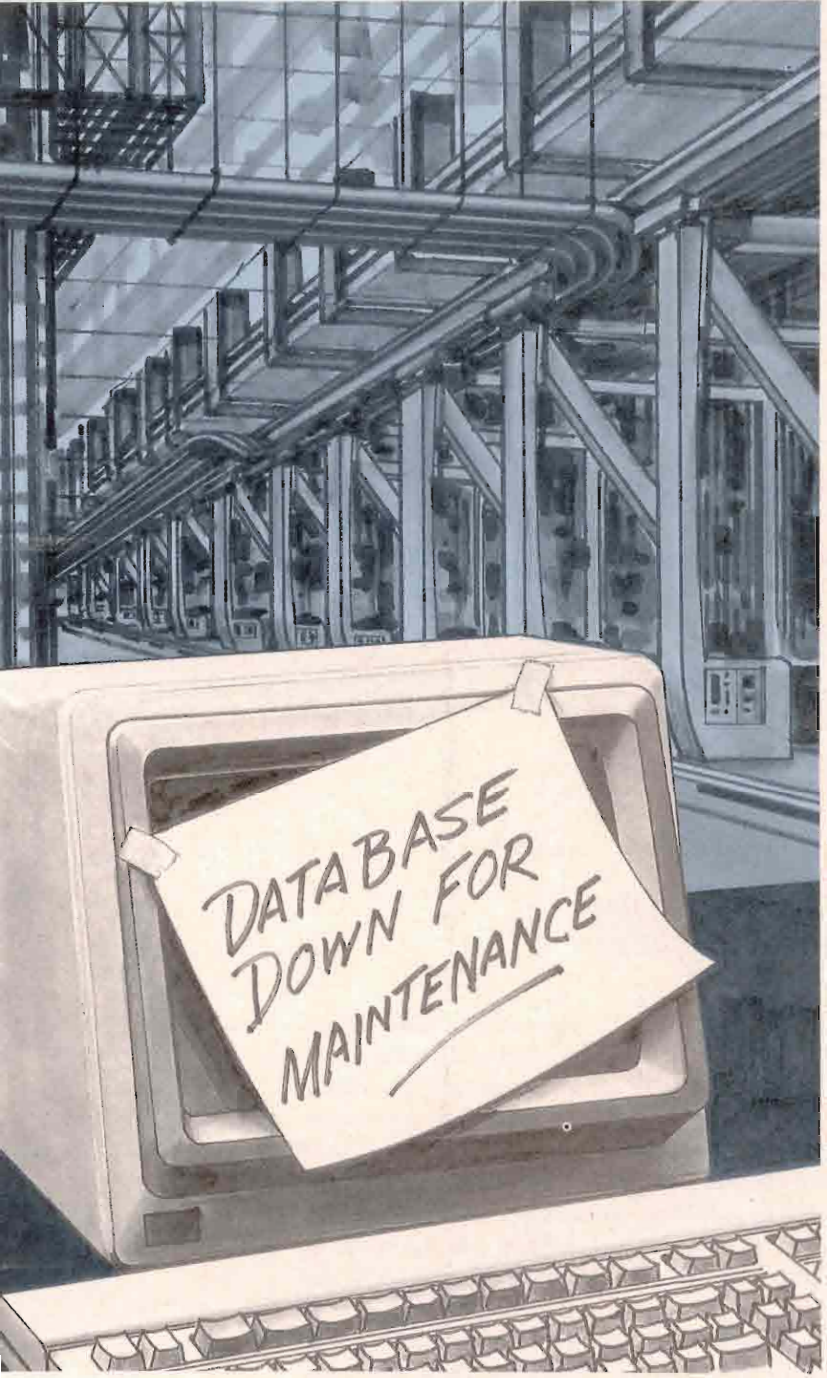

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The Best And The Worst Of The Microcomputer Compatibility Sideshow

Compatibility

[By Don Person]

Compatibility with the PC standard is an elusive thing. Architectures matching HP's own computer standards are for all practical purposes nonexistent outside the HP product line. I'm not including problems between HP models and operating system variations within lines in the HP captive market already. In the past two years, I've been facing the best and the worst of the microcomputer compatibility sideshow. Let me outline the dimensions of the problem for you.

Normally, if all your programs work the way you want on an IBM PC XT/AT (you fill in the letters), and each functions identically and accurately in the time domain on another computer, then the other computer is said to be "compatible." On the other hand, if a program doesn't work, data can't be exchanged, programs run but feel like they fell into the honey jar, or you add one more program to your suite and suffer a crash, then you have an "incompatible."

HP seems to have specialized in making IN-compatible PCs for as long as they've been mucking with MS-DOS. Mostly this has been attributable to the "creeping feature creature" syndrome that the in-house BIOS playboys can't seem to shake. Take the basic machine and mess with the operating system to add something proprietary (like touch, for instance) and you make the resultant box just that much less compatible with the IBM device you've tried (and failed again) to clone. That has become HP's specialty niche — maker of Almost PC and Almost UNIX clones.

There are other less innocent factors, but viewed charitably, that's the picture. Can you name all the UNIX hardware providers who can interchange disc information with HP-UX? Hint: The answer is believed to be in the region bounded by zero and none.

Time domain decoupling effects are the single most troublesome side effects of so-called compatibility packages. The problems range from the subtle to the obvious. This is the "honey jar" I mentioned. Products like the Viper simulator amply demonstrate it. A program runs on an alien "compatible" system, but the time domain performance is completely wacked out.

The situation is seen at its worst in simulators created totally in software, and this applies as much to devices running under MS-DOS as it does to the complement. It's a level of problem that's really beyond the scope of mortal user intervention.

What then is to be known about HP file compatibility that can help you beat the odds and actually move files at will?

Here are answers to three common questions I'm repeatedly asked by customers in need of support for non-HP compatibles.

QUESTION #1: Why can't programs be interchanged between the PC and HP?

This is far more complicated than you think, because so often the petitioner isn't sure of what he's asking. Let's break this down a little further.

First, from the MS-DOS side of the fence. If the "program" is executable (EXE or COM), there's no hope, short of running it on an HP-PC clone in the Vectra line. Hopefully, the Vectra will have Phoenix BIOS Version B or beyond. If this is true, you have a 95 percent compatible and all major programs will run.

With the exception of keyboard drivers, the ES series has come as close to pure PC compatibility as you'll find. Of course you'll want to use Vectra DOS version 3.2; take my word for it! Upgraded as it has been, there still are nasty surprises.

If you run a standard IBM AT or clone keyboard on a Vectra ES-12, it eventually will lock up. While it works, it only has half the key-repeat rate experienced when used on a real AT. It appears that the ES may subtly damage non-HP keyboards. Two different keyboards that I was foolish enough to use on an ES failed after a while in rather peculiar ways.

If you have an older Vectra, the best way to get compatible is to install the BIOS upgrade right away. There's no help for upgrading the pathetic Human Interface Loop (HIL) keyboard at all. HIL would be better named InHuman Interface Loop, since it was another of those incompatible HP better ideas that blessed us with the IHIL mouse and a plethora of keyboard interface problems, most notoriously of the Honey Jar variety. That was a major incompatibility factor in the first generation of standard Vectras.

Other than the HP-UX MS-DOS adaptor that runs MS-DOS as a child process under HP-UX (at significant cash and time expense) there's no other HP computer that can "play" an MS-DOS program.

Now another view: Many HP micro folks really are talking about some version of HP-BASIC or PASCAL when they ask the question. There's some source code compatibility between HP and MS-DOS languages, but when we get down to a discussion of just what lines up, there still is precious little. Sometimes, there's hardly more than the line numbering to take comfort in. Since MS-DOS exclusively is an INTEL processor operating system and HP has "standardized" on combinations of Motorola and pure proprietary CPUs, you can see how essentially hopeless this is.

If you can move the source code to a language compiler with similar syntax, and you're willing to put in the time to do a whole new round of debug and keyword swapping, there's a ray of hope. Just how much hope depends strictly on how much you plan to make use of unique hardware features.

As I've discussed in the past, there's good support for HPIB, IEEE-488 input/output on PC-AT class computers. Serial I/O and parallel output are somewhat transportable from HP to MS-DOS, but the converse requires more sweat.

Any program that depends on READIO, WRITEIO, STATUS, CONTROL or specialty hardware doo-dads like BCD or GPIO ports will move the conversion up near the end of the scale of difficulty. In all likelihood, you'll have to learn C or assembly language to do what you want. Keyboard and CRT compatibility is pretty much out of the question.

The balance tips plainly toward the differences as soon as you get beyond simple PRINT DISP WRITELN statements. First-degree rework is the order of the day, and auto translation is considered pretty much a joke for other than code of such simplicity and brevity that you wouldn't bother to convert in the first place.

FileSwap-PC and other programs make it physically possible to move data and programs stored as string data back and forth between HP and MS-DOS computers, but there's no translator on the market that approaches completeness in auto translation for MS-DOS. This is hard manual labor should you be desperate enough to make the move.

QUESTION #2: Why can't I read HP discs on another computer? When I copy BDAT files using a file translator, the result is crazy garbage. LIF files copy okay, so why won't BDAT move?

This is almost a corollary to number one, but opens a larger worm can. Let's take the simpler problem first. This gets right to the heart of a design-level decision that HP made way back in time.

It all started innocently enough with that venerable antique HPL. Specifically, data typing in BDAT files is controlled by the program that writes the file, NOT the language/operating system! This isn't a problem in itself, but there's no mixed typing identity provided for mass storage records.

The only other storage choice is LIF-ASCII, which per-

mits only serial strings to be read or written. Of the HP BASIC languages, only Series 80 BASIC and technical BASIC for the Integral provide data markers in record files, and that leaves Rocky Mountain BASIC programmers staring at one of numerous dumb throwback aspects of their language.

It's a tough choice. Use mixed data records or give up random access for compatibility. This could've been cleanly addressed if the RMB crew had decided to include a new random record structure when they bloated up the 5.0 version.

Here are your choices: Either program so that files are stored as LIF (which is a very nice interchange format) or serial port. Believe it or not, there's no way for a conversion program to know the structure of BDAT records without data headers. BDAT files physically can be moved, but the copy is still the binary image.

Are there any hot-shot programmers who can read a BDAT file without seeing the code that wrote it and successfully tell whether a record contains a collection of integer zeros or just null ASCII strings? No! Integer zeros each contain two ASCII zeros, while a null string is marked by four ASCII zeros. There's no difference between a program that writes two integer zeros or one that writes a single null string. The only way to make disc transport possible is to examine the program that creates the BDAT file and to make an intermediate program that reads the data types as they were written, and then dump the data as a string or its VAL$( ) equivalent into a LIF-ASCII serial file. At this point, FileSwap or other translators can move it with ease.

The exceedingly wise choice of Series 80s designers to nip this problem is the main reason it's so much easier to move files from that family today. In Series 80, every datum has a unique way to identify its type, even if read on an alien machine. Know the header code and you know the file.

Now back to the first part of the question. Since we know that HP programs have unique data structures and a common compatibility format (LIF), it should be no surprise to find that a parallel also exists with MS-DOS.

Spreadsheets, word processors and graphics programs almost universally use proprietary formats (read undocumented), but usually include DOS ASCII as an option. This is what allows simple translators a shot at HP data in the first place. DOS ASCII prints ordinary strings terminated by a carriage return and linefeed pair. While not as flexible as LIF, since it can't convey character 13 or 10 as legal data, it's at least nearly universally recognized. This also happens to be the standard way text is stored under good old HP-CP/M.

To be sure of making a transform possible in a bidirectional sense, be sure to store "compatibility" data as ASCII on either medium. This is the sure way to move numbers into spreadsheets and text between documents. If the data is binary in nature, it still can be moved, but you'll have to do some amount of programmed conversion on the target side of the move.

And then we have the nasty ASCII Z-string "convention" promulgated by UNIX and the C programming language. Terminating strings with the ASCII zero character may appeal to Eunuches, but not to me. It's no better than the CR/LF combination I've already mentioned, and in other ways it's a lot worse. Making character zero illegal raises hell with translation, and if this is your lot, I only can offer my condolences. HP didn't bite you here; this is a problem bigger than both of us.

QUESTION #3: What can I do to make files produced by the Integral and larger HP-UX computers transportable to other computers?

When I'm feeling facetious, I usually ask if the poor sucker knows where his serial port is. Disc organization under UNIX is pretty weird and HP-UX has moved bad to worse here. The folks in Corvallis have some one-way data transport tools for the Integral that make it read Series 80 and some version levels of MS-DOS, provided you have access to ss/80 disc drives.

If you have the larger desk models in the 300 family, you have the pricey option of running the MS-DOS compatibility plug-in. If data exchange is the only object, I hope your bank account is well charged. Otherwise, the old serial connection really starts to look attractive. For real-time users, HP-UX has been difficult enough, but the striking lack of data portability adds insult to injury.

HP is making strides to catch up with the rest of the PC-compatible industry. Unfortunately, even simple upgrades come a year or more after lesser-known innovators already have done the same thing. Simple add-ons like the 3½-inch drive and a DOS able to support them are a prime example.

You see, the compatibility issue will never be resolved, and for a good reason. HP doesn't really want the problem any more "solved" than it already is. We all know or suspect comfortable profit margins in the hardware HP sells us, but there are really terrific profits to be had elsewhere, and HP knows it.

By going to an extreme with the 150, HP learned that there were limits to what its sales force could do. We all stopped short of buying into an "open" system still rife with proprietary features. Flying tangentially to the established force of the genuinely open PC standard, HP learned that nobody with money and good judgement really wanted to buy a specially modified version of Lotus 1-2-3 and still not be able to exchange spreadsheets with IBM PCs.

This was the case with a lot of popular PC software that had to be converted to run on the Touch family, and still was incapable of anything approaching what you and I think of as easy data transfer, unless of course you count the HP-supplied terminal program that lets you connect your 150 to an HP-supplied minicomputer running HP-supplied system (and probably applications) software supported (and

understood) solely by your friendly HP staff.

This overall slant keeps independent repair service out of the picture, since only HP has the information and parts to keep your equipment running. I shouldn't have to explain what the economics of a captive market do to you. Usually your experience teaches that well enough. Perhaps now you know why HP has its own part numbering system. If you knew that the dead IC with the alien part number on the top was in fact a relabeled 74LS05, you wouldn't have to run to HP or pay so much. There's nothing in it for HP if you can fix a dead machine with generic parts.

For example, your IBM PC/AT power supply gives a great puff of smoke and everything comes to a halt. Finding no obvious short circuits on any of the outgoing supply pins, you decide that the power supply is indeed the problem. Almost anywhere in the country, you can buy a replacement power supply for about $100 or less. Installation is accomplished with a screwdriver in under a half hour, and you're back in business.

Suppose you have a Vectra AT. HP has chosen a profile, mounting and power switch method that's incompatible with the vanilla design that virtually everyone else uses. The bottom line is that the same repair will cost you up to $400 unless you've bought into the service contract numbers game. You'll pay about $200 per year to carry this HP-supplied insurance, and here we see another way that not addressing compatibility issues feeds the bottom line at HP. If you don't feel confident that anyone but HP can service your equipment, you're an easy mark when the sales force circles around to sell you some really lucrative stuff — the service contract.

Profits here can put even software to shame, and this is the big gotcha that HP has been protecting. Should HP make a fully compatible clone and risk defectors to third-party vendors for the whole range of options from software to service or continue with a minimal market share of captives? HP's choice has been pretty obvious. The company response has been to do no more than necessary with microcomputers, while moving all the research and development dollars upscale into the minicomputer line.

In spite of management's myopic obstinacy, HP languages like RMB still pull their weight, but just barely. Throughout the product line, old age is beginning to tell. Wake up, HP. Like it or not, MS-DOS machines are the standard for data analysis and word handling. While you drag your feet on MS-DOS issues, those of us who have to live with the consequences are more tempted to break the chains. There's nothing like the scorn of a betrayed lover, except perhaps a clone buyer.
—Don Person is an independent consultant based in Albany, NY.

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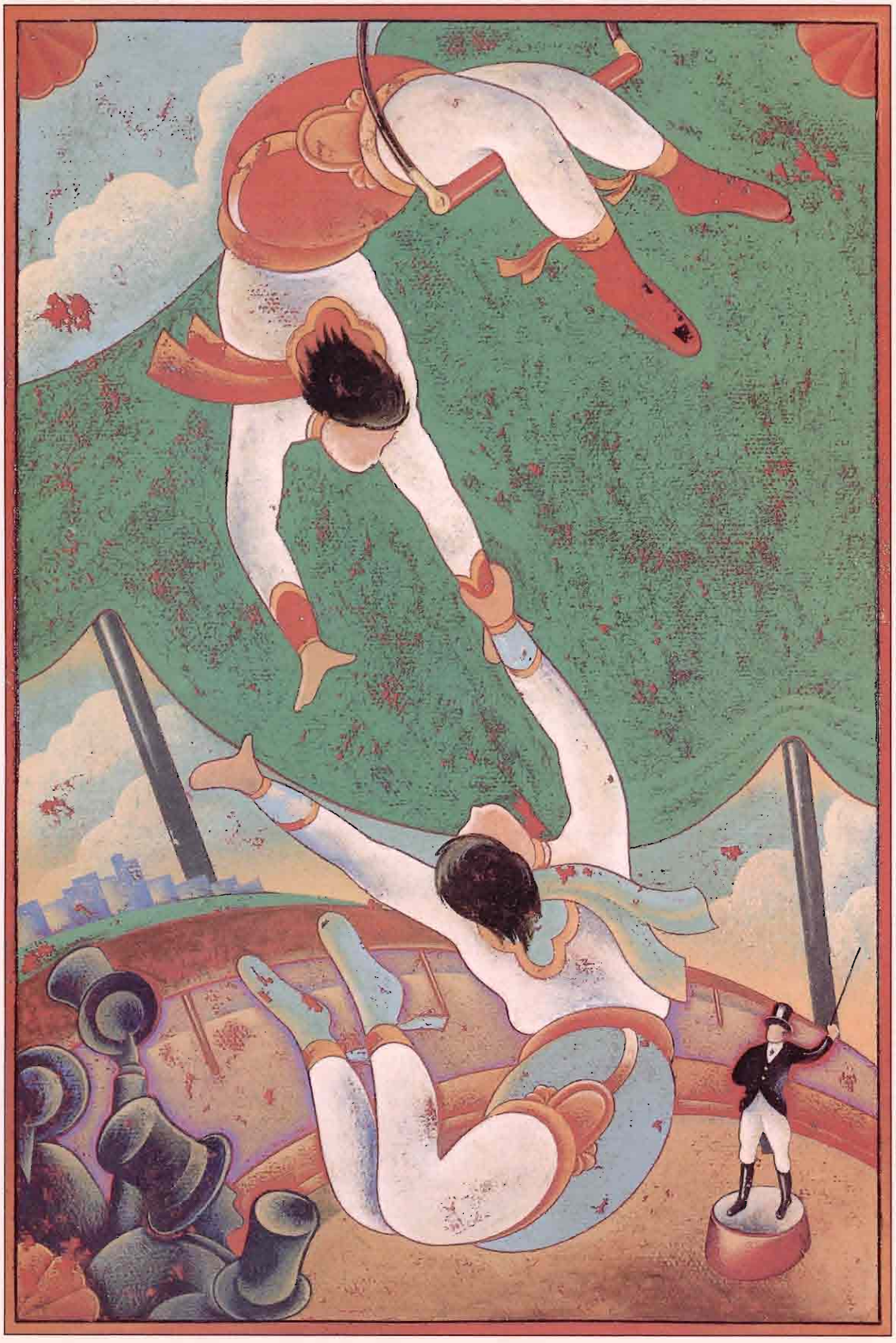

Connectivity And Communication

Improving Research And Development

Thousands of data communication networks are deployed worldwide to enhance the ability of data users to communicate with one another. These systems range from small networks interconnecting data terminals and computers within a single building or set of buildings, to large geographically distributed networks, covering entire countries or even the globe. The future should see wide, information laden networks spanning the globe as well as the orbit of the planet and the moon. The foundations of network topology and communication theory lie firmly in mathematics (graph theory for topology and the Fourier transform for modulation theory).

Ever since computers were first developed, the need arose for connecting the machines to share information. Communication between machines is a natural progression of technology. The study of the optimum configuration for the connection between computers includes ongoing research in graph theory, queuing theory and algorithmics. Often, advances in theory have immediate benefits to the user community and the research is well supported by telecommunication and computer companies such as Hewlett-Packard, GTE, AT&T, IBM and Digital.

[By Dr. Michael M. Dediu]

TWO TYPES OF NETWORKS and data flow management are packet switching, used to improve data communication, and circuit switching, used in telephone networks. Both technologies now may be considered vehicles for the integrated transmission of voice, data, video and other traffic.

In packet-switched technology, blocks of data, called packets, are transmitted from a source to a destination. Source and destination can be user terminals, computers, printers or any other types of data-communicating and data-handling devices. In this technology, packets from multiple users share the same distribution and transmission facilities.

Other networks are of the

circuit-switched type, most commonly portions of common telephone networks. In these networks, which generally transmit voice or data, a private transmission path is established between any pair or group of users attempting to communicate, and is held as long as transmission is required.

Integrated networks, combining aspects of both packet- and circuit-switched technology, are now beginning to be deployed. They are expected to dominate the field in the 1990s or later.

The most common types of traffic handled are: interactive data, generally transmitted in short bursts of a few characters, to as many as 400 to 1000 characters between terminals and between terminals and computers; file transfer, involving the transmission of up to millions of characters (or bytes) between computers, or between mass storage systems; and, increasingly, digital voice. Facsimiles, images and other types of traffic are being considered for transmission as well.

> Since computers require transmission rates far in excess of those possible over telephone lines, dedicated computer networks are necessary.

THE MOST COMMON communication networks today are the telephone networks. These are designed for voice communication and the technology is analog. Although telephone networks are used extensively for voice transmission, data signals normally must be converted (modulated) to voice-type analog signals using MODEMs (MODulator/DEModulator). This limits the rate of transmission of data to at most 14.4 kbps (9600-bps is a more common limit, due to noise), and then only using private, specially conditioned transmission facilities. Errors arise due to inherent noise. Therefore, error-correcting modems now are becoming the norm. Without error correction, transmission over dialed public telephone networks accommodate data bit rates of 300 to 2400 bps.

Digital modulation of voice onto digital networks is becoming more frequent with the introduction of fiber-optic transmission media. The switch to digital networks is a great advantage to data transmission, since transmission rates will exceed 1.544 Mbps (the T1 system). This type of digital carrier transmission is used extensively for so-called short-haul communication, up to 25 miles. The advent of long-haul fiber optic transmission systems will expedite the transition to all-digital telephone networks.

When telephone networks become all digital, any kind of data, whether of the interactive data type or computers communicating with one another, digital voice or digital images could traverse a network. Each type might be handled differently, or some could be multiplexed.

Since computers require transmission rates far in excess of those possible over telephone lines, dedicated computer networks are necessary. These networks are usually called local, since they don't span great distances. There are three types of local networks: local area network (LAN), high-speed local network (HSLN) or local computer network (LCN), and computerized branch exchange (CBX).

A local network is a network of terminals, hosts and other devices that are physically close. The nature of a local network falls somewhere between a multiprocessor system and a long-haul data network. The characteristics of local networks are:

- *High data rates (0.1 to 100 Mbps)*
- *Short distances (0.1 to 50 Km)*
- *Low error rate [10exp(-8) to 10exp(-11)]*

The benefits of implementing a local network include the potential of system evolution, high user availability and resource sharing. The problems that a local network can create are inoperability, lack of security and data integrity.

The local networks can be classified in function of their transmission medium and topology. Topologies include:

- *Star*, a set of nodes radially linked to a central controller. This topology is common for Computerized Branch Exchange (CBX) networks.
- *Ring*, a set of nodes or networks linked in a ring. Common in LANs.
- *Bus*, nodes attached to a common channel. This topology is typical of the Ethernet LAN.
- *Tree*, a set of buses attached to one point. This configuration is popular for networks of networks.
- *Mesh*, single connections between nodes. This topology is useful when redundancy is necessary for system integrity. An important question is whether a message can be sent to any node, even if nodes in the shortest path are down.

The transmission media include:

- *Twisted Pair*, with a capacity of 10 Mbps.
- *Coax Cable*, with 50 Mbps capacity over short distances. The data is not modulated onto a carrier frequency (also called baseband or single channel).
- *CATV Cable*, which can accommodate 20 Mbps over short and long distances. The data is modulated onto a carrier (broadband or multichannel), but physically, the wire is the same as Coax.
- *Microwave* (1.5 Mbps), for transmission between buildings.
- *Laser* (1.5 Mbps), used to transmit through air between sites.
- *Infrared* (150 kbps), the same idea as laser.

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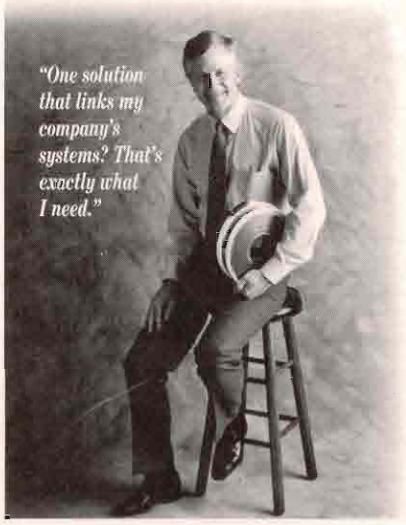

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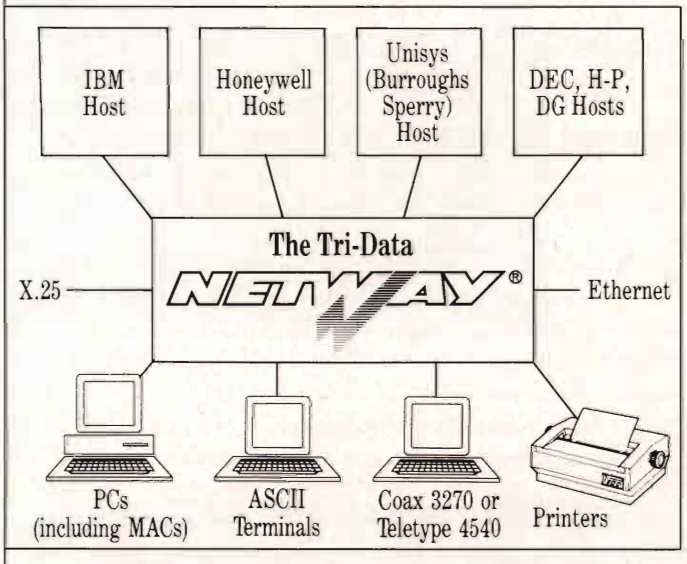

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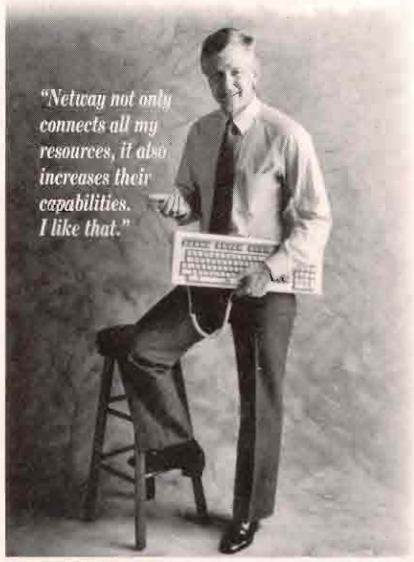

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LOCAL AREA NETWORK STANDARDS have been developed by the IEEE through a special committee called the IEEE 802 Committee. One of the two standards is almost identical to the Ethernet specification that was developed jointly by Xerox, Intel and Digital Equipment Corporation in 1982. The Ethernet standard has enjoyed broad use, especially as part of DEC systems and UNIX installations.

The basic concept of the Ethernet (CSMA/CD) protocol is quite simple. All stations listen for transmissions on the line. A station that wishes to transmit does so only if it detects the channel is idle. This procedure is called carrier sensing (CS), and the access strategy using it is termed CSMA (Carrier Sense Multi-Access) scheme.

It's clear that collisions may occur since stations are physically displaced from one another, and two or more stations may sense that the channel is idle and start transmitting, causing a collision. Once stations detect a collision (collision detection, or CD), they transmit a special jam signal notifying all other stations to that effect and abort their transmissions.

The second standard is the token-passing ring, developed by researchers at the IBM Zurich Research Laboratories. The token concept has a ring topology with no central controller. All stations operate in a decentralized mode. All messages (frames) move around the ring and are actively repeated by each station through which they pass.

A station reading its own address as a destination copies the frame while passing it on, bit by bit, to the next station on the ring. The information contained in the frame then will be passed on to terminals, controllers or other devices connected to the station. A circulation frame is removed from the ring by the station that transmitted it.

Each standard has its advantages, and the proponents of each are firmly entrenched. However, there is room for both in the world, and their use is likely to grow.

Each standard has its advantages, and the proponents of each are firmly entrenched.

Advances in LAN Technology

LAN USERS GET an important improvement from a recent enhancement to data PBXs, the addition of synchronous transmission facilities. When it debuted in 1972, the data PBX solved primarily asynchronous communication problems. Today many computer systems communicate with their terminal networks by synchronous transmission, and data switching technology has evolved to handle this development. In fact, the most recent advances make it more accurate to describe these systems as integrated network processors rather than as data PBXs.

For example, one of the functions that some of these systems can perform in a large synchronous data-com network is management of the data links joining terminals, cluster controllers and host mainframes. This helps the network manager protect users from failures by allowing new links to be switched into the network when old links fail. Also, bandwidths can be consolidated, so multiple low-speed or intermittently used terminals and data links can be multiplexed onto higher speed links. With the data networking system able to support synchronous interfaces to mainframes, additional functionality is possible on the terminal side.

GATEWAY FUNCTIONS can be added by means of integrated protocol converters. This enables asynchronous or synchronous terminals from one vendor to communicate with mainframes and other nodes provided by other vendors.

Similarly, today's network processor can provide LAN gateways. An integrated gateway on the network processor connects into a specific LAN, such as IBM's token ring. The gateway also provides software for protocol conversion, to allow a device on the LAN to communicate through the data PBX to another LAN gateway, or some other facility, such as a host mainframe.

In addition, users can benefit from high-speed digital communication interfaces available from some vendors. These include the new generation of switched 56 kbps services, 1.544 Mbps T1 communication in North America, and 2.048 Mbps European equivalent. Though PC prices are at their lowest, a corporate PC with hard disc, printer and software represents a substantial investment.

One recent data networking development from Gandalf brings PC capabilities to users without the PC investment. The solution is a pool of MS-DOS compatible processors integrated into the switch and connected to each other via a high-speed LAN, the Novell NetWare operating system.

An important aspect of a network is the performance analysis of the distributed routing algorithms. A formal quantitative comparison of shortest path distributed routing algo-

rithms is rather difficult to carry out, for two major reasons.

First, there are a number of performance criteria that one might want to use to assess performance. The performance of various algorithms may very well differ; some may have better performance on certain objective functions; others, on other objective functions.

Second, the relative performance of algorithms depends on specific network configurations. You can obtain general analytic results for certain regular graphs only. For "real" network configurations, you must rely on computer analysis and simulations.

What are some criteria you might want to use to evaluate the performance of a given shortest-path algorithm? Note that as long as the network is quiescent (at a steady state), routing tables remain unchanged. All shortest path algorithms provide the same results for the routing tables. The differences in the various algorithms arise when they adapt to changes in network topology. Thus, we must compare algorithms as to how they perform in response to a change. Various criteria are:

- *Speed of response.* This is the time for a change in topology to propagate through the network, and for the routing tables to settle down to a new quiescent, shortest path state. As a measure of speed, you can consider the average number of iterations required for the algorithm to converge to a new state. This performance measure obviously is important in a dynamic environment, for the speed of response must be faster than the rate of change of network topology. Otherwise, convergence won't occur and the routing algorithm will be useless.
- *Number of control packets transmitted.* This is the information that must be transmitted network-wide to propagate the desired topological change and routing-table updates. The larger the number of control packets, the larger the overhead and the greater the possible congestion introduced by transmitting topological and routing change information.
- *Computational complexity.* Algorithms require varying amounts of computation at a node to process the control packets, carry out the shortest-path computations and update the routing tables. This also is reflected in processing time at a node and, therefore, in processing speed.
- *Size of control packets.* Algorithms differ as to the amount of information transmitted per control packet.
- *Buffer space required.* Algorithms differ as to memory space required to update and hold the routing tables.
- *Looping and loop freedom.* Loop freedom refers to the transient, converging state of a routing algorithm. A loop-free

algorithm ensures that data packets won't return to nodes already visited, while the routing tables are in the process of changing.

To analyze and design communication systems that are operating in the presence of noise, it's necessary to use statistical concepts. Communication systems are concerned with the transmission of information from a source to a sink or user.

IN OUR AGE of information, communication and connectivity between computers are two very rapidly changing technologies. Some of the latest advances in communication are, for the first time, land mobile satellite systems received worldwide radio frequency allocation; European countries agreed to build a unified digital cellular communication system; optical fiber began to be used by the telephone companies for connections directly to the home; electronic and voice messaging, as well as videotext services, began to be commercially successful.

For the communication of data to and from laptop terminals in vehicles, Spectrum Cellular Corp. introduced the first cellular telephone modems, which transmit at 1200 bits per second. TAT-8 is the first optical-fiber transatlantic cable, and will be completed this year between the United States, Great Britain and France. HAW-4/TPC-3 is the first transpacific fiber-optic cable between California, Hawaii, Japan and Guam.

Hewlett-Packard began to develop distributed data processing products in 1973. Using international standards, HP started in 1981 to interconnect multivendor systems, installing over 40,000 nodes in networked configurations. HP AdvanceNet is based on industry standards, uses the Open Systems Interconnect (OSI) Reference Model and offers a set of extensive networking products. OSI compatibility provides the users with LANs and wide area networks that support a large variety of applications and compatibility.

Let's see an example of the HP AdvanceNet Environment, based on HP 9000 Series 800: A user could connect a group of Vectras, PCs and ATs with HP 1000 A-Series, with HP 9000 Model 825S, then with an HP 9000 Model 850S. Then he could add some UNIX system workstations connected to a LAN based on IEEE 802.3 or Ethernet, then use the HP 9000 Series 300 to connect (using SNA) an IBM mainframe working on MVS, CKS, IMS or CMS, then put an HP 9000 Model 840S on the net, and don't forget to add all your DEC VAX clusters using their VMS or UNIX BSD. From this example, it's easy to understand the power and capabilities of this HP AdvanceNet.

HP offers multivendor communication by supporting industry standards that provide communication with a variety of minicomputers and superminicomputers. These standards include IEEE 802.3 and Ethernet, Transmission Control Protocol and Internet Protocol (TCP/IP), as well as ARPA and Berkeley networking services.

OSI compatibility provides the users with LANs and wide area networks that support a large variety of applications and compatibility.

HP supports many network protocols, offering compatibility with most computer networks. For example, HP AdvanceNet connects with DEC VAX computers through a product that's compatible with DECNET and features file transfers between DEC VAX and HP computer systems. Communication to IBM systems can be done over SNA. HP Precision Architecture products, working in a networked environment, can help to exchange information among different systems and consolidate the network

In the supercomputer market, the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign uses a Cray X-MP/48 Supercomputer connected through a backbone network to other supercomputers in the National Science Foundation support centers. The Cray may be accessed through a variety of workstations, including microcomputers from HP, Apple, DEC, IBM and SUN. This Center has a visualization facility.

ENGINEERS AND SCIENTISTS can analyze their data in realtime, using graphical animations of their simulations and produce video tapes of their results. The use of supercomputers, communication, networks and color-imaging techniques will fulfill von Neumann's vision that computers would become the tools for solving non-linear partial differential equations. From these computer calculations it clearly will appear that the multi-dimensional dynamic solutions of non-linear partial differential equations can exhibit complex behavior compared to what you normally encounter in analytic solutions.

The intelligent use of computers, connectivity, communication and enhanced visualization is going to significantly improve the methods used in research and development in many areas of science, engineering and business. —*Dr. Michael M. Dediu is president of Dediu Computer Consultants, Tewksbury, Massachusettes.*

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THE NEW 350/835 TurboSRX

HP's Latest 3-D Graphics Workstation

WORKSTATIONS

Andy Barlow

On April 1, HP announced the 350/835 TurboSRX, a high-performance 3-D graphics workstation that utilizes the most advanced and extensive feature set available in its price range. This increases customers' productivity and competitiveness by maximizing graphics interactivity while displaying superior photorealistic images.

It is the result of continued work with key customers and application suppliers. The customers have asked to remain anonymous, but applications suppliers such as McDonnell Douglas, SDRC, Patran and Deneb Robotics have helped us define this advanced and extensive feature set that maximizes graphics interactivity while displaying photorealism.

Graphics interactivity and photorealism (the ability to display very realistic-looking images) are critical to improving productivity. An engineer needs to interactively manipulate the model he has created so that he can try many different ideas. When he creates a model that's close to what he believes is correct, he wants to render that model as realistically as possible, so others quickly can understand what the model will look like when it's built and eliminate prototypes. Ideally, he would like to work interactively with the photorealistic image from the start. With the TurboSRX, he can.

The TurboSRX is designed to work on either Precision Architecture (835) or on 68000-based architecture (Series 300) to become a complete high-performance graphics workstation. The subsystem consists of a graphics display controller, a high-resolution 19-inch color monitor and 8-24 frame buffers with four overlay planes, 1-3 transform engines, a scan converter and 16 planes of Z buffer.

Like the SRX, the system is very versatile. When configured as individual pieces, the system can grow by adding frame buffer memory, transform and scan conversion boards and Z buffer boards. Beginning with an eight-plane low-cost color system, the system will expand to a high-performance system with 16.7 million colors. This means a customer can configure a system that will meet his needs exactly and can grow as his needs grow.

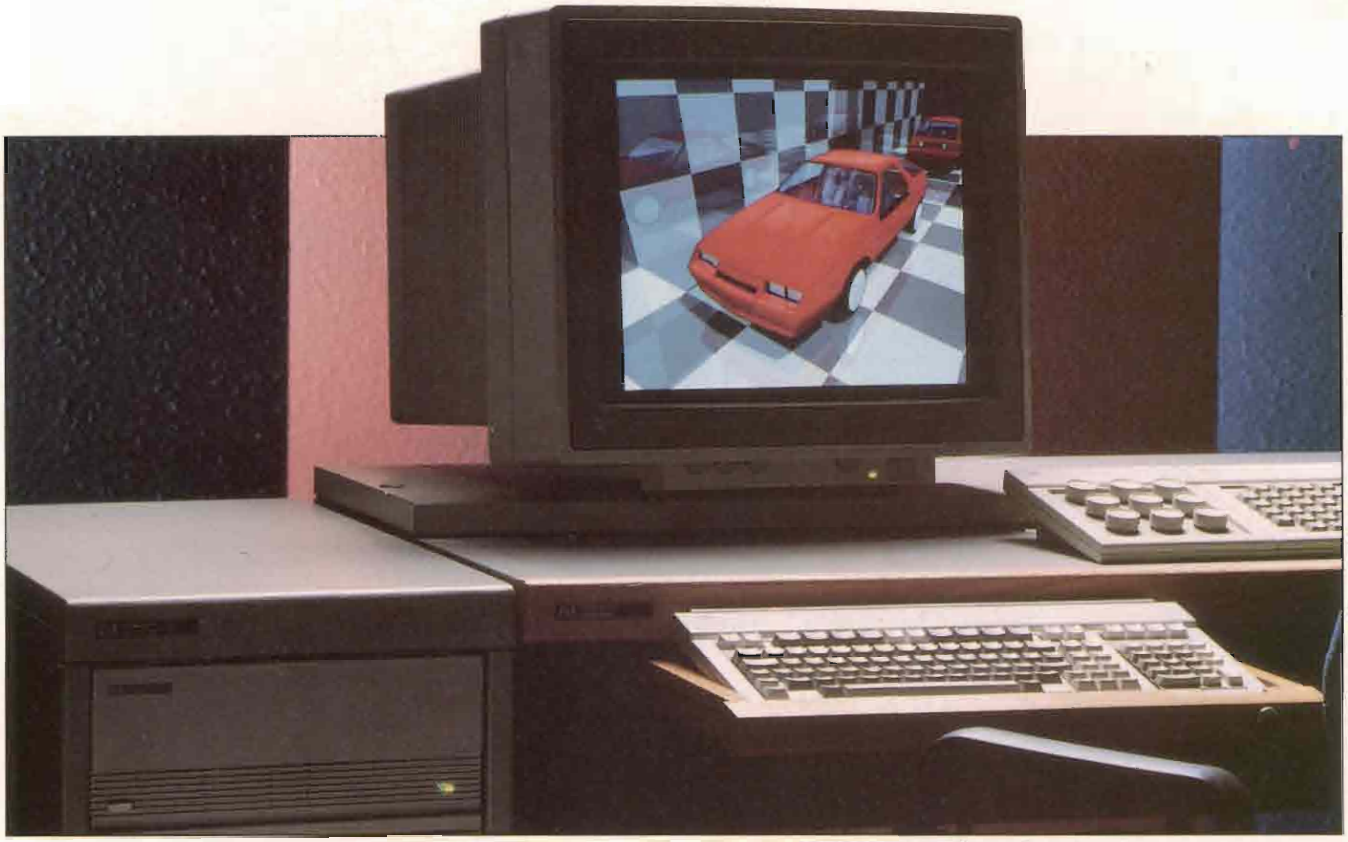
All the features of the SRX are maintained and their performance has been improved three to 10 times. It is object code and source code compatible, so all an application program that now runs on the SRX needs to do is relink to the new driver. However, the TurboSRX also includes a significant number of new features.

Graphics Interactivity

The *Non-Uniform Rational B Spline (NURBS)* with trimming curves was one of the most important contributions made to the SRX. A NURBS is a graphics primitive that allows applications to generate both geometric and free-form curves and surfaces parametrically, rather than generating segments of polygons directly. In TurboSRX, we have improved this from fourth order to sixth order.

For application suppliers, the benefit of NURBS is that it increases the flexibility in defining and controlling desired curves and surfaces without increasing the data involved. In addition, exact conic sections can be represented and it can provide precise ways to remove surface and intersecting points. For users it increases interactivity. It means that the data stored about the object is mathematically correct, rather than a geometric approximation, and it can reduce data storage by 75 times.

MOMA windows stands for *M*ultiple



The new 350/835 TurboSRX workstation features Ray Tracing, a method used to produce very realistic highlights, reflections and transmittance effects.

Obscurable *M*ovable *A*ccelerated windows. What this means is that multiple windows can be created, moved and obscured and still each of the windows will be accelerated by the graphics hardware.

Thus, different operations can run simultaneously in different windows and utilize all the hardware performance features of the TurboSRX. X Version 11 will be shown at introduction and will be fully incorporated with MOMA windows at the earliest possible date.

The *Polygon Mesh Primitive* is a Phigs+ feature that substantially increases the polygon performance by reducing the lines necessary to draw the polygon. Two primitives have been implemented, the quadrilateral mesh and triangle strip. Preliminary tests show a 10x performance over the SRX for the triangle strip primitive.

Cursors now have been put in hardware so they can be moved independently and rapidly. The benefit of this is that cursor movement will not affect other features such as rendering performance and windows. In addition, full screen cursors are possible, or the cursor can be implemented as a 63 x 63 pixel icon. The cursors also provide considerable improvement in "rubberband" rectangles and line performance.

The Fast 16-Bit Z Buffer is now separate memory that's available for hidden line removal. It reduces the time to render drawings with hidden lines or surfaces by as much as 6x. A complete system now can consist of 24 color frames, four overlay planes and 16 frames for Z buffer.

Hardware Blending is a feature that allows individual images stored in the frame buffer to be selectively superimposed to detect more information. This feature will be particularly beneficial for imaging applications.

Pixel Pan and Zoom allows you to treat your monitor like a magnifying glass to view the entire frame buffer or to enlarge portions of it.

For Photorealistic Images

Radiosity is a method to render an object very realistically. It's a technique that accurately models the global illumination of diffuse surfaces. The strengths of the radiosity algorithm are highly realistic lighting, shading and shadowing effects. The advantage of Radiosity is that it allows users to change the view without having to recompute the image and in TurboSRX it is hardware assisted.

Ray Tracing is a method used to produce very realistic highlights, reflections and transmittance effects. Like Radiosity,

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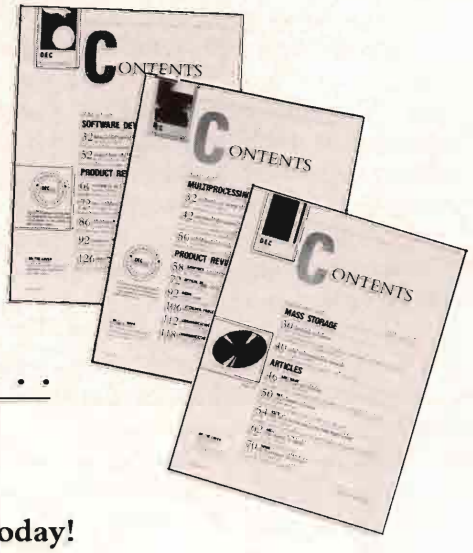

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*DEC PROFESSIONAL December 1987 BPA Publisher's Statement.

FIGURE I

KEY ENHANCEMENTS	
1. GRAPHICS INTERACTIVITY	
NEW FEATURE	**BENEFIT**
6th Order NURBS w/Trimming	Increased accuracy plus control.
Polygon Mesh Primitive	Increased performance of mesh models.
16-bit Z Buffer	Improves hidden line and surface removal performance.
Hardware Cursors	Cursors tracking do not affect application performance.
MOMA Windows	Multiple, obscurable, movable accelerated windows for simulatneous application performance.
Pixel Pan/Zoom	Increased ability to manipulate pixel data.
Frame Buffer Blending	Ability to interactively blend and overlay multiple images.
2. PHOTOREALISM	
NEW FEATURE	**BENEFIT**
Hardware-Assisted Radiosity	Interactive models with shading and shadows.
Ray Tracing	Highly realistic models with reflections and highlights.
Gamma Correction	Color accuracy in smooth shading.
Wireframe Lighting	Wireframe clarity.
16 Colored Lights	Improved lighting realism.

it usually takes time to render the first image. One major disadvantage of Ray Tracing algorithms is that they produce static images. Every time you change the view angle, the analysis must be recomputed. Both Ray Tracing and Radiosity are optional extensions to the Starbase library, thus any starbase application program that runs on the SRX or TurboSRX can be "ray traced" or "radiositised " or both.

Gamma Correction is a method of increasing realism by adjusting the displayed colors to compensate for nonlinearities in the CRT monitor.

Wireframe Lighting allows hardware lighting models to be applied to the wireframe to increase the clarity.

Up to 16 hardware lights improve the lighting realism.

System Components

The *Display Controller* provides the resolution performance and the number of displayable colors necessary for high-end graphics applications. The display controller is a box with the following components:

Master Board (opt) — This contains a transform engine and a scan converter. The transform engine converts the 3-D world coordinates to 2-D screen coordinates based on the location of the viewer. It also performs clipping, color calculations and several other operations. The scan converter takes these commands and generates actual pixel information. Both these functions are implemented in VLSI technology.

Slave Board (opt) — This board adds two more transform engines, permitting transformations to be done in parallel and increasing performance.

Frame Buffer Controller Board — The frame buffer controller board

and color map board are nothing more than very large memory where the color of each pixel on the screen can be stored. The frame buffer controller also provides the overlay planes. The overlay planes provide capabilities such as interactive windows and menus and are alpha independent of the frame buffer.

1-3 Frame Buffer Boards — These boards add additional colors to these capabilities. Frame buffer memory can be added in increments of eight planes. The additional boards permit a system with up to 24 graphics planes, four overlay planes and a 16-bit Z buffer.

Z Buffer Board (opt) — This board increases the performance of hidden line removal and hidden surface removal and contains 16 planes of Z buffer.

1-2 Power Supplies — These provide power to the subsystem.

The *19-inch Color Monitor* is the same 1,280 x 1,024, 19-inch color monitor used for the SRX. It has a high-quality 60-Hz non-interlaced refresh rate and a P22 phosphor for realistic colors. The CRT offers a clear, vivid image that doesn't wash out. The cylindrical face and antiglare coating are ergonomic design features for maximum eye comfort.

The *32-Bit High-Speed Local Graphics Bus* (LGB) provides direct access to system memory, increasing total system performance.

Interface Card, RGB Video Cables, Cabling Extensions, and *Input Devices*: Through HP cabling extensions, human interface devices such as the display, keyboard, mouse and control dials can be placed up to 30 meters from the host SPU and graphics subsystem. Cabling is provided for three types of signals:

- *HP-HIL* for the keyboard, mouse and other HP-HIL input devices.
- *Audio* for the speaker to provide audio output for the system.
- *RGB* for the video signal to color display.

The 32-Bit High-Speed Local Graphics Bus (LGB) provides direct access to system memory, increasing total system performance.

The bundled 350 TurboSRX and 835 TurboSRX systems will sell for $70,000 and $91,500 respectively. The Series 300 will compete in the mid-price range and the Series 835 will compete in the high end. Both systems come standard with 8 MB RAM, I/O Expander, HP-IB, DMA, LAN connection, HP-UX, mouse, NS-ARPA services, NFS software and a 1,280 x 1,024 pixel (60 Hz non-interlaced) 19-inch monitor. The display processor contains 24 image planes, four overlay planes, 16-bit Z buffer and three transform engines. In each price range, the graphics workstation will offer superior price performance.

A very aggressive upgrade program to move customers from the SRX to the TurboSRX also will be available. Existing users of a 350SRX or an 825SRX can upgrade to a fully configured system. The TurboSRX upgrade for the Model 350SRX will sell for $15,000. The upgrade for the 825 (and 835) will sell for $10,000. Typical upgrade programs in the past have preserved only 25 percent to 40 percent of the original investment.

Shipments are planned for June (350) and October (835). —*Andy Barlow is Graphics Product Marketing Engineer, Hewlett-Packard, Ft. Collins, CO.*

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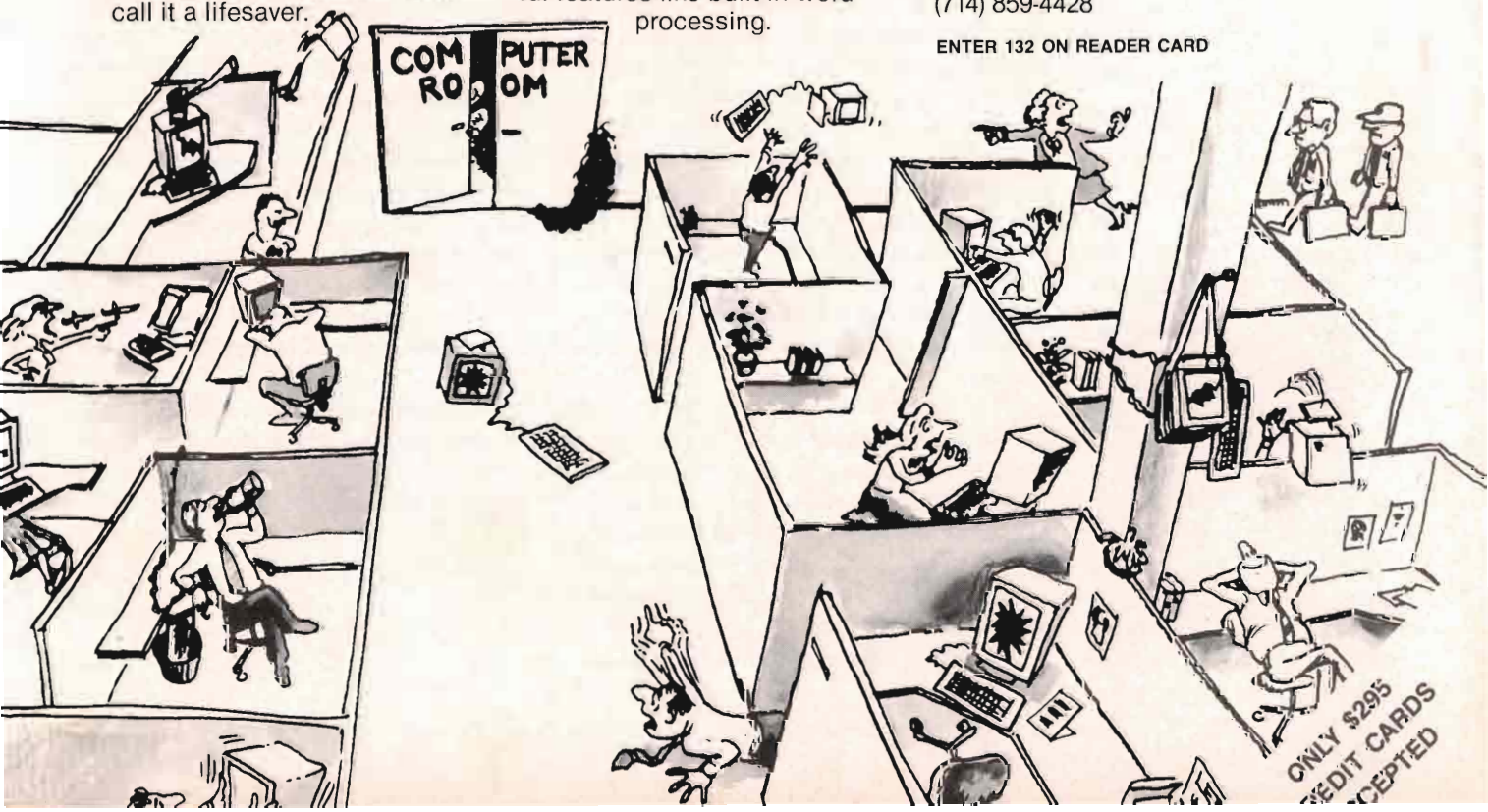


IPRINT

Forms Follow Function Keys

Electronic forms can be a genuine time and money saver for any business. Using classical techniques of typesetting, paste-up and printing, forms can be expensive to produce and costly to inventory (paper is bulky). New electronic forms packages can deliver both responsive design capability and production on any PC and laser printer.

IPRINT is a powerful, easy-to-use forms-design package. You can create complicated, multipage forms visually on screen, merge them with data from text files and worksheets at print time, and even include predesigned logos, signatures and graphic images.

Many businesses might not think they have a burning need for custom-designed forms, but a form can be extremely useful in presenting information in a clear, easy-to-read style. A single short form can outline and highlight the same information as a 10-page internal memorandum. Combined with a data capture facility such as Indigo's *IPROMPT* or a print merging utility like *IMERGE*, forms can enhance existing data processing operations.

When you first call up *IPRINT*, you're presented with a self-explanatory function-key menu of routines. First you must "load" the form to be designed before you can work on it or print it. After we decided we wanted to "design" a form and loaded a form name, the function key labeled "execute" begged to be pressed.

The "execute" key is like the "DO IT" key on other programs. If you're in the design menu, it allows you to start designing. If you're in the print menu, choosing it prints the form. We couldn't agree on whether we liked it though; one of us thought it was a good idea to have a universal function key, the other didn't.

The main design screen is divided into two parts, the menu on the left and the workspace on the right. A border drawn around part of the workspace represents the page, and since *IPRINT* works on a "what you see is what you get" format, it's easy to place the lines and boxes and such exactly where you want them.

The initial screen colors are disconcertingly difficult to distinguish on a CGA. On an EGA screen, they show as pale blue lines on a white background. After playing around with the menu choices, we discovered a key called "set," which led to another menu, one of whose choices was "color" (the index leads you to this command "color," but you have to flip back several pages to discover that this is a subcommand under "set").

Set color is a simple, intuitive procedure to change the colors of the five basic areas on the screen — menu, menu background, worksheet line, worksheet background and highlighting. Alas, there's no capability for setting the default colors while in the design mode; you must quit and edit a configuration file.

A second and more sinister note to CGA users: Since there are five regions on the screen and only four colors available at one time on your monitor, two of the regions have to have the same color, making it difficult to distinguish between them. It's probably best to have both the menu and the worksheet lines black.

However, once you've set the screen colors to something readable, the rest of the program will proceed without much of a snag — at least as far as the design phase goes. The

SOFTWARE

Ashley Grayson and Dafydd ab Hugh

only major problem we encountered in the program was in getting the form we designed to print, but more about that later.

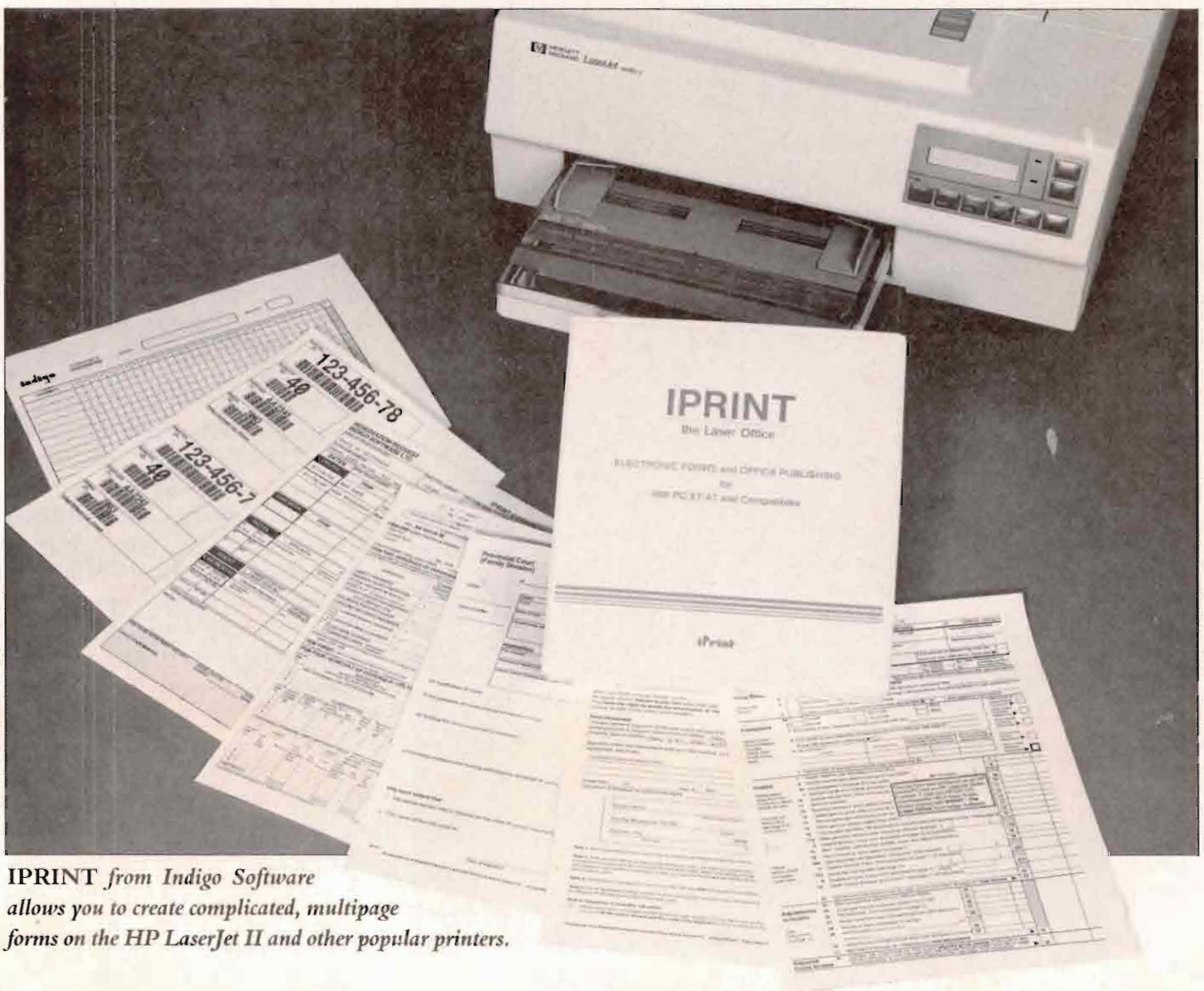
Making the user interface more consistent would be a definite improvement in *IPRINT*. Most commands are given by function keys suggested by the screen display. Forms design, however, is mouse-driven, but some of the menus are accessible only by the arrow keys, even in the middle of the design mode. Thus, to change fonts or line style, you first must use the mouse to select font or line style, and then, when the second-level menu flops down in front of you, go find the keyboard and poke at an arrow key until your choice is highlighted. You can't just point at your choice with the mouse; indeed, the cursor disappears entirely.

The program purports to be usable even without a mouse, but only if you have megabytes of patience and not very much else to do that day. Our best suggestion: Get a mouse! Fortunately, *IPRINT* recognizes several different mice, from the Logitech to the Hewlett-Packard.

The general procedure for designing a form is to select a command (box, line, text) with the mouse and then fix the object on the screen. The whole procedure has a vaguely Macintosh-like feel to it, especially since the menu choices are mostly represented by icons, rather than words. (Anyone experienced with a CAD system should have no problems.) The majority of these icons were clear — a shaded box for a shaded box, for instance. But a few are rather obscure, such as a box with an X through it for delete, or a question mark for help.

Unfortunately, since the icons weren't listed in the index, and since there was no quick reference, the only ways to track down what each icon meant were to experiment or skim through the entire command section in the manual.

The actual design process is straightforward. Since every box, line or block of text on the screen is a separate



IPRINT *from Indigo Software allows you to create complicated, multipage forms on the HP LaserJet II and other popular printers.*

object, it can be moved anywhere else, including overlapping another object. A command called "area" (represented by a box with dashed borders) allows multiple objects to be moved, copied or resized as a group (you cannot resize logos or fonts). There seems to be no way to alter the size of your text except for specifying a larger or smaller size as an alternate font (assuming your laser printer has such a larger or smaller size font internally or on one of its cartridges).

A certain amount of "graininess" must be put up with in *IPRINT*; the program divides the worksheet into a number of "cells," and then it restricts you to moving or sizing an object by integer numbers of cells (like graph paper). You can set the cell size using another non-intuitive icon to a minimum x-direction movement of .027 inches and a minimum y-direction movement of .033 inches, which should be precise enough for most applications. However, if the cells are that small, it is hard to line up boxes and text and such. If the cell size is larger, the fact that you cannot place an object between two cells interferes with design aesthetics (such as centering text between two boxes).

You can create complicated, multipage forms visually on screen, merge them with data from text files and worksheets at print time . . .

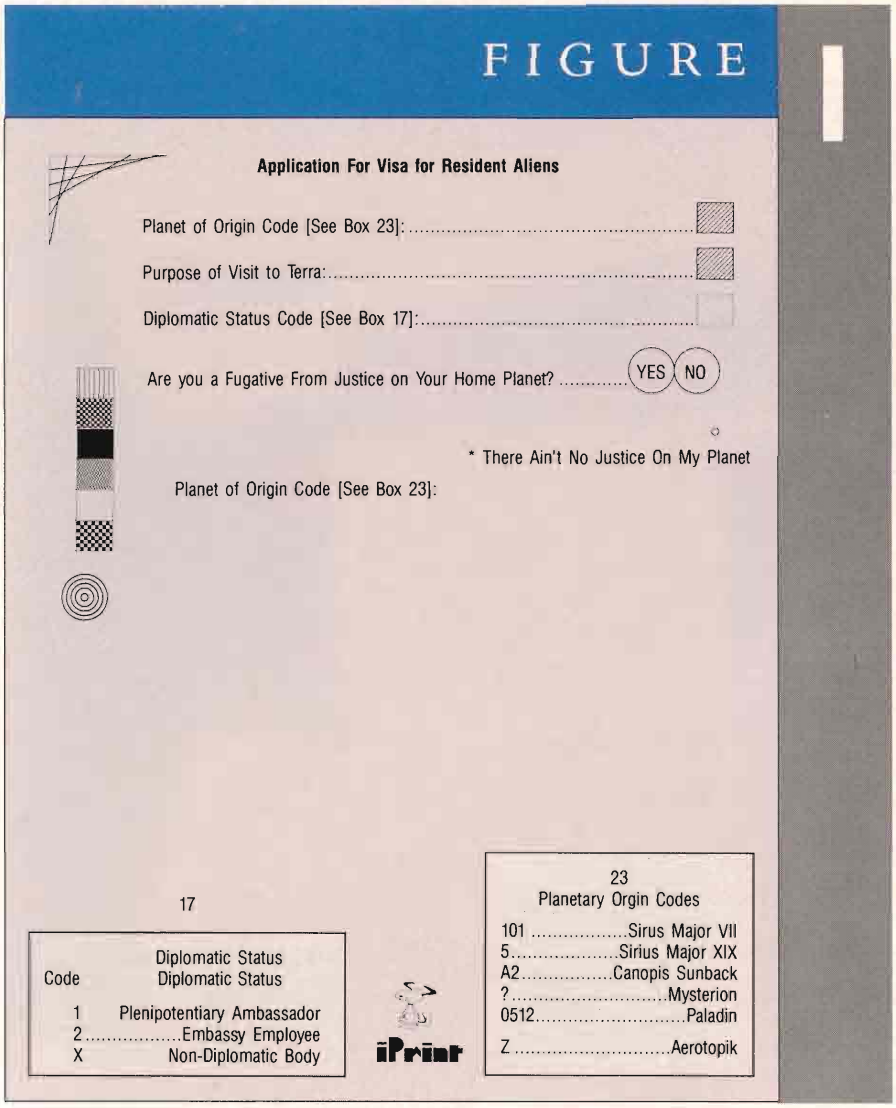
It's possible to redefine the cell size in order to move an object and then redefine it again when you've finished; but it would have made more sense to be able to turn this aligning device off at will if you wanted to make an arbitrary move or set an arbitrary size.

Another minor cavil is that text is displayed only as solid blocks that approximate the size of the individual words. You have no clue to what the text says unless you either select the text as an object, in which case the complete text appears at the top of the screen, or you select an area of the page including the text and zoom in on it. Even then the words appear in screen fonts inside the solid blocks; you still don't get to see the text as it will appear on the page.

IPRINT is mostly intuitive, which is fortunate, because the manual is poor. The commands are arranged by function key number, rather than conceptually; there is no trouble-shooting guide; and the index covers only five and a half pages (in large type) for a 16-page manual.

EVEN WITH THESE petty grievances, *IPRINT* is a fun program to work with. A good number of vertical and horizontal line styles are supported, including

FIGURE



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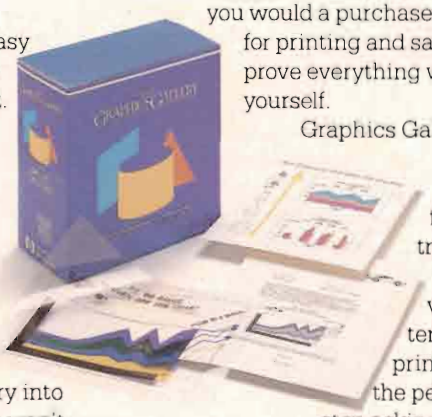

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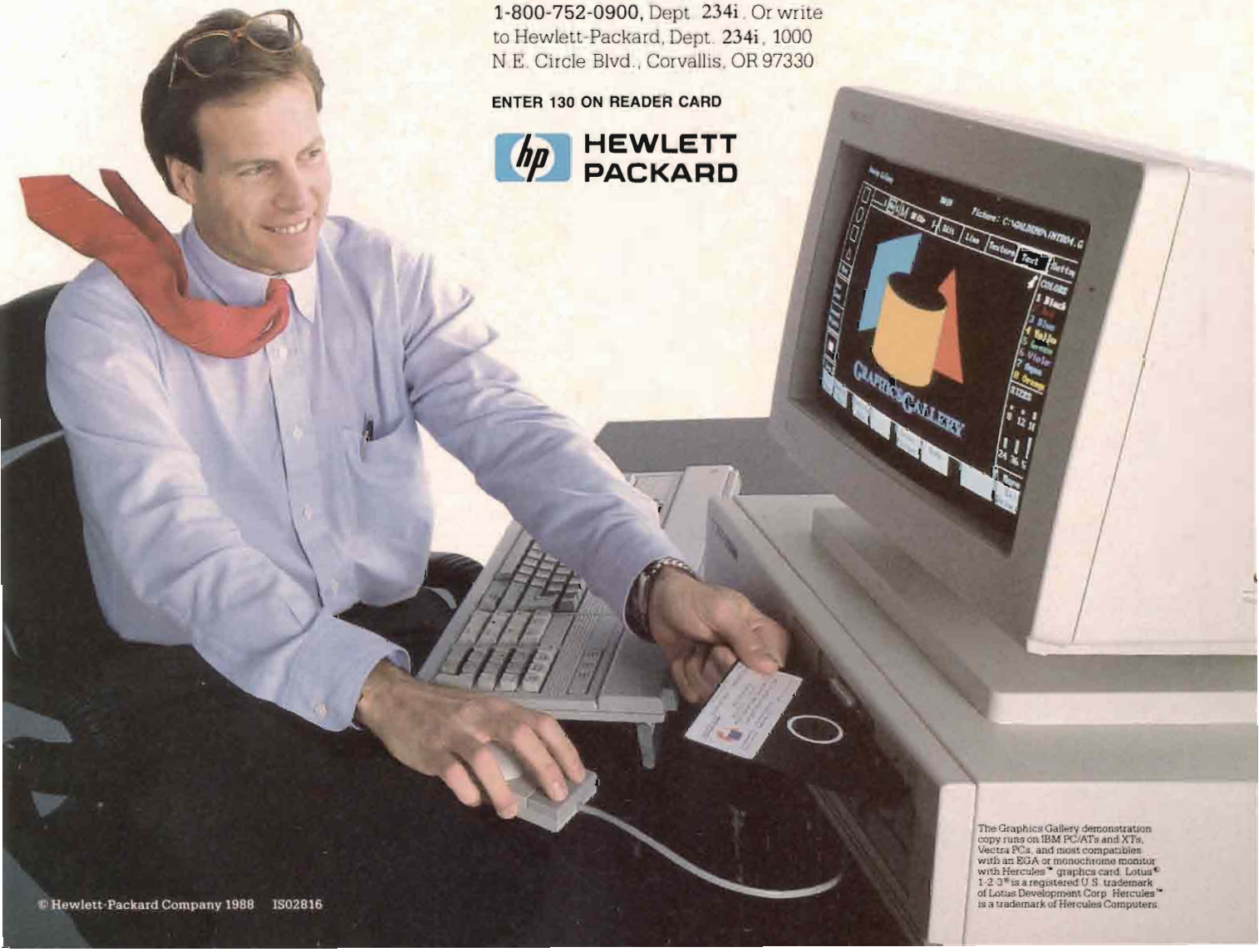

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[ELECTRONIC FORMS ENVIRONMENT]

A great deal has been written about the relative merits of PostScript from Adobe Systems and PCL (Printer Control Language), the language used by the Hewlett-Packard family of LaserJet printers. One or the other of these two page description languages is now used in most non-impact page printers currently on the market. What are their relative strengths and weaknesses when it comes to the "electronic" forms environment?

"Electronic" forms are printed repeatedly, with data filling in the blanks. They are a production data processing tool. Speed of printing is a critical factor in a successful implementation of "electronic" forms. PCL has several distinct advantages over PostScript in this area.

PCL is a very compact escape code driven language, while PostScript is an "English-like" language. PostScript can take 1.5 to 2 times as much data to draw the same form. This data must be sent to the printer. More data means a longer print time.

PCL uses bit-mapped fonts. Each point size is stored separately in the printer. PostScript stores only one size of a font. All other sizes are generated algorithmically at print time. These calculations take a great deal of time, especially on forms that are text intensive. Another point for PCL.

PCL allows the user to store the instructions needed to draw a form as a "macro" in the memory of the printer. PostScript has a similar capability, but the complexity of the forms that can be stored is so trivial that this feature is not viable. In PCL, instead of transmitting a form to the printer every time it is printed, it can be loaded once at the beginning of the "day" and then used repeatedly by sending a simple five-character escape sequence to the printer just before the data file is sent. Over the course of a day, an enormous amount of time can be saved using this feature of PCL.

PostScript does have one advantage over PCL. When it comes to forms design, PostScript is a much richer language. Its graphics capabilities are far beyond those of PCL. If an "artistic" form design is required, PostScript is more suitable. On a more practical level, PostScript allows text to be in both portrait and landscape mode on the same page. PCL does not have this capability. Of course the user pays for these more complex features. The additional complexities of Postscript slow it down. For most forms the more advanced features of PostScript are not required.

In summary, Hewlett-Packard's PCL has the features required to quickly and efficiently print forms merged with data. This speed advantage is critical in a sophisticated production "electronic" forms environment.

—Barry Gillespie, Indigo Software, Ottawa, Ontario.

dotted, dashed and invisible, while all lines (including diagonal lines) have a variable width. The boxes can be shaded in any one of a dozen ways, ranging from light gray to black to checkerboard, to vertical, horizontal, or diagonal (left or right) lines, and their borders can be any of the line types, any thickness, or even non-existent. Shading and borders don't appear as entries in the index, of course.

The logo facility is quite useful. You can design the logo with PC Paint, PC Paintbrush or Windows Paint and port the image file into *IPRINT*. To put a logo on the form, you only need to select logo from the menu; *IPRINT* then will give you a drop-down menu containing the names of all logo files that have been defined (three predefined logos are included in the program — an *IPRINT* logo, a logo for Indigo and a picture of Snoopy). There's no facility in *IPRINT* itself for generating logos; you can't paint one with the mouse.

Once we got used to some of these strange conventions and limitations, however, we had no trouble designing

a few forms. Our problems began when we tried to print one we designed.

Upon first installing *IPRINT*, you're asked what type of printer you have. Many common printers are offered as choices, including the LaserJet II, which is what we used. After installation, *IPRINT* offered appropriate choices of cartridges available and fonts found on them.

However, when we tried to print a form with text, all of which was in the resident HP Courier 12, *IPRINT* announced it couldn't find the font file and refused to print anything. Debugging proved difficult, first because it had displayed the font-file name as a string of object code characters (and then immediately covered up the screen with a menu), and second because of the lack of an error or troubleshooting section in the *IPRINT* manual. The closest thing is a section of "commonly-asked questions" about *IPRINT*. None of these non sequiturs were of the form, "What do I do if it doesn't work?"

After some fiddling around and changing all of the text to a different font (a cartridge font), we got the same error message and the same non-performance. Upon further reflection, we removed all the specially accented international characters that *IPRINT* says it allows and tried again. This time we actually got output from the printer; unfortunately, the output consisted of a file dump of the iprint.cfg file rather than our document.

Curiously, when we created another form, we had no trouble printing it out, aside from the perplexing fact that both before and after it printed the form, it displayed the error message, "Printer not available (abort, retry, ignore?)."

Indigo product support was prompt and helpful and suggested the answer to the first printing problem. Our initial work was done on a PC's Limited 286 system driving a Tandy CGA monitor. We then brought over the predefined form to a Vectra ES that ran the LaserJet II. Subtle differences in the *IPRINT* configuration files caused the confusion.

Specifying "reset" before loading the form caused the form to match the new configuration. Our test form also uncovered two other problems. If part of the form slops over the border line that represents the edge of the printable part of the paper, by even as much as a single cell, trouble will result. This is a common problem with the LaserJet family, but the software ought to tell you. A trouble-shooting guide would be most helpful here.

Even after correcting these sundry subtle problems, the form still wouldn't print. Eventually, after visiting Indigo in person at a trade show, we determined that we had found an actual bug in the program.

One of the line types that *IPRINT*

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supports is an arc, or part of a circle. You're allowed to specify the radius, and to rotate the arc an arbitrary number of degrees. However, if the arc is rotated to any position other than a right angle from the horizontal, the form will crash when you try to print it.

Indigo plans to correct this flaw in a future release; in the meantime, if you restrict your arc rotation to 90-degree increments, and are careful not to have any piece of any object slopping over the edge of the "paper," you should have no trouble printing.

Once you've designed your form with *IPRINT*, you either can make a laser printer master for commercial printing, print forms on demand with your laser, or do data entry and merging with two related products.

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Runs on PC and compatible computers. Output to a variety of laser printers including: HP LaserJet family, Canon, AST Turbolaser, Xerox 4045, IBM 3812 and PostScript printers. It also supports other laser printers that emulate the LaserJet. Price $350.

The *IPROMPT* package will compile your form into a screen-prompting data entry and data capture program. Running on a PC like the Vectra, anyone can fill out a form, press a key and print the data on a predefined form stored in a local laser printer. Data also can be written to a DOS text file for later importing into a PC-based database or other program.

The *IMERGE* packages allow data stored on HP 3000, HP 9000 (HP-UX) and DEC VAX computers to be merged with forms designed with *IPRINT* on a PC. Merging can occur as an overlay, where the current page image is superimposed on the form (operationally identical to pre-printed forms), or on a field basis. The latter offers more flexibility and direct dumping of field delimited databases.

All in all, *IPRINT* is a worthwhile program for anyone who can use custom designed forms. It can present vital information in a much clearer and less dense mode than a simple report or memo, in a standardized format for quick absorption. We found it easy to learn, despite the poor manual, and relatively bug-free. We would unhesitatingly recommend it to any small business that sends a lot of information up and down the chain. —*Ashley Grayson is the founder of ADG, a high-technology marketing services organization based in San Pedro, CA. Dafydd ab Hugh is a member of the ADG technical staff.*

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MULTITASKING PERFORMANCE

Monitoring Performance When Running More Than One Program On The Integral

INTEGRAL

Joe Bormel

One feature that continues to set the HP Integral apart from most of the other personal computers popular today is its ability to run many programs simultaneously. This capability guarantees that you never have to wait for one program to finish before you can access any other information or program on your machine. This full-time availability undoubtedly will be a standard feature taken for granted in future PCs.

Multitasking opens up a new way to interact with your computer. A classic example is offered by the Integral demonstration program. In it, the user is writing a letter using an HP word processing program, MemoMaker, and runs a calculator program to compute a figure needed in the letter being written. Since this easily could be accomplished in a single-tasking computer using a memory-resident program such as Sidekick (Borland International, Scotts Valley, CA), it presents a weak case for the virtues of multitasking. A more powerful example and one commonly used by Integral owners is running a communications program while running other programs concurrently.

With electronic information sources becoming commonplace, I frequently find myself using electronic mail, remote electronic databases and bulletin board systems. While my data communications program is busy at work downloading articles, programs, selected data records, etc., I can be found doing other frequently unrelated applications on my Integral. This greatly improves human efficiency!

Another time when multitasking is appreciated is during compilation of huge programs. Most programmers using compiled languages have experienced the frustration of waiting for a compile to finish before they could get their editing program to work on the next section's documentation. (HP programmers document before they code, right?) This is a particularly good application of multitasking because editing tends to be limited by the programmer's typing speed. Therefore, very little of the computer's time is diverted away from the compiling in order to support user editing. Neither the compiling program nor the editing program is greatly degraded in speed by the other program's presence.

When more than one program is running, they share the computer's resources and even may compete for them. If no explicit arrangements are made, each program receives an equal amount of attention (time) from the computer. If two identical programs are running, each gets half of the computer's power and each takes twice as long to run than if it had the machine to itself.

There are many factors that affect this relationship, however. For example, while the editor (editing program) is waiting for the user to type in some text, the editor isn't actually running, so the compiler runs at nearly full speed.

There are programs (unlike our friendly editor in the compile/edit example) that don't "get out of the way" when they aren't doing anything. When several programs that use the computer heavily are running at the same time, the speed of all the programs running is greatly reduced. In order to get an idea of how heavily burdened the computer was, I wrote the BASIC program called Monitor shown in *Program 1*. (*Program 2* shows a slightly more elaborate version written in C.)

When run with no other actively running programs (PAM, the Personal Applications

Manager doesn't count as a running program), the Monitor prints the percentage of the computer it used during approximately the last second. Usually, this number is around 92 percent to 93 percent because of system overhead. When BASIC is run as a real-time program (using rtprio), it produces 100 percent. If two copies of the program are running, each reports seeing approximately half of the available machine.

MONITOR BECOMES VERY INTERESTING and useful when run in combination with other programs, because it tells you indirectly how much the other program is using the computer. For example, when running HP's Datacomm program, Monitor reports that it's getting to use half of the computer every second, even when the Datacomm program is just waiting for characters from the user or the modem.

In contrast, when using Kermit (a public domain datacomm program available as freeware and resident in the software engineering ROM) as the datacomm program, Monitor reports that it's getting to use all of the computer when the Kermit datacomm program is waiting for characters from either the user or modem. Because of this aspect of HP's Datacomm program, I try to use Kermit whenever I need a datacomm program. (There are several other differences between these two programs that make it ideal to have them around.)

Another use of Monitor is testing the way other programs work. For example, running Monitor and time_of_day(1) shows that time_of_day doesn't use the computer during the minute in between updates. On the other hand, the BASIC WAIT statement does its wait by using the computer time during the wait, instead of sleeping and leaving the computer fully available to the other running programs. Thus, a BASIC program that displayed the time and WAITed for one minute would slow down significantly other programs running at the same time.

Using Monitor, you can access the load of each program running on your Integral and tune the performance of your applications to avoid unnecessary, unproductive and wasteful use of your multitasking computer. *—Joe Bormel is a free-lance writer based in Columbia, MD.*

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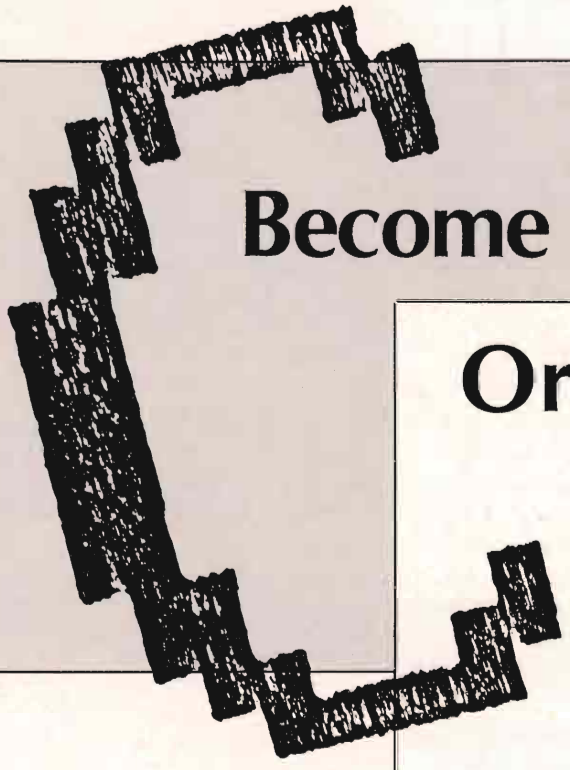
Program 1.

BASIC Implementation of Monitor: The program is very simple and should be easy to translate to multitasking machines other than the Integral.

```
5   !  Monitor:  program to monitor CPU utilization. See article text
6   !            for description of use. Written by Joe Bormel, 1/88.
10  !  save "/usr/Joe/basic/monitor"     ! embedded save command
20  f=100/178 ! adjustment factor to normalize counts to 100%
30            ! CPU availability based on counts achieved in real time
40  start=TIME      ! TIME is a function that returns system seconds
50  elapse=TIME-start
60  IF elapse>1 THEN 90
70  c=c+1
80  GOTO 50
```

Continued.



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Program 1. . . . CONTINUED

```
90  DISP USING "DDD" ; INT(c*f/elapse) ! display counts/second times f

100 c=0

110 GOTO 40
```

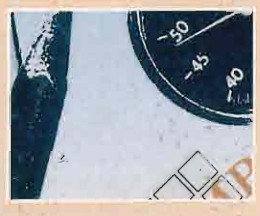
Program 2.

```
C Language Implementation of Monitor

        This version of the Monitor program is portable to any machine
        with a C compiler running UNIX. Implementation on a non-UNIX
        multitasking machine requires changing the system time accessing
        functions. By setting the variable "factor" to one, a machine-specific
        value for factor may be obtained to yield 100 percent.


# include <stdio.h>
# include <time.h>
# include <sys/types.h>
# include <sys/times.h>

# define TICKS 60.
# define SIZE  60

long c,elapse,start,tc,telapse ;
long times();
static struct tms tbufl;
float factor    =1.0;
int index,q_ptr;
long count_history[SIZE], elapse_history[SIZE];


main()
{
        printf("Percentage of CPU available shown followed by a minute average.\n");
        start = times(&tbufl) ;
        factor =  100 / 12.5    ;       /* factor has been chosen so that */
        /* real-time performance is 100%    /*
        for(index=0; index  < SIZE ; index++)  {
              count_history[index]  = 0;
              elapse_history[index] = 0;
        }
        q_ptr = 0;
        while(1) {
              elapse = times(&tbufl) - start;
              if (elapse >= TICKS) {
                        printf("%4.1f\t",(float) ( c * factor / elapse ) );
                        count_history[q_ptr]=c;
                        elapse_history[q_ptr]=elapse;
                        q_ptr++;
                        if (q_ptr>=SIZE) q_ptr=0; /* update circular que ptr*/

                        tc=0;
                        telapse=0;
                        for(index=0; index < SIZE ; index++) {
                                tc += count_history[index];
                                telapse += elapse_history[index];
                        }

                        printf("%4.1f\n", (float)
                                tc * factor / telapse );

                        fflush(stdout);
                        c = 0;
                        start = times(&tbufl) ;
              }
              else c++;
        }     /* end of while() */
}
```

■

XDS, LONG POINTERS AND C

Solving Portability Problems With Extended Data Addressing



PRECISION ARCHITECTURE

Tim Chase

One well-known limit to HP 3000 architecture is the short addressing reach of its instructions. Born in a 16-bit world, the maximum amount of directly addressable memory any program on the 3000 may access is a little more than 31K words. To augment this address space, the MPE operating system offers extra data segments (XDS). Extra data segments are, effectively, memory disc drives. The user may allocate extra data segments and then transfer blocks of data to and from the XDS.

Doing this causes two problems. First, source code either must be designed to use XDS or it must be modified. With few exceptions, compilers on the 3000 don't support the XDS concept other than to give programmers access to XDS intrinsics. The amount of work necessary to change an existing program to use extra data segments can be profound, depending on the program's logic and basic design.

The second XDS problem is portability. For example, if you develop a program under MPE making use of extra data segments, you must change the program again if you move to an IBM PC. Like the 3000, the PC has its own memory size problems, but the solutions provided are quite different from those found on the 3000. Likewise, if you want to port to HP's Precision Architecture (PA) computers running HP-UX, you have a different set of problems. Because the PA computers are 32-bit, there's no need for trick memory management. All the memory you've ever wanted is waiting to be directly accessed, so all XDS code should be removed when porting to PA machines.

These problems become more apparent when using C because its portable nature tends to cause programmers to want to port existing code. It's not unreasonable to want to develop a C program that will be targeted to run on PCs, HP 3000s, 1000s and PA machines, all without source-code changes.

At Corporate Computer Systems, we faced this challenge in the design of our C compiler for the HP 3000. How would we efficiently integrate the concept of extra data segments and yet remain portable to machines that do not have the same capability? To meet this requirement, CCS borrowed from existing C implementations. Ideas were taken from both PC versions of C and from HP's C for the 800/900 Series computers. The result is what CCS calls eXtended Data Addressing (XDA).

The basic concept behind XDA is the addition of a *long pointer* type to the C language. The HP 3000's natural pointer size is 16 bits, but long pointers provide the programmer with an additional type of pointer 32 bits long. With 32 bits, the C compiler has a way to access direct memory as well as any extended memory the host computer may support.

Because there's a time penalty for using 32-bit pointers, you're allowed to mix 16- and 32-bit pointers freely. If a 32-bit pointer is appropriate, then one may be used. If you don't need a 32-bit pointer, then the compiler won't automatically force you to use one. You can make the basic space-versus-speed design trade-off by choosing the correct pointer type at any given time.

Although new to the 3000, this technique is old and time-tested. For example, Microsoft's QuickC and 5.0 compilers provide this feature with their *far pointer* concept. HP's PA machines have long pointers that provide 64 bits of addressing reach.

Because of their extra size, CCS/C long pointers have the ability to point to any word or byte in any data segment. When a program

is operating in privileged mode, this includes even system data segments.

Once set to point to a location within an extra data segment, a long pointer may be "dereferenced" using the same source syntax as would be used for any normal (16-bit) pointer. The dereference operation in the case of a long pointer, however, causes an extra data segment reference. Depending on the use of the pointer, the data segment reference either can get information from the data segment or store information to the data segment.

When programming in C, extra data segments may be allocated two ways. The net result of each method is that a long pointer is set to point to a location in an extra data segment. As a degenerate case, long pointers also may be used to point to data objects that are in your local stack space. Thus, long pointers make all storage (XDS or process stack) appear homogeneous. Data structures, therefore, may span several different extra data segments.

The two ways to allocate extra data segments referenced by long pointers are:

■ *Calls to the GETDSEG intrinsic*

This is the normal way to allocate extra data segments on the 3000. The resulting extra data segment number is passed to a CCS/C library routine named "to_long", which converts it into a long pointer to the first location of the extra data segment. This pointer may be adjusted to point to any location within the XDS simply by adding an offset to it. Using this technique results in noncontiguous extra data segment address spaces. This means that the largest data structure that can reside in an XDS will be limited by the size of the largest XDS that the system can allocate. For all practical purposes, this is about 31,000 decimal words.

■ *Calls to ( )*

A special heap management routine called "emalloc" is provided in the C library. This routine will allocate extra data segments and treat them as an extended heap space, meaning that if you were to request 1,000 words from emalloc, an extra data segment would be allocated, 1,000 words would be taken from it and the remaining storage would be kept pending another call to emalloc. The companion routine "efree" deallocates blocks allocated by emalloc. Calls to emalloc may or may not generate calls to GETDSEG, depending on whether or not emalloc has any "free" extra data segment room to allocate.

One important feature of emalloc is that it's able to allocate blocks of space that are larger than the largest extra data segment allowable in the system. This is done by allocating multiple extra data segments and managing them

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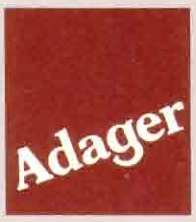
Adager began shipping Spectrum-compatible software in August 1987.

This new version of Adager works on ANY HP3000 computer running IMAGE/3000 or TurboIMAGE under MPE or MPE-XL.



The Adapter/Manager for IMAGE/3000 Databases

Program 1.

```
struct S {
   int  type;
   char buf[100];
   float value;
};

struct S ^b;                    /* used as an XDS "array" */
struct S loc;                   /* local structure */

/* Allocate array of 10 XDS "S" type structures */

b = (struct S ^)emalloc(sizeof(struct S) * 10L);

/* copy i-th structure locally to work on it */

loc = b[i];                     /* same as DMOVEIN call */
loc.type = 0;                   /* reference locally */
strcpy(loc.buf, " ");

/* now move back to XDS */

b[i] = loc;                     /* same as DMOVOUT call */
```

as a unit. Each extra data segment allocated by emalloc is 16,384 words in length.

For example, you may call emalloc and pass a request for a block with 50,000 words in it. Emalloc automatically will allocate four extra data segments, each 16K words in length. The long pointer scheme is designed so that the 50,000-word block will appear to be contiguous rather than broken up into four different extra data segments.

Another important use for long pointers is to access system tables. Although clearly not for all programmers, CCS/C's long pointer makes system tables much easier to access correctly. Using C, you're much less apt to make dangerous mistakes when getting information from system tables. As with SPL, however, the C program must be executing in privileged mode in order to gain access to system tables.

Most system tables actually are collections of well-defined structures. Accessing them from C provides a way to formalize the structures and then treat the table as arrays of the structures pointed at by long pointers.

Using Long Pointers

The CCS/C long pointer declaration syntax was selected to minimize the impact on existing source code and to maximize compatibility with other compilers on different host computers. The only difference in syntax associated with long pointers is that used during their declarations.

In order to achieve compatibility with various implementations, CCS/C supports both the far pointer syntax found on PCs and the special ^ syntax found on the HP and C Precision Architecture compilers. The far keyword is used as a modifier to the * character during pointer declarations, while the ^ character is used instead of the * character.

The far keyword or the ^ character is used only for the declaration of pointers or for casts involving those pointer types. All pointer dereferencing is done with the * and -> operators, so only pointer declarations need to be changed when altering an existing program to use long pointers. All code that references the pointers remains the same.

For example, the declaration of a long pointer to an integer is either:

```
int ^ p;
```

or:

```
int far *p;
```

The same declaration with a short pointer would be:

```
int *p;
```

Once a long pointer contains a value, it may be used like a short pointer. For example, to store a value of 12 into the extra data segment pointed to by the long pointer "p", we would write:

```
*p = 12;
```

Long pointers may be declared to point to any type of object except functions. A long pointer to a character string would be declared as:

```
char ^ cp;
```

or:

```
char far *cp;
```

and a long pointer to a (previously defined) structure tagged as S would be:

```
struct S ^ sp;
```

or:

```
struct S far *sp;
```

Likewise, dereferencing these pointers is performed in the same way as with 16-bit pointers:

```
*cp = ' ';
sp->field = 0;
```

Because standard C defines all pointers to behave much

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the same as arrays, pointers (both normal and long) may be indexed. In C, the pointer expressing p[i] is defined to be identically equivalent to *((p) + (i)) for any pointer expression p and any integral expression i. Because of this, long pointers pointing to extra data segments can behave as if they were arrays of objects. This is the normal way that long pointers are used. For example, to allocate an array of 10,000 integers and clear it all to zero, we'd write:

```
#include <stdlib.h>
    :
int ^a;          /* define the array base as a pointer */
    :
a = (int ^)emalloc(10000L); /* allocate the space */
    :
for(i=); i<10000; ++i)
    a[i] = 0;                    /* clear to 0 */
```

A slightly more efficient way to use long pointers on the 3000, yet remain portable, is to store structures in XDS and then move structures to local memory to reference individual members. Although not necessary (individual members may be referenced directly in XDS), moving a structure locally does improve the access efficiency for individual members. In fact, moving an XDS structure to local storage is the C equivalent of the MPE intrinsic DMOVEIN. *Program 1* is an example of this technique.

With long pointers, programmers have control over the speed/complexity trade-off. If you wish, you may access individual words in extra data segments just as if they were in local memory. This reduces program complexity, but increases execution time. On the other hand, you may elect to optimize code so that it's more complex (as in the previous structure example), but runs faster.

Long pointers provide an interesting alternative to calling extra data segment intrinsics directly. They enable the concept of the extra data segment to be directly incorporated into the memory model supported by ANSI standard C, yet because of their near-universal acceptance on other host machines, long pointers are quite portable.

Although sometimes not required for smaller projects, long pointers need to be considered seriously by anyone embarking on sophisticated software development where portability and large memory requirements will be issues. *—Tim Chase is the project manager for Corporate Computer Systems Inc.'s C compiler on the MPE V and HP 1000 systems, as well as co-owner of the firm which is based in Holmdel, NJ.*

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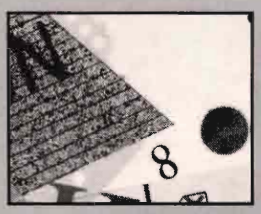

SPECTRUM NEWS

HP PRO Staff

Highest Performing HP-PA Models Ever

New Systems Unveiled

Earlier this month, HP introduced seven new computer models based on its Precision Architecture (HP-PA) design, including the highest performing systems in the company's history.

As in the past, HP compared the aggressively priced models with similar systems from IBM, Digital Equipment Corporation and others.

The new models, which extend both the HP 3000 and HP 9000 lines, include:

- *mid-range HP 3000 Series 925 ($80,000), 925LX ($50,000) and 935 ($150,000) systems,*
- *a high-end HP 3000 Series 955 system ($390,000),*
- *mid-range HP 9000 Model 835S ($45,000) and 835SE ($99,000) systems, and*
- *a high-end HP 9000 Model 855S ($320,000) system.*

Also introduced were two entry-level HP 3000 business computers — the Micro 3000LX ($10,900) and Micro 3000GX ($15,950).

The HP 3000 Series 955 is the highest performing commercial system ever introduced by HP, providing 50 percent more performance than the previous high-end system — the Series 950 computer (which remains in the product family).

The Series 955 is capable of supporting more than 400 users and provides mainframe-class performance comparable to high-end IBM 4381 systems and large DEC VAX systems at half the price. Like all of the new HP-PA systems, it uses a single-chip central-processing unit based on proprietary NMOS III VLSI (very-large-scale-integration) technology. This technology enables all of the processing power to be deployed on a single printed-circuit board, resulting in higher reliability and lower maintenance costs.

HP can increase the performance of any installed Series 950 to that of a Series 955 by exchanging the processor board at the customer's site. Increases in performance do not require customers to purchase entirely new systems. The Series 955 will be available in the first half of 1989.

At the mid-range, the Series 925 can support as many as 152 users and is comparable in performance to a DEC VAX 8530 at one-third the price and provides more performance than the IBM 9375-60 at about half the price. The Series 925LX has the same performance as the Series 925 at a lower price for configurations of up to 32 users. The Series 925 and 925LX are available immediately.

The Series 935, which supports as many as 240 users, provides up to twice the performance of a Series 925 and about 85 percent of the performance of the Series 950. The system also provides more performance than the DEC VAX 8550 at one-third the price and more performance than the IBM 9377-90 at about half the price.

The Series 935 replaces the first HP 3000 based on HP-PA (Series 930), with about 30 percent more performance at a 17 percent lower price. It will be available later this year.

At the low end are the HP Micro 3000 LX and Micro 3000GX which are based on traditional HP 3000 architecture. The Micro 3000LX reduces the price of an entry-level HP 3000 to $10,950, half the price of the previous low-end system. Both systems are targeted toward small businesses, branch offices and small departments. These low-end systems are available immediately.

The HP 9000 Model 835S and Model 835SE are the new mid-range members of the HP-UX family. They will be available this summer.

The Model 835S is well-suited for computationally intensive tasks or multiuser environments with up to 30 users. The Model 835SE is targeted for commercial and technical applications requiring larger configurations — up to 70 users — such as software development and office work groups.

The Model 835 systems include a new subsystem that offers 2.02 double-precision MFLOPS of floating-point performance. Using this measure, the Model 835S is four times faster than a DEC MICROVAX 3600 at a lower price and 75 percent faster than a Sun 4/260 at a comparable price. The Model 835SE exceeds the performance of a VAX 8550 and 8700 at less than one-third the price.

Graphics workstation versions of the Model 835 were introduced in March. They include the 2.02-MFLOP superworkstation, the Model 835 TurboSRX (see "The New 350/835 TurboSRX," by Andy Barlow, p. 46, this issue).

The Model 855S, which will be available in the first half of next year, becomes the new performance leader of all HP computers that run the HP-UX operating system. It offers more than 50 percent more performance than the current high-end system, the Model 850S.

In addition to the new systems, HP also introduced two new enhancements to the HP 9000 Model 850S: a new field-installable floating-point upgrade that doubles the unit's floating-point performance, and a terminal expander that triples its terminal connectivity.

HP also introduced the HP-FL fiber-optic disc interface for HP-PA systems. ■

DEVELOPMENT

Lisa Burns Hartman

TurboIMAGE Logging

Reliable hardware alone is not enough to protect your users. TurboIMAGE provides excellent data insurance with database transaction logging.

Unless you're a data center manager, you may not have had this particular nightmare:

It's 3:00 p.m. the last day of the month, quarter and fiscal year. Your operator comes running into your office. He's in a state of panic. "The Sales machine is down! The entire Order Processing Department is screaming!" he shouts. You're not too worried, since you always can RESTORE last night's DBSTORE of the Order Processing database. But just then, the Order Processing data entry manager storms into your office. "What do you mean, re-enter my data?" he says. "Are you crazy? We booked half a million dollars worth of business today. My people go home in an hour, and we still have stacks of P.O.'s to book!" he says. "Oh boy," you think, "the entire company needs that data." This could be a long night for Order Processing.

Sure, HP hardware is extremely reliable. However, failures do occur. Moreover, lightning storms, floods, fires and even plane crashes can endanger data centers and valuable hours of work. Re-entry of transactions after a RESTORE from the previous day is time-consuming and expensive. Also, if the data source is a phone call rather than a printed purchase order, re-entering the data may not even be possible. Reliable hardware alone is not enough to protect your users.

TurboIMAGE provides excellent data insurance with database transaction logging. With logging, transactions are written to a log file as well as to the database itself. The log file then can be reapplied to last night's DBSTORE, bringing the old copy of the database back up to date (see *Figure 1*). No re-entry of data is necessary — happy users, happy data center staff. Here I'll describe TurboIMAGE logging, the different types of database recovery with logging, and offer suggestions on how to implement logging within your own shop.

TurboIMAGE logging, when enabled for a given database, captures database changes in a sequential file which then can be used to recover from a system failure. This file is called the log file for the database. The log file contains data from any intrinsic that changes the contents of the database. This means that when a program calls the DBPUT intrinsic, TurboIMAGE will write the buffer for the DBPUT to both the database and to the log file.

Similarly, data for DBOPEN, DBUPDATE, DBCLOSE, DBDELETE, DBBEGIN, DBEND and DBMEMO intrinsics also will be written to the log file. Execution of a DBGET or DBFIND intrinsic, however, will not update the log file, since these intrinsics do not alter the contents of the database. When the time comes that a recovery is necessary, the log file can be used to recapture work done after a DBSTORE of the database was taken.

Physical Integrity

To completely ensure that the database is consistent following a recovery, however, Intrinsic Level Recovery (ILR) is necessary. Remember that if your database contains any Automatic Master sets, a DBPUT intrinsic call within your program to add to the detail actually will cause a record to be added to both the detail and the Automatic Master set. In this case, TurboIMAGE logging needs to know whether or not the second add was completed before the system came down. The ILR file on disc contains a flag indicating the success of the second add. Thus, with ILR enabled, broken chains are prevented, since an entry in a detail set always will have an entry in the corresponding master set.

Similarly, if a DBDELETE intrinsic is called within your program, a delete to a detail set will cause a record to be deleted from both the detail and the associated Automatic Master. Again, TurboIMAGE logging will check the ILR file to see whether or not the second delete was completed before the crash. Physical integrity is ensured with ILR.

Logical Integrity

But wait — what about details associated with Manual Master sets? ILR won't help us here. Applications programmers need to ensure that a database is logically intact. Only they know that adding a new order to the database

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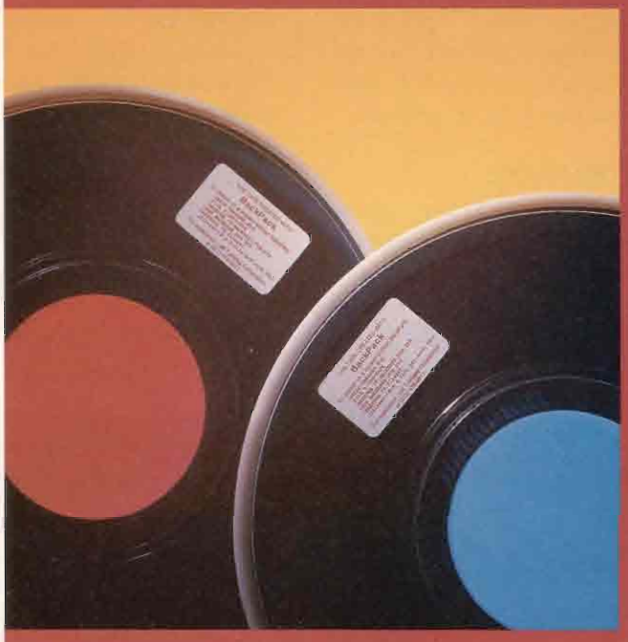

BackPack offers two ways to lighten the burden backup places on data center operations. First, you can take the 'traditional' approach, simply substituting BackPack for HP STORE in your job streams. BackPack cuts backup time by 35-50% on most systems, and halves tape usage as well. What's more, by incorporating DBSTORE into daily backup, BackPack eliminates the need to backup each database separately — an additional time and tape savings for IMAGE users.

A second alternative is to institute unattended backup procedures. In BackPack's "operatorless" mode, you start the store, mount a tape, and leave. BackPack fills the first reel, stores remaining data in compressed format to disc, and resets all store bits. In the morning, you copy the data to tape concurrent with normal system usage. For an unattended full dump, you need one-third of your total disc space free. With less space, you can probably still do daily backups unattended and full dumps partly unattended.

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 ENTER 140 ON READER CARD

means that five DBPUTs and one DBUPDATE must be executed in order to add a complete new accounting entry to the database.

This is where the intrinsics DBBEGIN and DBEND become important. By bracketing a complete transaction with DBBEGIN and DBEND intrinsics, the programmer can ensure that TurboIMAGE logging maintains the relationship between Manual Master sets and their associated details, and between different detail sets. Logical database integrity is ensured through DBBEGIN and DBEND intrinsic use.

Now we know how to preserve the integrity, both physical and logical, of our precious database. How do we go about saving the data entered by our poor friends in Order Processing? Assuming we already have enabled our database for logging, ILR and Roll-Back Recovery, we have a lot of options.

Roll-Back Recovery

If the system crash we just experienced was caused by a "soft" failure, we may be able to recover the database using Roll-Back Recovery. This recovery method, new with Turbo, allows us to return our database to a physically and logically consistent state without the need for a DBRESTORE and reapplication of log files. Once the machine has been WARMSTARTed successfully, the Roll-Back Recovery process examines the last transaction in the TurboIMAGE log file and backs out the results of an incomplete multiset transaction. *Figures 1a* and *1b* illustrate this process.

Enabling a database for Roll-Back Recovery requires ILR. This is so that if the last intrinsic written to the log file was a DBPUT or DBDELETE to a detail

FIGURE 1

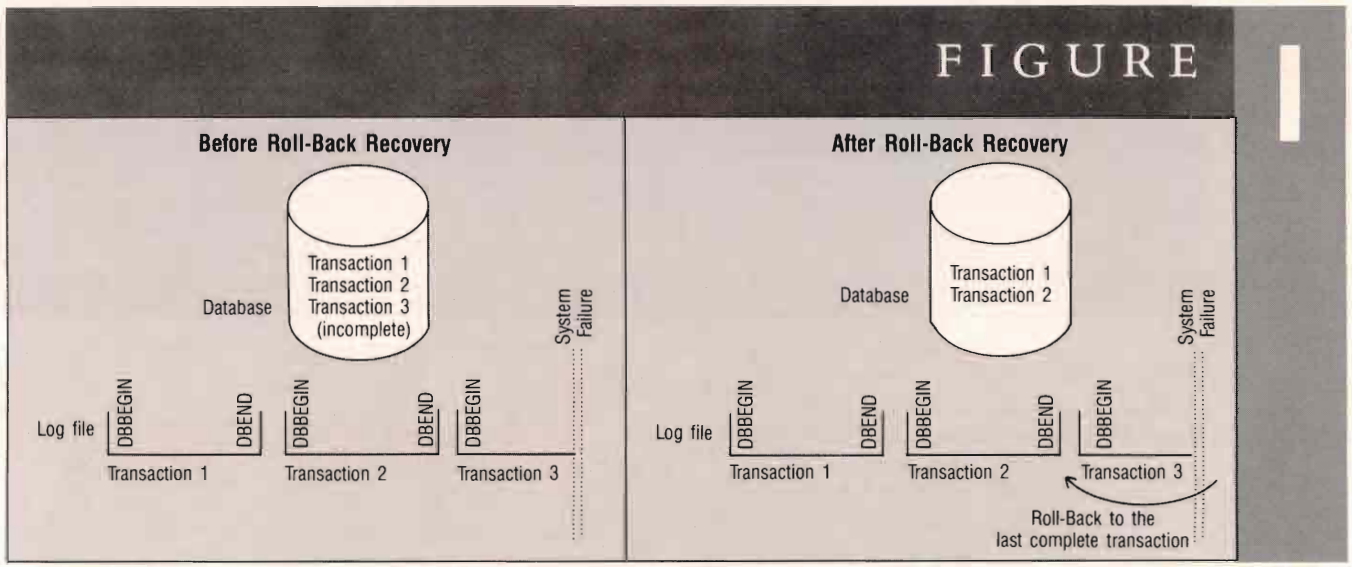

FIGURE 2

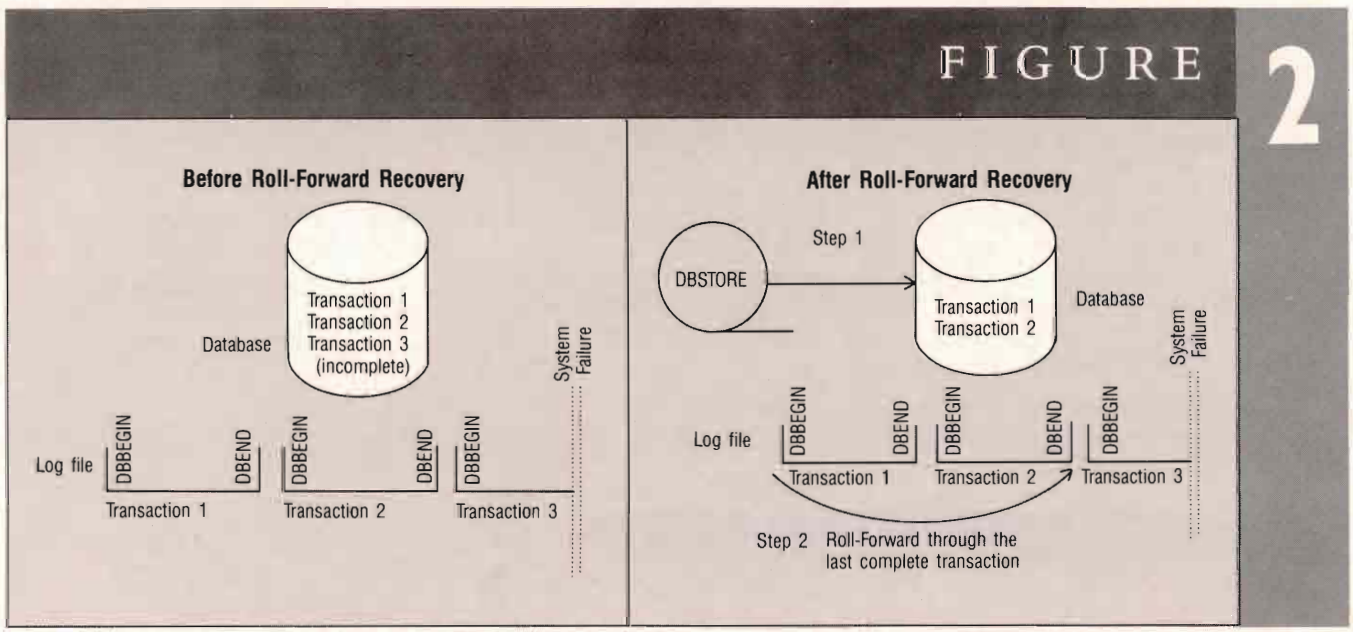

FIGURE 3

```
!JOB LOGONID,ADMIN/ADMPASS.MAS/MASPASS,OMSDTA/DTAPASS
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |     OMSZLOGJ  - OMSZLOGJ  is used to setup an existing |
!COMMENT |                 OMS database for IMAGE logging.       |
!COMMENT |                                                       |
!COMMENT |  The OMS log identifier is acquired for the log file. |
!COMMENT |  The logid and flags are set in the data base for the  |
!COMMENT |    OMS backup.                                        |
!COMMENT |  The OMS database is backed-up.                       |
!COMMENT |  The log file is built.                               |
!COMMENT |  Flags in the database are set for logging.           |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |  STEP 10 - SETUP EXISTING OMS DATA BASE FOR IMAGE     |
!COMMENT |            LOGGING                                    |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!GETLOG OMSLOG;PASS=OMS;LOG=OMSLG001.DISC;AUTO
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP 20 - SET LOGID INTO DATA BASE                 |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!RUN DBUTIL.PUB.SYS
SET OMS LOGID=OMSLOG
OMS
EXIT
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |  STEP 30 - SET USER FLAGS PRIOR TO BACKUP OF DATA BASE |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!RUN DBUTIL.PUB.SYS
DISABLE OMS FOR ACCESS
ENABLE OMS FOR RECOVERY
ENABLE OMS FOR LOGGING
ENABLE OMS FOR ROLLBACK
EXIT
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP 40 - "DBSTORE" OMS DATABASE                   |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!TELL ADMIN.MAS +-----------------------------+
!TELL ADMIN.MAS |  OMSZLOGJ  - STEP 40 |       |
!TELL ADMIN.MAS |---------------------+       |
!TELL ADMIN.MAS |                             |
!TELL ADMIN.MAS |  TAPE MOUNT FOR "OMS"       |
!TELL ADMIN.MAS |  PLEASE MOUNT A SCRATCH TAPE |
!TELL ADMIN.MAS |                             |
!TELL ADMIN.MAS |  This step will perform a   |
!TELL ADMIN.MAS |  DBSTORE of the OMS Turbo   |
!TELL ADMIN.MAS |  IMAGE data base.           |
!TELL ADMIN.MAS |                             |
!TELL ADMIN.MAS +-----------------------------+
!FILE DBSTORE=OMSDB;DEV=TAPE
!RUN DBSTORE.PUB.SYS
OMS
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP 50 - BUILD NEW CURRENT LOG FILE               |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!BUILD OMSLG001;CODE=LOG;DISC=10000,32,1
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP60  - START IMAGE LOGGING FOR OMS              |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!TELLOP |-------------------------------|
!TELLOP |  OMSZLOGJ  - STEP60 |         |
!TELLOP |--------------------+          |
!TELLOP |                               |
!TELLOP | NOTE: OPERATOR ACTION REQUIRED! |
!TELLOP |                               |
!TELLOP | Please start IMAGE logging for |
!TELLOP | OMS by typing the following   |
!TELLOP | command:                      |
!TELLOP |                               |
!TELLOP |      :LOG OMSLOG,START        |
!TELLOP |                               |
!TELLOP +-------------------------------+
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP70  - RESET OMS DATABASE FOR ACCESS AND DISALLOW |
!COMMENT |              RECOVERY.                                |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!RUN DBUTIL.PUB.SYS
ENABLE OMS FOR ACCESS
DISABLE OMS FOR RECOVERY
EXIT
!TELL ADMIN.MAS; OMS LOGGING AND DBSTORE HAS COMPLETED
!EOJ
```

set with an associated Automatic Master, Roll-Back Recovery can check the ILR file to see if both parts of the transaction must be removed, or if only one was completed before the failure. For this reason, enabling a database for Roll-Back Recovery will enable ILR automatically as well. In this way, TurboIMAGE logging can ensure both logical and physical data integrity.

Because it eliminates the need for a DBRESTORE and the reapplication of log files, Roll-Back Recovery is very fast. Users can be back online in as little as five minutes. This makes it an extremely attractive recovery method.

Roll-Forward Recovery

If the system crash we just experienced is due to a hardware problem, especially a disc problem, we may not be able to recover using Roll-Back. A "hard" failure forces us to use the Roll-Forward Recovery method. We begin with a DBRESTORE of the last available DBSTORE tape. Then, one or more log files are applied to the database. Roll-Forward Recovery will apply only complete transactions to the database. This means that no part of an incomplete logical transaction (bracketed by DBBEGIN and DBEND intrinsics) will be applied to the database, as shown in *Figures 2a* and *2b*. Logical integrity is maintained.

The use of Roll-Forward Recovery with TurboIMAGE logging doesn't require the use of ILR. However, ILR provides additional protection and its use is recommended, especially if DBBEGIN and DBEND calls are not provided in the application programs. If ILR is enabled, and the last intrinsic written to the log file was a DBPUT or DBDELETE to a detail set with an associated Automatic Master set, Roll-Forward Recovery will check the ILR file to see if both parts of the transaction were completed. If not, neither part will be applied. Again, logical and physical data integrity are maintained.

Because of the need for a tape mount and a DBRESTORE, Roll-Forward Recovery is certainly more time-consuming than Roll-Back. However, it's the only choice in the case of a hard crash. Also, it's certainly faster than having our poor Order Processing friends re-enter their data. Depending on how many transactions have been processed against the database, users

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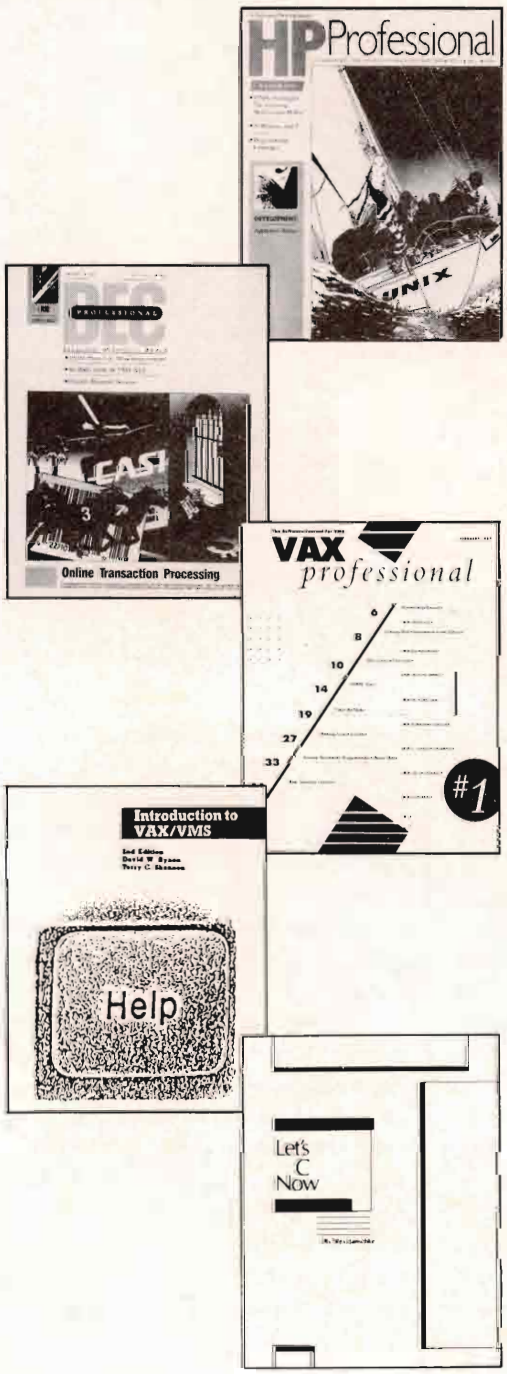

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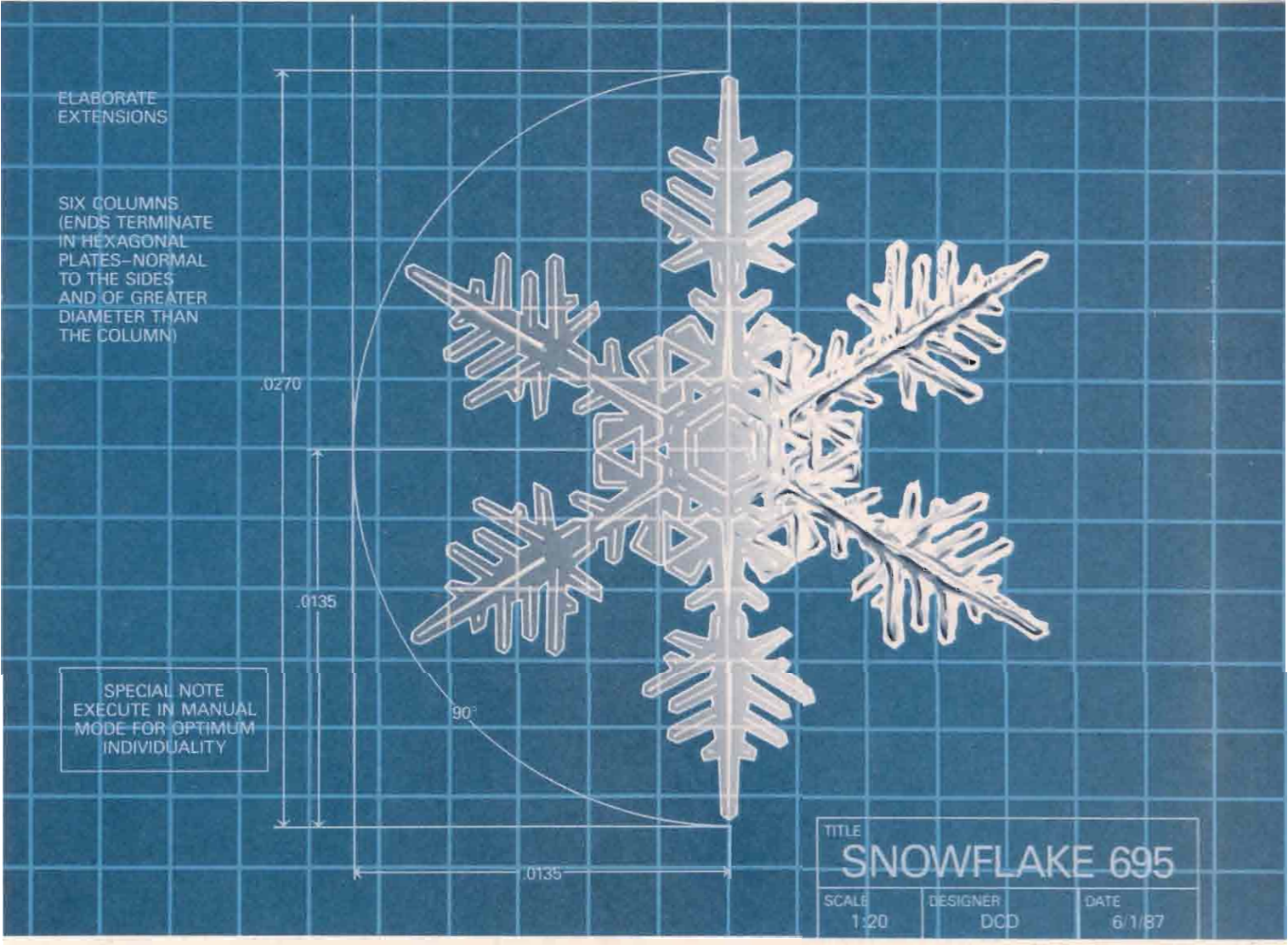

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FIGURE 4

```
!JOB OMSRECVJ,ADMIN/ADMPASS.MAS/MASPASS,OMSDTA/DTAPASS
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |     OMSRECVJ - OMSRECVJ is used to restore the OMS    |
!COMMENT |                database and apply the pending         |
!COMMENT |                transactions from the log file         |
!COMMENT |                to bring the OMS database back         |
!COMMENT |                to a current status.                   |
!COMMENT |                                                       |
!COMMENT |  The log process for OMSLOG Id is stopped and flags   |
!COMMENT |  in the data base appropriately set for recovery.  The|
!COMMENT |  OMS database is then restored and the pending        |
!COMMENT |  transactions applied from the IMAGE log files.       |
!COMMENT |  A new log file is created, after which the log process|
!COMMENT |  is started.                                          |
!COMMENT |                                                       |
!COMMENT |-------------------------------------------------------|
!COMMENT
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |  STEP 10 - STOP IMAGE LOGGING FOR OMS                 |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!TELLOP +-------------------------------------------------------+
!TELLOP | OMSRECVJ  - STEP 10 |                                 |
!TELLOP |---------------------+                                 |
!TELLOP |                                                       |
!TELLOP |  Please stop IMAGE logging for OMS by typing          |
!TELLOP |  in the following command:                            |
!TELLOP |                                                       |
!TELLOP |          :LOG OMSLOG,STOP                             |
!TELLOP |                                                       |
!TELLOP +-------------------------------------------------------+
!COMMENT
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP 20 - "PURGE" OMS DATABASE                     |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!RUN DBUTIL.PUB.SYS
PURGE OMS
EXIT
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP 30 - RESTORE OMS DATA BASE                    |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!TELLOP +-------------------------------------------------------+
!TELLOP |  OMSRECVJ - STEP 30 | TAPE MOUNT FOR "OMS"            |
!TELLOP |---------------------+ PLEASE MOUNT LAST OMS           |
!TELLOP |                       DATABASE BACKUP TAPE            |
!TELLOP |                                                       |
!TELLOP |  DBRESTOR of OMS data base                            |
!TELLOP |                                                       |
!TELLOP +-------------------------------------------------------+
!FILE DBRESTOR=OMSDB;DEV=TAPE
!RUN DBRESTOR.PUB.SYS
OMS
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP 40 - RUN DBRECOV                              |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!RUN DBRECOV.PUB.SYS
RECOVER OMS
RUN
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |  STEP 50 - "DBSTORE" OMS DATABASE                     |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!TELLOP +-------------------------------------------------------+
!TELLOP |  OMSRECVJ - STEP 50 | TAPE MOUNT FOR "OMS"            |
!TELLOP |---------------------+ PLEASE MOUNT A SCRATCH TAPE     |
!TELLOP |                                                       |
!TELLOP |  This step will perform a DBSTORE of the              |
!TELLOP |  OMS IMAGE database.                                  |
!TELLOP |                                                       |
!TELLOP +-------------------------------------------------------+
!FILE DBSTORE=OMSDB;DEV=TAPE
!RUN DBSTORE.PUB.SYS
OMS
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP 60  - PURGE OLDEST GENERATION OF LOG FILES AND|
!COMMENT |               BUILD NEW CURRENT LOG FILE              |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!PURGE OMSLOG3D
!RENAME OMSLOG2D,OMSLOG3D
!RENAME OMSLG001,OMSLOG2D
!BUILD OMSLG001;CODE=LOG;DISC=10000,32,1
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP 70  - ENABLE OMS FOR ACCESS AND DISABLE OMS FOR|
!COMMENT |               RECOVERY TO ALLOW USERS TO ACCESS       |
!COMMENT |               THE DATABASE, LOG TRANSACTIONS, AND NOT |
!COMMENT |               ALLOW RECOVERY.                         |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!RUN DBUTIL.PUB.SYS
ENABLE OMS FOR ACCESS
DISABLE OMS FOR RECOVERY
EXIT
!COMMENT +-------------------------------------------------------+
!COMMENT |                                                       |
!COMMENT |    STEP 80  - START IMAGE LOGGING FOR OMS             |
!COMMENT |                                                       |
!COMMENT +-------------------------------------------------------+
!TELLOP +-------------------------------------------------------+
!TELLOP |  OMSRECVJ - STEP 80  |                                |
!TELLOP |----------------------+                                |
!TELLOP |                                                       |
!TELLOP |  Please start IMAGE logging for OMS by typing         |
!TELLOP |  in the following command:                            |
!TELLOP |                                                       |
!TELLOP |       :LOG OMSLOG,START                               |
!TELLOP |                                                       |
!TELLOP +-------------------------------------------------------+
!TELLOP +-------------------------------------------------------+
!TELLOP |  OMSRECVJ - NORMAL COMPLETION                         |
!TELLOP +-------------------------------------------------------+
!EOJ
```

should be back online within 45 minutes or less.

So, you say, sounds great, but what is the cost of this data insurance? Well, nothing is free, but TurboIMAGE logging is very cheap. Long gone are the days when enabling a database for logging caused significant performance problems. I would challenge a user to notice any performance difference today between a database enabled for ILR and TurboIMAGE logging and a database without it. However, there are some things to be aware of with logging:

First, databases must be enabled for logging. For maximum flexibility — to allow both Roll-Forward and Roll-Back Recovery — databases should be enabled for ILR and for Roll-Back. Jobstreams to enable these capabilities can be supplied by the application teams. *Figure 3* is an example of a jobstream to enable a database for Roll-Forward and Roll-Back Recovery. Note that since Roll-Back Recovery is enabled, ILR will be enabled automatically. *Figure 4* shows examples of executing Roll-Forward Recovery against a database.

Next, logging must be explicitly started and stopped. Jobstreams should be written by the application team and supplied with software. *Figure 5* shows an example of a daily logging job.

Another thing to be aware of is that, like any other file, log files take space. If you log your files to disc, you must have adequate space for the files. If you're already low on disc space, this can be a problem, since *all* activity against a database will come to a screeching halt if there's no space available in the log file.

An additional warning about log-

For maximum flexibility — to allow both Roll-Forward and Roll-Back Recovery — databases should be enabled for ILR and for Roll-Back.

ging transactions to disc files involves the problem of a disc failure. Since all data on a particular drive may be irrecoverable in the case of a head crash, care must be taken to place the disc log file on a separate logical device from the datasets in the database being logged. This way, if the database drive takes a hit, the log file still can be used. Application teams can specify the LDEV when BUILDing the log file. This is done in the daily logging job shown in *Figure 5*.

An alternative is to log transactions to tape. However, this requires a dedicated tape drive. Furthermore, tape logging can be cumbersome and error-prone, since operator intervention is required to change tapes. This can lead to over-writing data, or to the stopping of activity against the database if the tape becomes full and another is not mounted.

Finally, to ensure logical consistency, programs running against a database must be coded using the DBBEGIN and DBEND intrinsics. This will ensure that only complete transactions are posted to the database. If DBBEGINs and DBENDs aren't used, logging still can be used, but only physical integrity (through ILR) will be ensured.

How is logging used within our shop? First, not all application databases are enabled for logging. For some fairly stable resource files, like our validity table database, logging is unnecessary and isn't used. Since this file is updated only once a month, it's easy to recover. Update transactions sent from a central source simply can be reapplied. In this

case, the updates and the update program act as a substitute for TurboIMAGE logging.

For our volatile, heavy data-entry database applications, however, logging has been enabled by applications teams. For example, the repair order dispatching application has been using logging for many years. For this application, data entry input comes via telephone calls from customers needing service. This means that re-entering data is not only undesirable, but may be impossible! Logging ensures that no data will be lost in the case of a failure.

Our sales order processing system also now makes use of logging. In the past, this system made use of a central order file as a backup and insurance in the case of a system failure. With a new enhancement, not all data entered is passed on to the central file. This makes logging mandatory for data recovery.

The application team has just completed the full implementation of DBBEGIN and DBEND calls around multidataset transactions. This will ensure that only complete transactions are written to the database. A sample program is shown in *Figure 6*.

Applications within our shop have supplied the data center staff with jobstreams to enable databases for logging, ILR and Roll-Back. These jobstreams also are careful to place log files on specific drives, away from the database's datasets. They also have supplied jobs to stop logging, store the database and start logging again. Finally, they have supplied jobs to recover the database in both Roll-Forward and Roll-Back methods.

Our experience with recovery situations is blessedly little! Some sites who have had major applications enabled for logging for years have never had to recover. However, logging recovery has been tested for each application using it, in rehearsal for what we hope never occurs. The few sites who have experienced power surges and other problems have recovered successfully and quickly with logging.

Implementing logging within your own shop will help you avoid that fiscal year-end situation I described earlier. Hopefully, the examples provided here will help you. Section 7 (Maintaining the Database) and Section 8 (Using Data Base Utilities) of the *TurboIMAGE Manual* can offer further information and assistance.

HP hardware and software is ex-

FIGURE 5

```
!JOB OMSBKUPJ,ADMIN/ADMPASS.MAS/MASPASS,OMSDTA/DTAPASS;OUTCLASS=XDEV,XRI
!COMMENT |-------------------------------------------------------|
!COMMENT |     OMSBKUPJ  -  OMSBKUPJ is used to backup the OMS   |
!COMMENT |                  database and start a new logging     |
!COMMENT |                  cycle.                               |
!COMMENT |                                                       |
!COMMENT |  Flags are set via DBUTIL prior to STOREing the data  |
!COMMENT |  base and OMS backed-up.  The logging                 |
!COMMENT |  files are then re-initialized, after which the log   |
!COMMENT |  process is started and the data base flags reset for |
!COMMENT |  on-line updating.                                    |
!COMMENT |-------------------------------------------------------|
!COMMENT
!COMMENT +-----------------------------------------------------+
!COMMENT |                                                     |
!COMMENT |STEP 10 - STOP IMAGE LOGGING FOR OMS                 |
!COMMENT |                                                     |
!COMMENT +-----------------------------------------------------+
!TELLOP +-----------------------------------------------+
!TELLOP |OMSBKUPJ - STEP 10                             |
!TELLOP |                                               |
!TELLOP | Please stop IMAGE logging for OMS by typing in|
!TELLOP |                                               |
!TELLOP |       :LOG OMSLOG,STOP                        |
!TELLOP |                                               |
!TELLOP +-----------------------------------------------+
!COMMENT +-----------------------------------------------------+
!COMMENT |                                                     |
!COMMENT |  STEP 20 - THE USER ACCESS FLAG IS DISABLED SO THAT |
!COMMENT |            IF THE DATABASE IS RESTORED FROM THE     |
!COMMENT |            BACKUP MADE IN THE NEXT STEP, USERS WILL |
!COMMENT |            NOT BE ABLE TO ACCESS THE DATABASE UNTIL |
!COMMENT |            ALL THE RECOVERY STEPS HAVE COMPLETED.   |
!COMMENT |                                                     |
!COMMENT |            RECOVERY IS ENABLED SO THE DATABASE WILL BE |
!COMMENT |            READY FOR "DBRECOV" IF THE BACKUP IS     |
!COMMENT |            RESTORED.                                |
!COMMENT |                                                     |
!COMMENT |            LOGGING AND ILR ARE ENABLED FOR DBSTORE  |
!COMMENT |                                                     |
!COMMENT +-----------------------------------------------------+
!RUN DBUTIL.PUB.SYS
DISABLE OMS FOR ACCESS
ENABLE OMS FOR RECOVERY
ENABLE OMS FOR LOGGING
ENABLE OMS FOR ROLLBACK
EXIT
!COMMENT +-----------------------------------------------------+
!COMMENT |                                                     |
!COMMENT |    STEP 30 - "DBSTORE" OMS DATABASE                 |
!COMMENT |                                                     |
!COMMENT +-----------------------------------------------------+
!TELLOP +-------------------------------------------------+
!TELLOP |  STARTLOGJ- STEP 30 | TAPE MOUNT FOR "OMS"      |
!TELLOP |---------------------+ PLEASE MOUNT A SCRATCH TAPE|
!TELLOP |                                                 |
!TELLOP |  This step will perform a DBSTORE of the        |
!TELLOP |  OMS database.                                  |
!TELLOP |                                                 |
!LOP +-------------------------------------------------+
!FILE DBSTORE=OMSDB;DEV=TAPE
!RUN DBSTORE.PUB.SYS
OMS
!COMMENT +-----------------------------------------------------+
!COMMENT |                                                     |
!COMMENT |    STEP 40 - PURGE OLDEST GENERATION OF LOG FILES AND |
!COMMENT |              BUILD NEW CURRENT LOG FILE             |
!COMMENT |                                                     |
!COMMENT +-----------------------------------------------------+
!PURGE OMSLOG2D
!RENAME OMSLOG2D,OMSLOG3D
!RENAME OMSLG001,OMSLOG2D
!BUILD OMSLG001;CODE=LOG;DISC=10000,32,1;DEV=7
!COMMENT +-----------------------------------------------------+
!COMMENT |                                                     |
!COMMENT |    STEP 50 - START IMAGE LOGGING FOR OMS            |
!COMMENT |                                                     |
!COMMENT +-----------------------------------------------------+
!TELLOP +-----------------------------------------+
!TELLOP |  OMSBKUPJ - STEP 50 |                   |
!TELLOP |---------------------+                   |
!TELLOP |                                         |
!TELLOP |  Please start IMAGE logging for OMS by typing |
!TELLOP |  in the following command:              |
!TELLOP |                                         |
!TELLOP |      :LOG OMSLOG,START                  |
!TELLOP |                                         |
!TELLOP +-----------------------------------------+
!COMMENT +-----------------------------------------------------+
!COMMENT |                                                     |
!COMMENT |    STEP 60 - RESET OMS DATABASE ACCESS AND          |
!COMMENT |              LOGGING  FLAGS TO ALLOW USERS TO  ACCESS |
!COMMENT |              THE DATABASE, LOG TRANSACTIONS, AND NOT |
!COMMENT |              ALLOW RECOVERY.                        |
!COMMENT |                                                     |
!COMMENT +-----------------------------------------------------+
!     RUN DBUTIL.PUB.SYS
ENABLE OMS FOR ACCESS
DISABLE OMS FOR RECOVERY
EXIT
!TELLOP +-----------------------------------------+
!TELLOP |  OMSBKUPJ - NORMAL COMPLETION           |
!TELLOP +-----------------------------------------+
!EOJ
```

tremely reliable. Murphy and natural disaster still can produce expensive data processing disasters, however. Wouldn't you sleep better at night knowing that by implementing logging, you've done all you can to prevent data loss? I know I do. —*Lisa Burns Hartman manages an internal business software programming team at Hewlett-Packard Corporate Headquarters, Palo Alto, CA.*

FIGURE 6

```
 2110-ADD-ENTRY.
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
*                                                                         *
*    THIS PARAGRAPH ADDS A NEW USER TO THE PARAMETER                      *
*    DATABASE.  THE TRANSACTION WILL NOT BE LOGICALLY                     *
*    COMPLETE UNTIL THE USER IS ADDED TO BOTH THE                         *
*    MANUAL MASTER DATASET "SUPERVISOR-MAST" AND TO THE                   *
*    DETAIL DATASET "SUPERVISOR-DTL".  FOR THIS REASON,                   *
*    THE TRANSACTION IS BRACKETED BY DBBEGIN AND DBEND                    *
*    IMAGE CALLS.  WHEN RECOVERY IS EXECUTED, THE DATABASE                *
*    WILL BE LOGICALLY CONSISTENT, AS EITHER BOTH DBPUT's                 *
*    WILL BE COMPLETED, OR NEITHER ONE WILL.                              *
*                                                                         *
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

      MOVE "2110" TO PARAGRAPH-NUM.

      MOVE ALL SPACES TO NEW-SUPR-NAME
                         SUPR-INFO.
      MOVE SUPR-NAME OF SUPR-BR-SCREEN TO SUPR-NAME OF SUPR-INFO.
      MOVE BRANCH OF SUPR-BR-SCREEN TO BRANCH OF SUPR-INFO.
      MOVE SUPR-INFO TO ICP-BUFFER.
      MOVE ICP-ALL-LIST  TO ICP-LIST.

*Add to SUPERVISOR master

      PERFORM DB-BEGIN THRU DB-BEGIN-EXIT.
      MOVE SUPERVISOR-MAST TO ICP-DSET.
      PERFORM DB-PUT THRU DB-PUT-EXIT.

*Add to SUPERVISOR detail.

      MOVE SUPERVISOR-DTL TO ICP-DSET.
      PERFORM DB-PUT THRU DB-PUT-EXIT.
      PERFORM DB-END THRU DB-END-EXIT.

*SHOW "SUCCESSFUL ADD" MESSAGE

     MOVE SPACES TO V-MESSAGE.
     MOVE "SUPERVISOR WAS ADDED SUCCESSFULLY" TO V-MESSAGE.
     PERFORM VIEW-PUTWINDOW THRU VIEW-PUTWINDOW-EXIT.

 2110-EXIT.   EXIT.


 DB-BEGIN.
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
*                                                                         *
*  THIS PARAGRAPH IS USED TO BEGIN TRANSACTION LOGGING.                   *
*                                                                         *
*  INPUTS:  ICP-BASE                                                      *
*           ICP-TEXT                                                      *
*           ICP-TEXTLEN                                                   *
*           COME-FROM-NUM                                                 *
*                                                                         *
*  OUTPUTS: NON-ERROR STATE       ERROR STATE                             *
*           ----------------      -----------                             *
*           ICP-STATUS            ICP-STATUS                              *
*                                 ERROR-FLAG                              *
*                                 ERROR-MSG                               *
*                                 COME-FROM-NUM (UNCHANGED)               *
*                                                                         *
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

     MOVE SPACES TO ERROR-FLAG.

     CALL "DBBEGIN" USING ICP-BASE
                          ICP-TEXT
                          ICP-MODE1
                          ICP-STATUS
                          ICP-TEXTLEN.

     IF ICP-COND-CODE = 0 OR = 71
         MOVE ICP-COND-CODE TO ICP-BEGIN-CODE
         MOVE 0 TO ICP-COND-CODE
         GO TO DB-BEGIN-EXIT

     ELSE
         MOVE "I" TO ERROR-FLAG
         MOVE ICP-BASE TO ERR-FILE
         MOVE "DBBEGIN FATAL ERROR" TO ERR-MSG
         MOVE ICP-STATUS TO IMAGE-GEN-STATUS
         GO TO 9999-FATAL-ERROR-EXIT.

 DB-BEGIN-EXIT. EXIT.

 DB-END.
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
*                                                                         *
*  THIS PARAGRAPH IS USED TO END TRANSACTION LOGGING.                     *
*                                                                         *
*  INPUTS:  ICP-BASE                                                      *
*           ICP-TEXT                                                      *
*           ICP-TEXTLEN                                                   *
*           COME-FROM-NUM                                                 *
*                                                                         *
*  OUTPUTS: NON-ERROR STATE       ERROR STATE                             *
*           ----------------      -----------                             *
*           ICP-STATUS            ICP-STATUS                              *
*                                 ERROR-FLAG                              *
*                                 ERROR-MSG                               *
*                                 COME-FROM-NUM (UNCHANGED)               *
*                                                                         *
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

     MOVE SPACES TO ERROR-FLAG.

     CALL "DBEND" USING ICP-BASE
                        ICP-TEXT
                        ICP-MODE1
                        ICP-STATUS
                        ICP-TEXTLEN.

     IF ICP-COND-CODE = 0
         GO TO DB-END-EXIT

     ELSE IF ICP-COND-CODE = -153 AND
       ICP-BEGIN-CODE = 71
         MOVE 0 TO ICP-BEGIN-CODE, ICP-COND-CODE
         GO TO DB-END-EXIT

     ELSE
         MOVE "I" TO ERROR-FLAG
         MOVE ICP-BASE TO ERR-FILE
         MOVE "DBEND FATAL ERROR" TO ERR-MSG
         MOVE ICP-STATUS TO IMAGE-GEN-STATUS
         GO TO 9999-FATAL-ERROR-EXIT.

 DB-END-EXIT. EXIT.


 DB-PUT.
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *
*                                                                         *
*  THIS PARAGRAPH IS USED TO ADD NEW ENTRIES TO A MANUAL                  *
*  MASTER OR DETAIL DATA SET.  THE DATA BASE MUST BE OPENED               *
*  IN ACCESS MODE 1, 3, OR 4.                                             *
*                                                                         *
*  INPUTS:  ICP-BASE                                                      *
*           ICP-DSET                                                      *
*           ICP-LIST                                                      *
*           ICP-BUFFER                                                    *
*           COME-FROM-NUM                                                 *
*                                                                         *
*  OUTPUTS: NON-ERROR STATE       ERROR STATE                             *
*           ----------------      -----------                             *
*           ICP-STATUS            ICP-STATUS                              *
*                                 ERROR-FLAG                              *
*                                 ERROR-MSG                               *
*                                 COME-FROM-NUM (UNCHANGED)               *
*                                                                         *
*  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *  *

     MOVE SPACES TO ERROR-FLAG.

     CALL "DBPUT" USING ICP-BASE
                        ICP-DSET
                        ICP-MODE1
                        ICP-STATUS
                        ICP-LIST
                        ICP-BUFFER.

     IF ICP-COND-CODE = 0
         GO TO DB-PUT-EXIT

     ELSE
         MOVE "I" TO ERROR-FLAG
         MOVE ICP-BASE TO ERR-FILE
         MOVE "DBPUT FATAL ERROR" TO ERR-MSG
         MOVE ICP-STATUS TO IMAGE-GEN-STATUS
         GO TO 9999-FATAL-ERROR-EXIT.

 DB-PUT-EXIT. EXIT.
```

■

Continued from page 24.

links to MPE/V systems using the same version of BACKCHAT running in compatibility mode.

The company also announced immediate availability of its Q-GEN reporting system in both native and compatibility modes. In addition, the native mode version generates native mode compiled report programs that reinforce the high performance of this product.

Full support of FLEXIBASE (its database management utility) on MPE/XL also is available.

Contact Randy Safier, Proactive Systems, P.O. Box 7102, Bloomfield Hills, MI 48302; (800) 356-7117; in Michigan (313) 333-7200.

Enter 394 on reader card

R1030 Collects Simultaneous Data

Rapid Systems recently announced the R1030, a four-channel datalogger for PC XT/AT and compatibles. It collects eight-bit, simultaneous data continuously in real time to disc, printer or screen at rates of 10KHz and above, depending on your computer type and configuration.

The turnkey R1030 contains software and hardware to get users up and running in two minutes. The menu-driven software allows you to pass data directly to disc, printer or monitor in real time. Disc storage data format is well-documented so it can be readily retrieved for analysis.

Product highlights include one- to four-channel simultaneous acquisition with multiplexing, internal/external analog/digital triggering, programmable start/stop time, burst mode for short high-speed data collection, Epson printer support, scrolling feature for data viewing, and more.

Contact Rapid Systems, 433 N. 34th St., Seattle, WA 98103; (206) 547-8311.

Enter 374 on reader card

Touchstone 1.6 Improves Simulation Program

EEsof Inc. has introduced Touchstone 1.6, the newest generation of its linear simulation program for the design, analysis and optimization of microwave/RF circuits.

Touchstone 1.6 ($9,900) features a new sparse admittance matrix reduction capability, full-feature screen editor commands, increased variable and equation faculties and more.

Touchstone 1.6's capability to perform sparse admittance matrix reduction of circuits lets you analyze large, complex circuits faster and provides more efficient use of computer memory. This technique offers an alternative and an addition to the existing scattering parameter reduction analysis presently available in Touchstone.

The user interface has been enhanced with new full-screen editor commands, including search and replace; repeat find command; file read/insert; and select, delete, move, copy and undo block. These features simplify the preparation of circuit files, especially large circuit files, where sections of code are repeated and/or available to be read from separate files.

Up to 250 variables plus equations can be represented in a circuit file. This feature offers you a greater capability to model relationships and characterize non-standard or proprietary circuit parameter relationships.

Touchstone 1.6 is available on the HP 9000 Series 300, IBM PCs and compatibles, DEC VAX series, Apollo and Sun Microsystems.

Contact Donn Mutch, EEsof, Inc., 5795 Lindero Canyon Rd., Westlake Village, CA 91362; (818) 881-7530.

Enter 397 on reader card

T.S.I. To Distribute Communications Software

371355 (Alberta) Limited has appointed Timesharing Inc. (Jacksonville, FL) as the sole distributor of the HPE3 range of PC to HP 3000 communications software in the U.S. and Canada.

T.S.I. will be selling HPE3 through its own sales network of offices in Boston, New York, Chicago, Atlanta, Orlando, Denver, Jacksonville and Dallas, and through Value Added Resellers such as Micro Marketing and Sales Inc. of New York. T.S.I. will be selling HPE3 in tandem with its own range of external disc subsystems for the Hewlett-Packard minicomputers.

HPE3 is the second-generation evolution of the HPE2 product, developed in association with the Plessey Company in the U.K. and includes features such as a script processor/command language for the automation of PC-host sessions and file transfers, and online user-definable help.

Contact Glenn Johann, Timesharing Inc., Jacksonville, Florida; (800) 222-DISK.

Enter 375 on reader card

CAPTURE, MANAGER Run On 800 Series Under UNIX

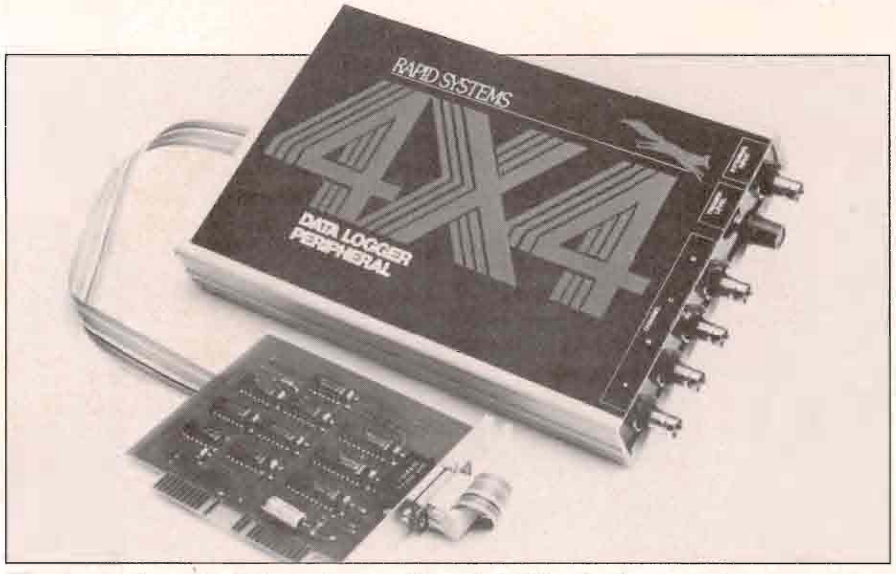
Industrial Computer Corporation has announced the release of its CAPTURE and MANAGER product lines running under UNIX on HP's 800 Series Precision Architecture systems.

CAPTURE was made a member of HP's National Account Program (NAP) in April 1987. It has been used to provide Shop Floor Data Collection and Control applications in a wide range of industries.

ICC also reports discussions with HP's European Marketing Center (EMC) in Lyon, France. ICC signed licensing agreements with Systems Integrators in Holland and the United Kingdom last year and is targeting availability of the first non-English versions of its products later this year.

Contact Industrial Computer Corp., 6065 Barfield Rd., Suite 114, Atlanta, GA 30328; (404) 255-8336.

Enter 390 on reader card



The R1030 four-channel datalogger collects eight-bit, simultaneous data in real time to disc, printer or screen.

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SIMPLY EXPOSES SECRETS.

BayTech Develops Data Exchange System

BayTech has developed a high-performance Data Exchange System, Model 24, that allows peripheral sharing, computer-to-computer communication plus buffering of print data.

The unit has a 16-bit CPU, plus multiple high-performance I/O processors that allow super high-speed transfer of data demanded by new faster computers and software.

Each Model 24 ($895 - $1,895) is customized by combinations of serial and parallel ports installed in four-port I/O modules to a maximum of 24 total ports. Ports are user-set as computer or peripheral ports, and data input and output are simultaneous on all ports. The standard 512-KB buffer is expandable up to 4½ MB. Computer-to-computer communication provides file transfer and database sharing capabilities concurrent with all operations.

The Model 24 is fully compatible with virtually all computers, printers, plotters, modems and other peripherals.

Contact Bay Technical Associates, 200 N. Second St., Bay St. Louis, MS 39520; (601) 467-8231.

Enter 373 on reader card

Image-Pro II Provides New Interface

Media Cybernetics has released Image-Pro II, a new version of its image processing software.

Image-Pro II has a new interface and many enhancements. It gives users an option to select a single-monitor configuration with pull-down menus on the display monitor, or a dual-monitor configuration in which the menus appear on the system monitor.

Image-Pro II also provides free-form processing, a feature that allows processing on "n vertex polygonal areas," which users can specify by tracing the area they wish to process.

A new Install program walks the user through the procedure step by step. It creates the necessary directories and copies relevant files.

In Image-Pro II, Media Cybernetics introduces the HALO Format File (HFF), a new file format. HFF is an extension of the Tagged Interchange File Format (TIFF), which is endorsed by Aldus, Microsoft and Hewlett-Packard. It allows faster reading and writing of images and adds the ability to store the entire image definition in one file. HFF also will be portable across the family of Image-Pro supported devices.

Contact Media Cybernetics, 8484 Georgia Ave., Silver Spring, MD 20910; (800) 992-HALO.

Enter 377 on reader card

BayTech's high-performance Data Exchange System, Model 24, allows peripheral sharing, computer-to-computer communication and buffering of print data.

I-2-4 Add-On Memory For LaserJet II

Pacific Data Products has announced upgradable add-on memory for HP's LaserJet Series II printers.

The "1-2-4" board ($295) is fully compatible with the Series II memory expansion slot. It comes without memory in standard configuration and uses a unique socket arrangement to accept either 256K or 1-MB memory chips. The board can be configured to 1, 2 or 4 MB and may be upgraded at any time.

The LaserJet Series II requires extra memory for applications such as desktop publishing or design and drafting. The expandable "1-2-4" board eliminates the risk of selecting a memory board too small for an application. Resellers need to stock only one memory board instead of three and can offer memory upgrades at low cost as customers' application requirements change.

Contact Pacific Data Products, Inc., 8525 Arjons Dr., Suite M, San Diego, CA 92126; (619) 549-0922.

Enter 388 on reader card

CCS/C 3000 Implements XDS, Long Pointers

Corporate Computer Systems (CCS) recently announced ANSI function prototyping and long pointers on its CCS/C C Language Compilers. With versions available for both the HP 3000 and 1000, CCS/C now makes portable programming in C easier.

Release 2.0 of CCS/C 3000 is the only compiler to implement the draft ANSI C standard for function prototyping, which provides function argument typechecking and automatic type conversions. Function prototyping makes it easier for the programmer to generate better code with fewer bugs.

Even with ANSI standards, the MPE operating system provides a unique challenge for the C Language's portability feature in terms of its memory architecture. The MPE operating system provides extra data segments (XDS) to augment address space. However, source code has to be specially designed to XDS, causing problems when porting a program to another system. CCS has added long pointers to integrate the concept of XDS so the programmer can take full advantage of extended memory without sacrificing portability.

CCS/C 3000 allows transparent access to XDS that makes the program's stack and XDS homogeneous. Long pointers provide an extra benefit for programmers by making it easier to correctly access system tables. Although not ANSI standard, CCS/C's implementation of long pointers is compatible with C on the Spectrum class computers and IBM PCs.

Special features have been implemented for CCS/C 3000 so that programmers have a choice in development methods. Experienced HP 3000 programmers will find that it produces standard USLs, while C users coming from other environments like DEC, UNIX or IBM can produce "standard" C relocatables with the linkage edit approach, giving programmers a unique option for program development on the HP 3000.

Contact Corporate Computer Systems, Inc., 33 West Main St., Holmdel, NJ 07733; (201) 946-3800.

Enter 378 on reader card

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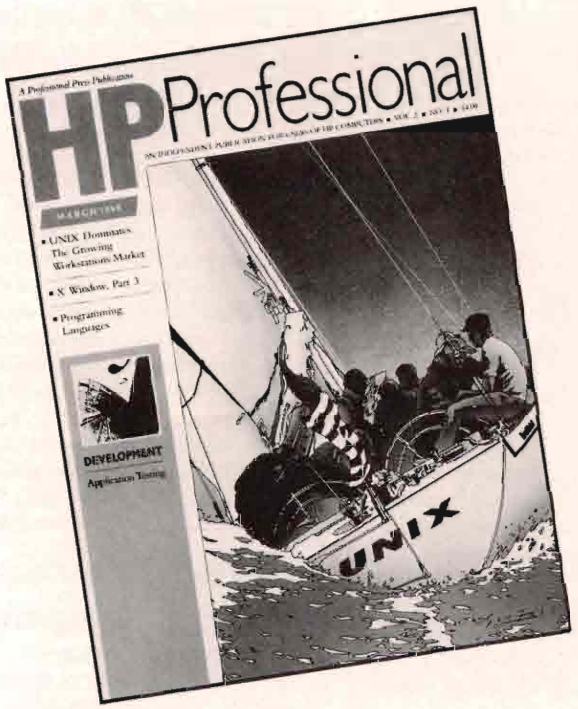

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NEW PRODUCTS

Magnetic Tape Subsystem Supports 1000s, 9000s

A new dual-density 1600-/6250-bpi magnetic tape subsystem has been added to the family of IEEE-488 (HP-IB)-based subsystems available from Digital Automation Associates, Inc.

The Model 2444S supports the HP 1000 and HP 9000 computer families. The 2444B supports the AT&T 3B2 computer family and includes the IEEE-488 feature card and cable. The 2444P supports the IBM PC, XT/AT family and includes a host adapter and cable.

All three models of the new subsystem interface to the host over the IEEE-488 (HP-IB) bus and executes a command set compatible with HP 7970 tape transports. The Model 2444S runs with HP 1000 under RTE-A and HP 9000 under BASIC and HP-UX. The Model 2444B runs on AT&T computers under UNIX. The Model 2444P runs on PC-DOS or MS-DOS.

Contact Digital Automation Associates Inc., 310 W. Gypsy Lane Rd., Bowling Green, OH 43402; (419) 352-7526.

Enter 392 on reader card

FASTRAN PLUS Increases CPU Speed

Performance Software Group recently announced FASTRAN PLUS, a significant enhancement to FASTRAN, its compiler for HP 3000 TRANSACT programs.

FASTRAN PLUS adds to the increase of CPU speed and file access speed in programs that access records sequentially, including records that come from IMAGE, KSAM and regular MPE files. In addition, any program doing sorts will run faster.

FASTRAN PLUS is a joint effort of Performance Software Group and RunningMate (Sacramento, CA).

Contact Performance Software Group, 12 Hillview Dr., Baltimore, MD 21228; (301) 242-6777.

Enter 383 on reader card

MPEX/3000 Offers REDO Capability

VESOFT Inc. has announced that its MPEX/3000 productivity and system control tool has a REDO command that allows its users to redo any of the last 20 or more commands entered. The REDO facility frequently was requested by users to save personal time and effort when programming.

The REDO command is useful when correcting typing mistakes and helpful in utilities such as QUERY, FCOPY, SPOOK, EDITOR KSAMUTIL, LISTDIR and other third-party utilities.

MPEX users can LISTREDO, REDO or DO commands by number or name, even in visual mode. MPEX also provides a special program, MPEXHOOK, which enables users to interface almost any utility to MPEX, allowing them to use this super-REDO facility inside EDITOR, QUERY, BASIC, etc. In addition, users can execute such commands as COBOL, PREP RUN and UDCs from within these utilities.

Contact Eugene Volokh, VESOFT Inc., 1135 S. Beverly Dr., Los Angeles, CA 90035; (213) 282-0420.

Enter 391 on reader card

VALUE-PACK Announced For HP Series 200/300

Applied Microcomputer Systems recently announced VALUE-PACK for the HP Series 200/300.

VALUE-PACK ($145) provides wild-card copy, purge and catalog of disc files. An automatic central menu is easily configured to run any program on the system with a single soft-key. For those who use the system clock, VALUE-PACK sets and verifies time, or the clock can be set automatically by connecting an optional modem-clock.

VALUE-PACK runs on Series 200/300 computers with BASIC 3.0 or higher, and can be installed on any disc drive.

Contact Microcomputer Systems, Page Hill Rd., Chocorua, NH 03817; (603) 323-8666.

Enter 387 on reader card

DRAWBASE Interfaces With SPACE Program

The DRAWBASE computer-aided design (CAD) software from SKOK Systems Incorporated now interfaces with the SPACE program from Graphic Systems Inc.

DRAWBASE ($1,995 - $4,995) includes 2-D drafting, 3-D design and database management capabilities. The integrated database is useful in facilities management because components such as areas, furniture and equipment that appear in the computer drawing are tracked with the database manager. As the drawing changes, the database manager updates the quantities automatically.

SPACE ($495) is a planning and decision-making software for architects, interior designers and facilities managers. The package can perform affinity analysis and generate blocking and stacking diagrams. SPACE enables decision-makers to consider growth and shrinkage scenarios and their

costs before generating space plans.

The bidirectional interface can be used to import floor plans from DRAWBASE into SPACE's blocking module and export saved blocking and stacking diagrams from SPACE into DRAWBASE, which allows DRAWBASE designs to be analyzed with SPACE. Layouts that have been created with SPACE can be developed and detailed with DRAWBASE.

DRAWBASE is compatible with the HP Vectra 286-based model, IBM PC/XT and compatibles, and supports the HP ThinkJet printer and all HP pen plotters. SPACE supports the HP Vectra, IBM PC/XT and compatibles.

Contact SKOK Systems Inc., 222 Third St., Cambridge, MA 02142; (617) 868-6003.

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QCI Announces BCL3000 Release 2.0

Quality Consultants, Inc., developer of BCL3000 (Bar-Code and Label Management System for the HP 3000), has announced Release 2.0 of the software, which allows users to design labels and/or bar-code formats and then modify them as needed.

BCL3000 ($2,000 - $5,000) accommodates almost any labeling need by generating user-defined labels using menu-driven screens. Release 2.0 allows users to define labels ranging in size from .1 by .1 inch to 13.2 by 16.5 inches. This enhancement allows printing of small labels for filing and mailing or large labels for shipping/manufacturing applications, signs and banners. Developers now are reporting that one hour of label/bar code development using BCL3000 is roughly equivalent to 40 hours of programming printer code.

With the addition of the Application Printing Module (APM), in Release 2.0, bar codes/labels automatically can be printed from any application system. Users need only define output from the application as an MPE Message File and define the Message File as data input in the APM Job Stream. As data is written from the application, bar codes/labels are printed to the specified device(s). In addition, the online "helps" in BCL3000 have been improved.

BCL3000 supports output to the HP 2934, HP 256X (with the HP Label Card and serial interface), Printronix printers (with the QMS Magnum Board) and the ATC 20/20 Thermal Transfer printer.

Contact Ken Kimbrough, Quality Consultants, Inc., 1775 The Exchange, Suite 380, Atlanta, GA 30339; (404) 980-1988.

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Two Systems Provide Link For PROTOS Users

Perpetual Software And Consulting recently announced Release 1.0 of MyReport! End User Report Writer, and MyDictionary! Reporter for PROTOS users. Both software programs operate on the HP 3000.

MyReport! End User Report Writer ($2,500 per HP 3000 system) interfaces with PROTOS software. A data dictionary is created on the HP 3000 and a file is passed on to a PC. The user walks through seven interactive screens to pass specific information about the report. A PROTOS code program is generated from the data and automatically transferred back to the HP 3000. The end user doesn't need any prior programming background to run the PC portion of the system; he may use actual names of datasets and fields, or may type in alias names.

MyDictionary! Reporter ($1,000 per HP 3000 system) creates four separate reports from the ROOTDB. It may be run at any time without disturbing data already entered. The second program allows the DP department to enter specific descriptions about all databases, KSAM and MPE files, and fields into the database. The third program will permit printouts of database reports, fields within datasets and field-by-field reports. Contact Perpetual Software And Consulting, P.O. Box 704, Draper, UT 84020-0704; (801) 571-5749.

Enter 379 on reader card

WIN/H3000 Provides HP 3000 MPE/V Support

The Wollongong Group, Inc. has announced WIN/H3000, a new addition to the Wollongong Integrated Networking Solutions (WINS) product family.

WIN/H3000 is a TCP/IP User Level Service product for HP 3000 MPE/V systems users who require TCP/IP user services over LANs and wide area networks. It provides TELNET (virtual terminal), FTP (file transfer) and SMTP (mail), which interfaces through the HP DeskManager.

WIN/H3000 uses the IEEE 802.3 standard for data transmission and is distributed on HP magnetic-reel tape. Options offered by Hewlett-Packard permit interconnection onto the Defense Data Network (DDN).

WIN/H3000 ($7,500—$12,000) features user-level TCP/IP services (government-mandated protocols for system-to-system communication) for use with the ARPANET and MILNET components of the DDN, and allows HP 3000 users to network with other vendors in mixed-system environments. Contact the Wollongong Group, 1129 San Antonio Rd., P.O. Box 51860, Palo Alto, CA 94303; (415) 962-7100.

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Correction

In the February issue, p. 82, the announcement "Printer Plot Converts HPGL To HP PCL" did not reflect a recent price increase. The correct price of Printer Plot is $195. Contact James Associates, 1525 East County Road, Ft. Collins, CO 80525; (303) 484-5296.

Remember how computers remembered? Mercury delay lines? Punched cards with 90 columns and round holes? Hand-wired magnetic cores? In case your memory needs refreshing, The Computer Museum would like to share its memories with you.

The Computer Museum Memory Poster
We have created a limited edition, 20"x32" poster of the picture shown below. Printed in full-color, it includes an identification key to help you recall the memories you've forgotten. To get your poster, along with an information kit on museum membership, exhibits and activities, send a tax-deductible contribution of $25 or more to:
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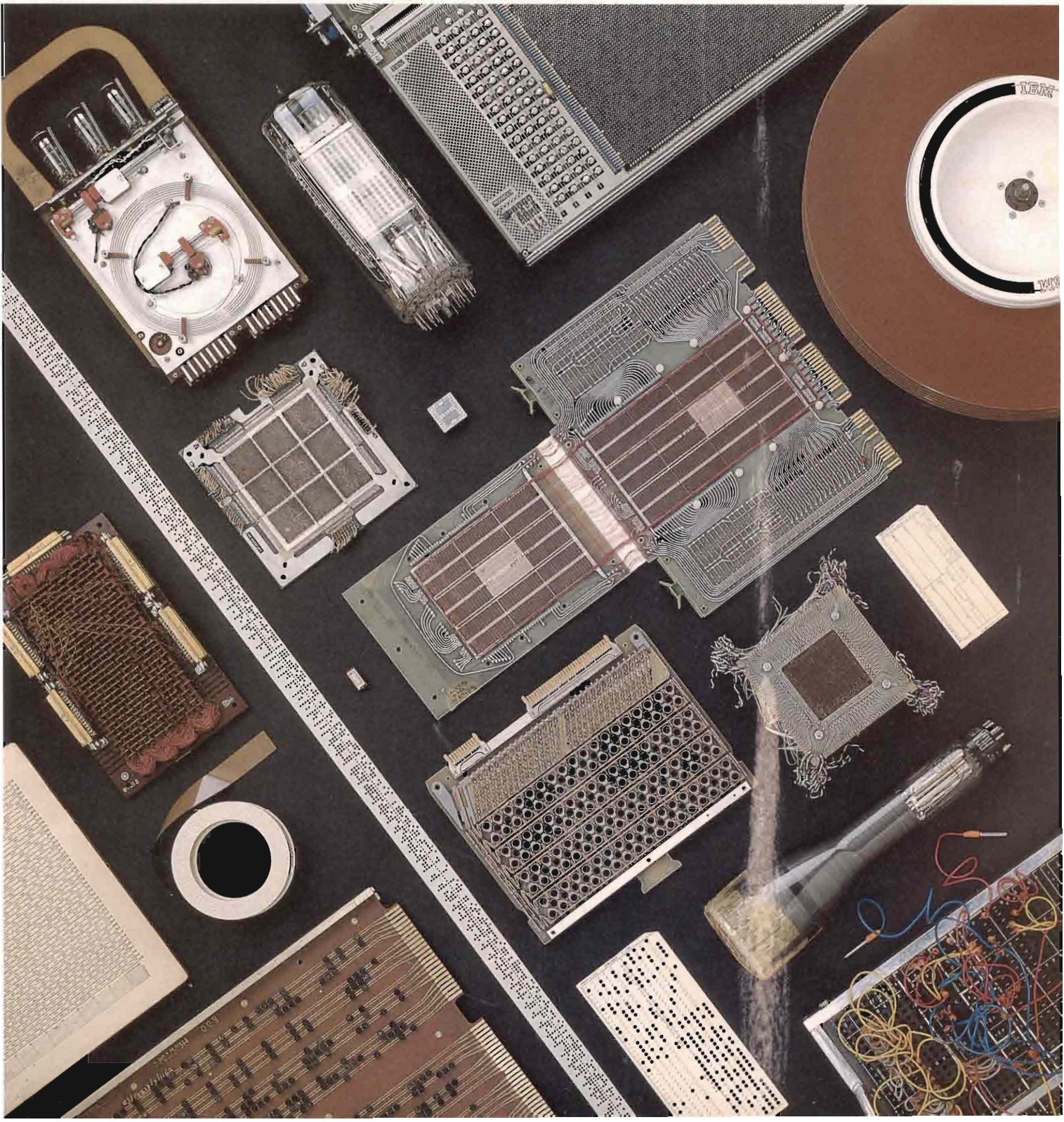
COMPUTER MEMORIES FOR SALE

Special thanks to this publication, Scitex America Corp. (color separations), Grafik Communications, Ltd. (design), David Sharpe Studio (photography) and VM Software, Inc. (poster).



HPS Scheduler Provides Batch Processing

HPS Software Developments Limited recently announced new features for the HPS Scheduler, a batch-processing controller for the HP 3000.

Now HPS Scheduler can catch every job as it is streamed ad hoc into MPE. New features include re-routing, conflict prevention and "hog control."

HPS Scheduler has a number of features that enable it to make the best use of system resources for batch jobs:

- *streams jobs depending on the success or failure of previous jobs without the need for complex JCL or database setups;*
- *prevents jobs running with conflicting jobs or sessions while allowing freedom of choice in run-time and multistreaming;*
- *allows repeat running of regular jobs at any interval specified (i.e., daily, weekly, monthly);*
- *multiple streams of jobs can be managed to allow low-priority jobs to run in the background while high-priority job turnaround is unaffected;*
- *avoids the need for a wait queue that may be lost if the system fails;*
- *jobs can be submitted with simple commands or UDC;*
- *full job reporting; and*
- *runs outside privileged mode.*

Contact HPS Software Developments Ltd., 196a Whittington Rd., London, England N22 4PD; telephone: 01-881 6644.

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HP DeskManager Accesses Gateway/3000 For MCI Mail

HP DeskManager installations now can have worldwide public access with their Gateway/3000 for MCI Mail product.

Gateway/3000 from E-Mail Incorporated provides a cost-effective bridge between the capabilities of HP DeskManager and the various services offered by the public access network of MCI Mail.

Capabilities include electronic mail, telex and mail-delivered courier or postal. Gateway/3000 hosts this connection with an ordinary phone line and a standard terminal port without the hardware complexity and upkeep of bisynchronous protocols. In addition, it provides complete independence of HP DeskManager up/down times, node security, scheduling and message monitoring, multiline addressing, ASCII and binary file transfer, event logging and automatic error recovery.

Contact Customer Support, E-Mail Inc., 10905 Venice Blvd., Los Angeles, CA 90034; (213) 204-5540.

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[CALENDAR]

[APRIL]

18-20: Interex HP 1000 Users Conference, Lyon, France. Contact Interex, Conferences, 680 Almanor Ave., P.O. Box 3439, Sunnyvale, CA 94088-3439; (408) 738-4848; Telex: 4971527.

24-26: SIGRAPID Users Group Conference, Red Lion Inn/Seatack, Seattle, WA. Contact Robert F. Meissner, Welding Engineers Inc., R. D. #1, Kulp Rd., Pottstown, PA 19464.

26: CINMUG (Cincinnati Metropolitan Users Group) half-day seminar on "HP Fourth Generation Language," Hewlett-Packard, Cincinnati, OH. Contact P.G. Landwehr, Vulcan Corp. (513) 621-2850.

[MAY]

9-10: Performance Maximization Seminar, Toronto, Canada. HP 3000-related seminar sponsored by Volz Associates (Winthrop, MA). $525 includes course materials, lunches and refreshments. Discounts available for three or more from the same company attending the same session. Contact Charles H. R. Volz, Volz Associates, Inc., 15 Pauline St., Winthrop, MA 02152-3011; (617) 846-3837.

17-20: SCRUG '88 Technical Conference and Vendor Show, The Pasadena Center, Pasadena, CA. Pre-conference tutorial for new users May 17 (extra charge). Two-day vendor show May 18 and 19. Conference fee $175 for full conference, $75 per day. Call Karen at (213) 453-5664 or write P.O. Box 84219, Los Angeles, CA 90073.

18-20: CAP International 1988 Hard Copy Supplies Conference, Marriott Long Wharf, Boston, MA. Contact Martha Johnson, CAP International, One Snow Rd., Marshfield, MA 02050; (617) 837-1341.

19: GHRUG, Inc. (Greater Houston Regional Users Group, Inc.) one-day meeting, Hilton Hobby, Houston, TX. For more information, contact Suzanne Spitzer (713) 977-3193.

25: DAYMUG (Dayton Metropolitan Users Group) and KYRUG (Kentucky Regional Users Group) joint meeting, Ramada Inn, I-71 and Pfeiffer Rd. exit, Cincinnati, OH. Speakers are Brian Duncombe (Triolet Systems) and Mike Hornsby (Hewlett-Packard, Cincinnati, OH) on "System Housekeeping." Contact P.G. Landwehr, Vulcan Corp. (513) 621-2850.

30-June 3: The International HP Users Conference, Goteberg, Sweden. Write Box 266, S-421 23 V. Frolunda, Goteberg, Sweden.

31-June 3: NECRUG Ninth Annual Eastern American HP Users Conference, The Trump Plaza, Atlantic City, NJ. Fee for members $275 if you register by April 29; $315 thereafter. Early/late non-member fees, $300/$400. Exhibitors call Jeri Fuller, U.S. Mortgage Insurance Co., (215) 825-4666.

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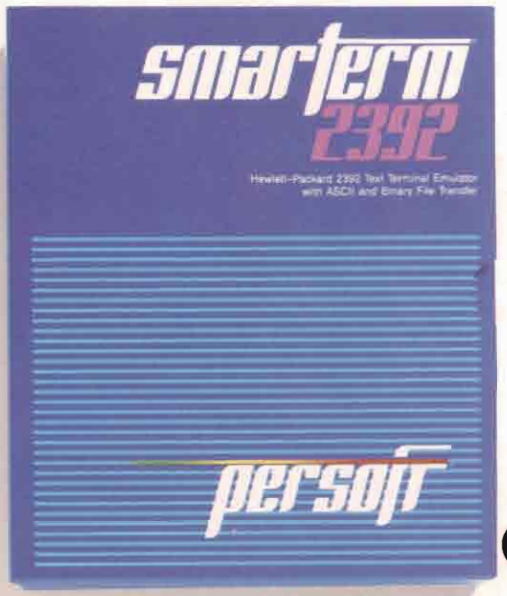

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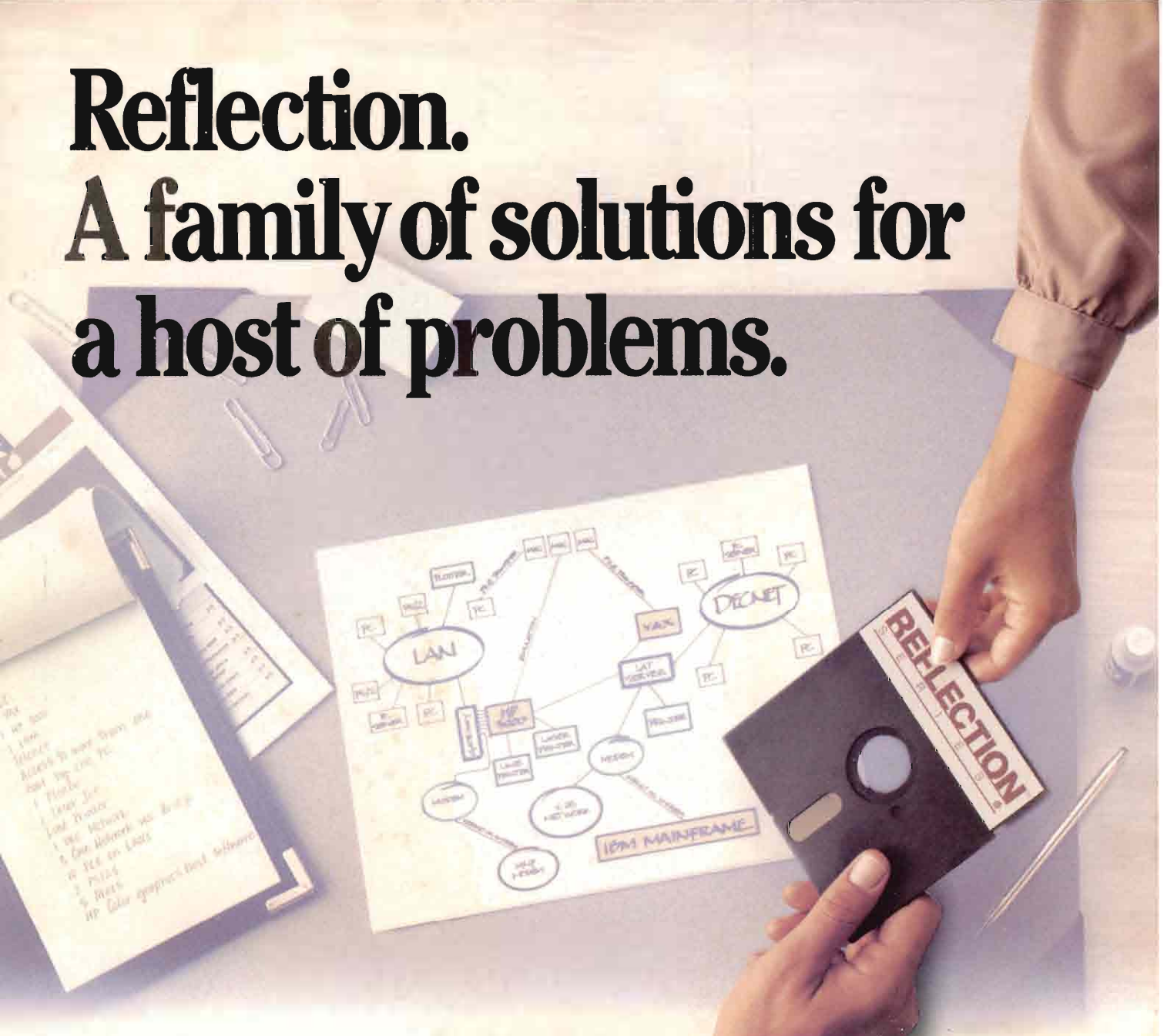

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